



19980311 175

DISTRIBUTION STATEMENT A

Approved for public release;  
Distribution Unlimited

DTIC QUALITY INSPECTED 4

DEPARTMENT OF THE AIR FORCE  
AIR UNIVERSITY  
**AIR FORCE INSTITUTE OF TECHNOLOGY**

Wright-Patterson Air Force Base, Ohio

AFIT/GIR/LAL/97D-8

*STRATEGIC PERFORMANCE MEASUREMENT IN AN  
AIR FORCE LOGISTICS ORGANIZATION*

THESIS

Michael A. Grover  
Flight Lieutenant, RAAF

AFIT/GIR/LAL/97D-8

Approved for public release; distribution unlimited

The views expressed in this thesis are those of the author  
and do not reflect the official policy or position of the  
Department of Defense or the U.S. Government.

AFIT/GIR/LAL/97D-8

STRATEGIC PERFORMANCE MEASUREMENT IN AN  
AIR FORCE LOGISTICS ORGANIZATION

THESIS

Presented to the Faculty of the Graduate School of Logistics  
and Acquisition Management of the Air Force Institute of Technology

Air University

Air Education and Training Command

In Partial Fulfillment of the  
Requirements for the Degree of  
Master of Science in Information Resource Management

Michael A. Grover, B.EEng.  
Flight Lieutenant, RAAF

December 1997

Approved for public release; distribution unlimited

## **Acknowledgments**

I would like to thank my sponsor, Lieutenant Colonel David Peterson (DLA-MM), my thesis advisor, Major William Scott, the two scorecard reviewers: John Hamberg and Chris Caplice. I would also like to thank my reader, Professor Alan Heminger, the Commander 436<sup>th</sup> Supply Squadron, Lieutenant Colonel Ed Skibinski, the Assistant Chief of Supply, Jim Mulvania, and all of the members of 436<sup>th</sup> Supply Squadron who assisted with this study.

This thesis is dedicated to my wife, Julie.

Michael A. Grover

## **Table of Contents**

|                                                             | Page |
|-------------------------------------------------------------|------|
| Acknowledgments.....                                        | ii   |
| List of Figures .....                                       | vi   |
| List of Tables .....                                        | vii  |
| Abstract .....                                              | viii |
| I. Introduction .....                                       | 1    |
| Chapter Overview.....                                       | 1    |
| Summary .....                                               | 5    |
| II. Background .....                                        | 6    |
| Chapter Overview.....                                       | 6    |
| Organizational Strategic Planning.....                      | 6    |
| Strategic Management & Control.....                         | 10   |
| A Model For Strategic Control.....                          | 11   |
| Performance Measurement Systems .....                       | 14   |
| Logistics Performance Measurement Systems.....              | 15   |
| The Balanced Scorecard Performance Measurement System ..... | 18   |
| Relevance of BSC Perspectives for Air Force Logistics.....  | 20   |
| Customer Scorecard Perspective .....                        | 20   |
| Financial Scorecard Perspective .....                       | 21   |
| Internal Processes Scorecard Perspective. ....              | 21   |
| Growth and Development Scorecard Perspective.....           | 22   |
| Evaluation of Performance Measurement Systems.....          | 24   |
| Metrics Development Methods .....                           | 27   |
| Research Methodology .....                                  | 28   |
| Summary .....                                               | 29   |

|                                                                    | Page |
|--------------------------------------------------------------------|------|
| III. Methodology .....                                             | 30   |
| Chapter Overview.....                                              | 30   |
| Issue.....                                                         | 30   |
| Overview of Thesis Methodology .....                               | 30   |
| Developing a Procedure for AF Logistics Balanced Scorecard .....   | 32   |
| Developing a Basic Balanced Scorecard. ....                        | 32   |
| Building a Basic BSC. ....                                         | 32   |
| Developing a Logistics Balanced Scorecard. ....                    | 34   |
| Review of Logistics BSC Development Procedure .....                | 35   |
| Review of Logistics BSC Results .....                              | 36   |
| Air Force Logistics Balanced Scorecard Development Procedure ..... | 36   |
| Procedure Review.....                                              | 36   |
| Overview of 436 <sup>th</sup> Supply Squadron Organization.....    | 37   |
| Execution of the BSC Development Procedure .....                   | 39   |
| Identification of Strategic Business Unit.....                     | 39   |
| Background Material. ....                                          | 40   |
| Delivery of BSC Package. ....                                      | 41   |
| Interviews and BSC Objectives.....                                 | 41   |
| BSC Objectives Ballot.....                                         | 42   |
| Compiled Questionnaire Responses.....                              | 42   |
| Summary .....                                                      | 43   |
| IV: Data Description and Analysis .....                            | 44   |
| Chapter Overview.....                                              | 44   |
| 436 <sup>th</sup> Supply Squadron Balanced Scorecard Proposal..... | 44   |
| 436 <sup>th</sup> Review of Proposed Balanced Score Card .....     | 49   |
| Independent Review of Balanced Score Card Results .....            | 49   |
| Discussion of BSC Development.....                                 | 51   |
| Summary of Results .....                                           | 51   |

|                                                                                            | Page |
|--------------------------------------------------------------------------------------------|------|
| V. Conclusion and Recommendations.....                                                     | 53   |
| Chapter Overview.....                                                                      | 53   |
| Main Findings .....                                                                        | 53   |
| Limitations of Study.....                                                                  | 57   |
| Research Recommendations.....                                                              | 58   |
| Conclusion.....                                                                            | 59   |
| Appendix A: Balanced Score Card Development Procedure.....                                 | 60   |
| Appendix B: Summary of Relevant Organizational Strategic<br>Planning Documents .....       | 81   |
| Appendix C: Biographical Details of John Hamberg, President of Apex Inc.....               | 87   |
| Appendix D: 436 <sup>th</sup> Initial Supply Squadron Balanced Score Card Objectives ..... | 90   |
| Appendix E: 436 <sup>th</sup> Supply Squadron Balanced Score Card .....                    | 91   |
| Appendix F: Compiled 436 LGS Interview Questionnaire Responses.....                        | 92   |
| Appendix G: 436 <sup>th</sup> Squadron Review of Proposed Balanced Score Card.....         | 98   |
| Appendix H: Chris Caplice's Biographical Details .....                                     | 101  |
| Bibliography .....                                                                         | 102  |
| Grover Vita .....                                                                          | 106  |

## **List of Figures**

| Figure                                                                   | Page |
|--------------------------------------------------------------------------|------|
| 1. Types of Strategies.....                                              | 6    |
| 2. Model of Modified John M. Bryson Strategic Planning Methodology ..... | 9    |
| 3. Model of Strategic Control .....                                      | 12   |
| 4. A Taxonomy of Logistics Performance Measures .....                    | 17   |
| 5. The Balanced Scorecard Framework .....                                | 19   |
| 6. Generic Value Chain.....                                              | 21   |
| 7. Links In The Logistics Service Chain.....                             | 23   |
| 8. Steps in Research Methodology.....                                    | 31   |
| 9. Steps in Logistics BSC Development Process.....                       | 32   |
| 10. 436 <sup>th</sup> Logistics Group Organizational Chart .....         | 38   |
| 11. 436 <sup>th</sup> Supply Squadron Organizational Chart .....         | 38   |

## **List of Tables**

| Table                                                                         | Page |
|-------------------------------------------------------------------------------|------|
| 1. 436 <sup>th</sup> Logistics Group Goals (1997 Plan).....                   | 41   |
| 2. 436 <sup>th</sup> Supply Squadron BSC Cause and Effect Relationships ..... | 47   |
| 3. 436 <sup>th</sup> Supply Squadron Balanced Score Card .....                | 48   |

### **Abstract**

Strategic performance measures are being used to define and communicate longer-term planning imperatives to organizational members and external stakeholders. These measures are designed to support the concept of a strategic management process, in which the progress towards strategic goals, and also the goals are continuously reviewed and updated. The measures are linked through associations and communicate the strategy as a series of hypothesized cause and effect relationships. One such performance measurement system, the balanced scorecard, describes the organizational strategy with reference to four common organizational perspectives: Financial, Customer, Internal Process and Growth and Development. A case study is performed to produce a balanced scorecard for a base level Air Force logistics organization. The four perspectives were found to provide a good framework for the squadron's strategic concerns. More research is required to gauge the effectiveness of the strategic management process.

**STRATEGIC PERFORMANCE MEASUREMENT IN AN  
AIR FORCE LOGISTICS ORGANISATION**

**I. Introduction**

*'High quality logistics support for operations is critical to the Air Force Mission and the wartime commander-in-chief.' (AFPD 20-1:1)*

**Chapter Overview**

How can performance measures be developed for implementing strategy? This is the central question this research attempts to address. The area of organizational performance measurement is attracting increasing attention as managers continue to seek out ways to leverage information resources in pursuit of organizational objectives. The introduction of mandatory reporting of performance measures has also increased interest in measurement techniques. The Government Performance Results Act of 1993 mandates agencies to develop and submit strategic plans and performance plans for their major programs. These reporting requirements are intended to hold government organizations more accountable for the use of resources to produce the services for which they are responsible.

The Air Force is responsible for providing capable weapon systems to support operations in the defense of the United States and its interests. Significant resources are required to field and maintain the wide range of weapon systems in the Air Force's

charge. "The logistics system objective is to create and sustain the military capability required for national objectives" (Peppers, 1988:66).

Air Force Logistics agencies are responsible to their primary customers for providing and supporting weapons systems from 'cradle to grave'. Normally decisions made at the executive level attempt to balance the delivery of resources for implementing longer-term strategic objectives, against delivery of resources for efforts to achieve shorter-term operational objectives. Decisions about strategies are communicated through strategic plans and other documents. To evaluate a strategic plan during its implementation stage requires the definition of performance measures that indicate how progress is to be made towards achievement of the objectives. Traditionally, factors such as time, cost and quality have been used as performance measures. A number of factors can hinder the development and use of good performance measures, including:

- a. Unclear Planning Objectives/Priorities. Objectives and priorities expressed in vague terms create confusion about what is required and which goals are most important. '...an effective (logistics) plan is unlikely if the objective and supporting data is unknown or only partially known to the planner' (Peppers, 1988:67)
- b. Uncoordinated Planning. Planning carried out without the involvement of key personnel responsible for implementation, reduces the probability of the plan's success. In large organizations where strategic plans are developed for use by individual business units, it may be difficult for

these units to co-ordinate development of their plan within the context of the larger organizational planning framework, because of resource constraints and more immediate business concerns.

- c. **Proliferation of Performance Measures.** Performance measures are already in widespread use in planning. Improving communication and information storage capabilities have made it easier to generate metrics. 'The problem (for most companies is) that there are too many performance measures – too many that are obsolete and too many that are not consistent'. (Keegan, Eiler, Jones, 1989)
- d. **High Staff Turnover.** 'The result of such turnover rates has been an unstable focus for lower level employees, as they are unsure of which direction the (organization) is headed.' (Miller, T.A. 1995)
- e. **Disconnected Budgetary Decisions.** Plans are not always capable of showing how funds are being used for business processes, because the plans do not include details explicitly linking the supporting strategic initiatives to the overall mission. When required, reports justifying funding for business supporting initiatives often require significant management effort for this reason.
- f. **Massive, Continuous, Organizational Structural Change.** Organizations are being forced to make significant structural changes more often. These changes are the response to complex economic, social, political and technological forces, such as strong business competition, government budgetary decisions and

the introduction of new technology into business processes. Structural changes increase the need for a strategic planning process that is streamlined, flexible, useful and able to support the changing organization's planning needs.

These issues speak strongly for the development and use of a performance measurement system that is not only integral to the process of strategic planning but also gives more visibility to the underlying connections between long range plans and everyday business operations.

For this study, a model for an organizational performance measurement system is selected and a case study is carried out to develop a set of strategic performance measures for evaluation. An Air Force logistics organization was used as the target for the study, mainly because logistics planning and performance information is accessible and because of the author's previous logistics management experience.

Hypothesis 1: A structured approach to performance measurement can be useful for strategic management in an AF logistics agency.

For the purposes of this study strategic management includes strategic planning and the implementation of strategic plans. The concept of 'requisite variety' is relevant to the development of the required performance measures (PM)s. There must be sufficient PMs to adequately describe the desired performance, however too many PMs would increase complexity without significantly increasing useful knowledge about performance.

Hypothesis 2: That four organizational performance measurement areas of Customer, Internal Processes, Financial and Growth and Development are necessary and sufficient

for establishing a structured framework of performance measures, for the implementation of strategic logistics initiatives in an Air Force logistics agency.

### **Summary**

A number of problems exist because of poor planning techniques under conditions of significant organizational change. The use of strategic performance measures may address a number of these problems. The potential to provide strong linkages between strategic plans and the organization's operations provides the motivation for this research into strategic performance measurement.

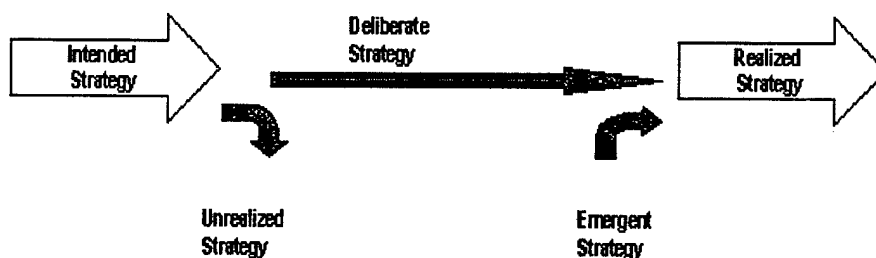
## II. Background

### Chapter Overview

This chapter discusses strategic planning, strategic management and control, organizational performance measures and performance measurement systems, and suitable criteria for performance measurement system evaluation.

### Organizational Strategic Planning

Strategic planning has been defined as 'the formalized, long range planning process used to define and achieve organizational goals' (Stoner et al., 1985). Another definition is 'a formal process for producing documents which lay out the future for an organization'. . Both definitions include a concept of future orientation. Two key terms common to both definitions are 'formal' and 'process'. Clearly, strategic planning is a kind of process. Is it necessarily a formal process? Mintzberg identified two kinds of strategies: Deliberate and Emergent (1978:945). The relationships between these strategies is illustrated in Figure 1



**Fig 1. Types of Strategies**

(source: Mintzberg, 'Patterns In Strategy Formation', 1978)

Deliberate strategies are 'intended strategies that get realized'. Some strategies are destined to become unrealized. Unrealistic expectations, misjudgments and environmental changes can result in unrealized strategies. Emergent strategies are realized strategies that were never intended. Either no strategy was intended from the beginning, or strategies evolved during implementation to fill 'the void' left by unrealized strategies. Some organizations employ very elaborate planning processes, while others use less formal methods. Others simply allow the business environment to dictate the firm's future actions. Mintzberg takes the view that an organization's realized strategy consists of a combination of deliberate strategy and emergent strategy, even in situations where a strict, formal strategic planning process is employed. '[P]erfect realization implies brilliant foresight, not to mention inflexibility, while no realization implies mindlessness' (Mintzberg, 1994:24). In spite of the obvious difficulties this view creates for planners, Mintzberg indicates that strategic planning is an integral element of highly structured organizations like the conventional military, and it serves as a device for communication and control purposes. (Mintzberg, 1994:401).

Given that a formal planning process is used, there are two requirements of the process. The first requirement is that the process must be useful for developing strategic plans that clearly communicate and exert some control over the future direction of the organization. The second is that the planning process and the plans must be flexible enough to account for unforeseen conditions en route, that could jeopardize goal achievement.

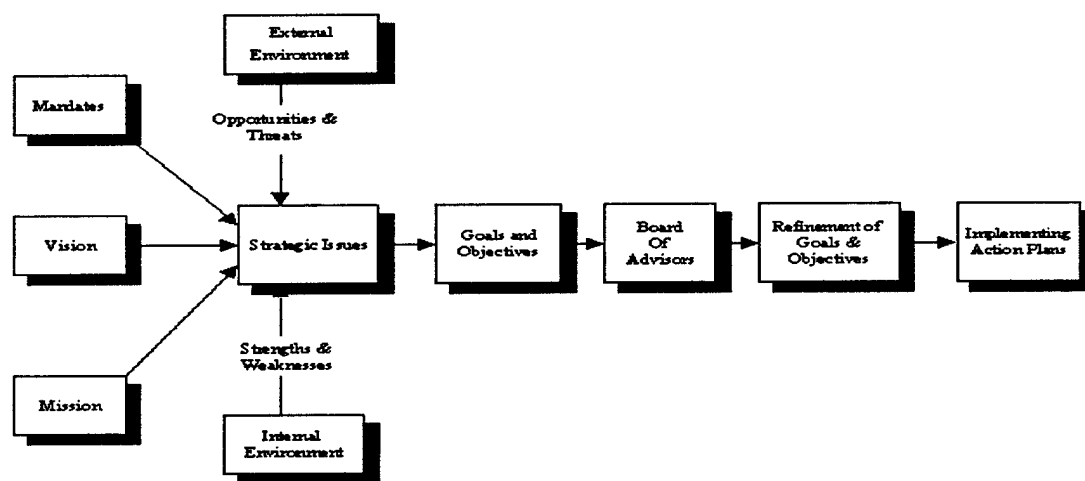
Formal strategic planning has been in widespread use since the 1970s. One of the main reasons for using a formal strategic plan is to communicate 'the way ahead' for the organization. The form and contents of a strategic plan can vary widely from organization to organization. Strategic plans generally have a time horizon of between five to ten years into the future, are updated annually or biyearly, and usually contain

details about the organization's vision, goals and objectives. Additional information such as value statements, implementation milestones, tasking responsibilities and performance measures are sometimes included. Strategic plans are currently in widespread use throughout the business community, however the results of these plans are not always clear.

One reason plans are difficult to evaluate is that the plan is not always communicated very well. Linkages between the mission, objectives, goals and performance measures may not be apparent to personnel responsible for implementation or to other groups that have investments in the outcomes (called stakeholders). Another problem is that higher-level strategic plans do not always seem very relevant in lower levels of the organization where near-term, operational plans command most of the attention. The strong tendency to manage operations at the expense of longer term planning hampers collection of strategic performance measures. The absence of strategic measures could lead to resource allocation inefficiencies in cases where ineffective strategies are being employed. Lack of performance information could also make it difficult to determine if suitable strategies are being poorly implemented, with sufficient time to take corrective action.

Logistics strategic planners in Air Force Headquarters (AF/LGX) have used a modified version of the 'John M. Bryson Strategic Planning Methodology for Public and Non-Profit organizations' for the development of the Air Force Strategic Logistics Plan. (AFLSP). (SPART, 1996). This model is shown in Fig 2.2, below. The Bryson Model is considered to be similar to other conventional strategic planning models currently available and incorporates provisions for stakeholder analysis. This analysis may be desirable in situations where opinions about the organization's future direction differ significantly between stakeholders.

The planning process begins with a review of the mission and vision statements and mandates that must be complied with. The next step involves looking at internal organizational strengths and weaknesses, as well as external opportunities and threats. Opportunities and threats may exist in the form of political, social, economic or technological trends. Key issues for the organization are then identified and prioritized and serve as the basis of the AFLSP. The AFLSP provides the organizational goals, objectives and specific initiatives to help logisticians successfully meet future operational requirements (SPART, Version 1.0A, 1996).



**Fig 2.** Model of Modified John M. Bryson Strategic Planning Methodology

*(adapted from HQ/USAF/LGXX Strategic Planning & Resources Tool Version 1.0A, 1996)*

The model implies that each activity in the process is carried out as a discrete, sequential step. In reality the internal and external environment is continuously changing. The goals and objectives comprising the plan's strategy must be reviewed regularly if the plan is to maintain its relevance in this dynamic environment.

## **Strategic Management & Control**

Strategic management has been defined as 'a system of corporate values, planning capabilities, or organizational responsibilities that couple strategic thinking with operational decision making at all levels and across all functional lines of authority in a corporation' (Gluck et al, 1980).

Gigliani & Bedeian, reviewed the literature on management control theory through the period 1900 to 1972. Their study pieces together strong evidence for rejecting the view that there is little knowledge to assist the executive with the control function of management. They comment that the management function of controlling has only recently (early 1970s) begun to be analyzed systematically, even though concern for controlling was expressed as the central idea of scientific management. In the past, the managerial role of control has been equated with financial control and techniques such as budgets and financial ratios. Many authors have noted that 'control' can take on very different meanings in different contexts. Other researchers have each pointed out that management control can be viewed in two parts: effective control over subordinates through direction of activities and the evaluation of the desired outcome of an activity and making corrections where necessary. Gigliani & Bedeian adopt the following definition of control: 'control will be taken to be the traditional constant cyclic activity of plan-do-compare-correct with its associated communication or information flow, thus eliminating the 'directing' facet of control from consideration'.

Cornell focused on the importance of performance standards, performance evaluation and corrective action. He also expressed the idea that planning without subsequent control was of little value. Since the 1930s, management control research has expanded into areas such as planning and control, top-management control, types of control mechanisms, and more recently, a feed forward model of control has been developed.

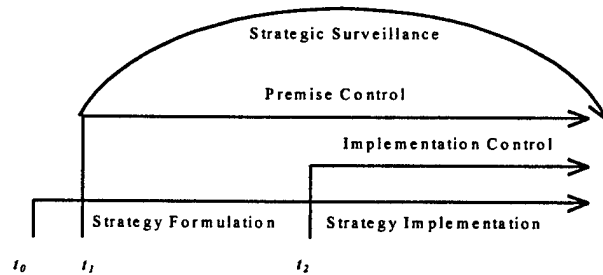
The need for strategic control in organizations arose because of practical experience. For example, there were problems with producing timely responses to planning failures. There were also unexpected developments because of incomplete information about the future validity of the chosen strategic plan.

### **A Model For Strategic Control**

“Few companies develop effective strategic control processes” (Goold, 1991)

Schreyogg & Steinmann discuss an interesting model for strategic control in their 1987 paper. The model arose from a need to express the ‘future-looking’ nature of strategic control. Feedback control is post-action control. In a feedback model, the standards used to judge whether planned actions have met performance expectations are taken for granted. Another problem with feedback control is that the delays associated with providing a feedback response may also discount corrective action. The single loop of the classical feedback control model focuses on deviations from defined standards and does not take into account the real possibility that the standards were inappropriate. Use of a feedback model can lead to losses in time and flexibility in terms of response options – unless, somehow, the plan is known to be correct and the strategic conditions are expected to remain stable during the planning period. Strategic control should be considered the critical evaluation of plans, activities and results to provide information for further action. Complexity and ambiguity are features of the environment that create ill-structured, difficult-to-define problems for management to solve. It is easier for managers to act decisively in these circumstances by being very selective about the information that is acted on. What is required is a model that compensates for the risk of being selective. The validity of the strategic plan needs to be questioned continuously to

compensate for the inherent risk in selectivity of planning. A model comprised of three parts is proposed to address these issues of strategic control. (refer to Fig 3).



**Fig 3. Model of Strategic Control**

(Schreyogg & Steinmann, 1987)

‘Premise Control’ refers to the need to carefully monitor the assumptions made about the internal and external environment throughout all stages of the strategic planning process. This is the feed-forward concept, which is not taken into consideration by traditional feedback control models. ‘Implementation Control’ is used to assess whether the whole strategic course should be changed in the light of past events. This role complements that of operational control, which has more of an implementation focus, which does not tend to question strategy. ‘Strategic Surveillance’ is designed to monitor the full range of events inside and outside the enterprise that are likely to threaten the course of strategic action. This differs from environmental scanning, in that strategic surveillance is designed to safeguard the established strategy on a continuous basis, whereas environmental scanning is considered a discrete stage of the planning cycle used to generate information for the new plan. In summary, this model is designed to answer the question of whether or not the strategic course of the firm should be changed in light of environmental threats.

Simons describes how control can be exercised in organizations that demand flexibility, innovation, and creativity (Simons, 1995). He defines four control levers: progress against plans (diagnostic control systems), belief systems, boundary systems, and interactive control systems ICS (scanning mechanisms). ICS have a number of characteristics that set them apart from diagnostic systems, including:

1. A focus on changing information that top-level managers have identified as potentially strategic.
2. Information that is significant enough to demand frequent and regular attention from operational managers at all levels of organization.
3. The information produced by ICS serves as a catalyst for an ongoing debate about underlying data, assumptions and action plans.

In Simon's control framework, diagnostic control systems are closely related to feedback control systems and ICS systems compare favorably with feed-forward systems.

Goold argues that strategic control involves both feedback and feed-forward elements. He includes among the advantages of adopting a formal control process:

- a. greater clarity and realism in planning,
- b. more stretching of performance standards,
- c. more motivation for business unit managers,
- d. more timely intervention by central management, and
- e. clearer responsibilities.

The Air Force generates numerous performance measures to 'assist' with the management control function. Use of a control model suggests that management could improve the strategic planning and management functions with selective use of measures and more explicit feed-forward control loops. Feed forward loops could be used for

checking planning premises and producing plans that are more flexible and responsive to significant environmental changes.

## **Performance Measurement Systems**

‘to achieve productivity a “top-down approach” in the organization is necessary’

*(van der Meulen & Spijkerman, 1985 )*

Accepting that strategic planning is integral to the Air Force organization and that use of a feed-forward control model could help with early identification of information concerning how plans are being implemented, the next step is to discuss how performance measures can be developed for logistics to serve this purpose. At this point it is worth reflecting on some of the problems with producing organizational performance measurement systems. A NASA report hosted at the Kennedy Space Center web site ([technology.ksc.nasa.gov](http://technology.ksc.nasa.gov)) discusses some of the common problems with organizational level performance measurement systems:

...a large percentage of these (organizational-level performance measurement systems) fail or are discarded after a relatively short period of time. These failures can generally be attributed to the measurement systems’ lack of one or more of the characteristics identified as necessary: validity, accuracy and precision, completeness or collective exhaustiveness, uniqueness or mutual exclusiveness, reliability, comprehensibility, quantifiability, controllability/ownership, flexibility, cost effectiveness, adaptability, maintainability. (from “Organizational Level Performance Measures for External Benchmarking”, <http://technology.ksc.nasa.gov/WWWaccess/95report/ief/ie14.html> 11 April 1996)

## Logistics Performance Measurement Systems

A 'measurement system' implies that there is an underlying association or connection between the constituent measures. Different schemes have been proposed for measuring logistics performance.

Van der Meulen and Spijkerman discuss a logistics PM model called the Pyramid Model which identifies performance indicators at several levels: strategic, control and planning, and operational. At each level, the characteristics of *quantity, time, place and quality* (collectively = results) and *labor, capital and other inputs* (collectively = means) are put together. The advantage of this approach is that the system explicitly indicates which factors can influence results. Measurement elements that determine results and means are mutually dependent and ratios do not indicate solutions. This system can be used at the strategic level to indicate the levels of resource inputs, however it is not clear that the system provides any leading performance information to assist with strategy evaluation.

Andersson et al (1989) argue 'the main objective in logistics (performance measurement) should be the overall coordination (of planning and realization) in order to supply the right information to the right decision-maker' (1989:253). The same researchers stress the potential benefits of making explicit the strategy underlying the logistics plan:

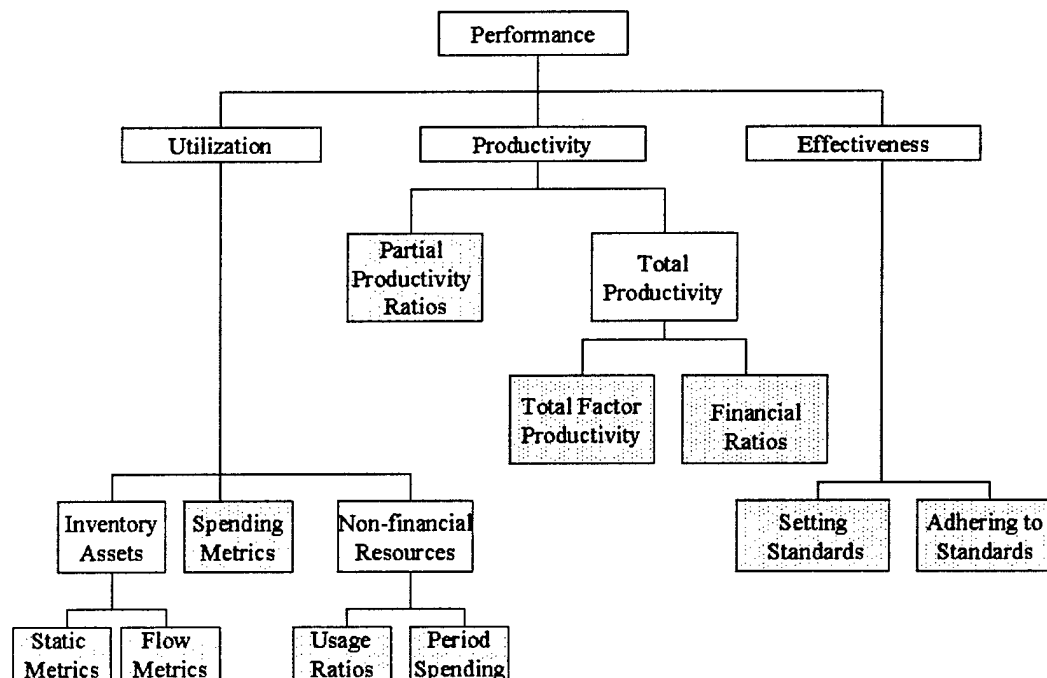
'Designing the logistics strategy gives an opportunity to consider coordinating effects and non-quantifiable factors...(to) support the operational level activities' (1989:257).

They argue that an overall perspective of logistics performance measurement is required: '...use the logistics strategy to guide the extent of the logistics measurement system'.

Andersson and fellow researchers conclude that the weaknesses of today's measuring systems often stem from a 'measurement gap' between traditional financial measurement and 'engineered measurement of physical quantities'. This problem they say, is very much a middle management problem, since financial measures are 'common as objectives and for controlling the organization's activities at the higher management level, while physical measures are being used at the operational level for controlling physical movement of the material' (1989:261). The performance measurement system proposed for their case study, involving a multinational Swedish company, focused on the tradeoff between financial and physical measurements and the related desire to balance internal organizational efficiency with external organizational effectiveness. Effectiveness was equated with different aspects of customer service. : 'Customer service was given a similar status as the budget in the system for judging a unit's total performance' (1989:259). External performance areas looked at for the case study included supplier performance, production performance and customer service. Although different factors were measured in each area, the factors of availability – the 'ability to deliver according to the customer's wish, and reliability – the 'ability to deliver to promises made', were common to all three external performance areas. Once this framework was recognized and acted upon, 'Substantial improvements (in performance) were reached almost at once' (1989:260).

Although Andersson et al provide a convincing case for a coordinated, strategic approach to logistics performance measurement and the authors discuss the importance of customer service, the authors do not explain how 'leading measures' might be used to drive strategic change as part of their model. Their main focus is on non-financial feedback measures, which do not fully communicate the details of management's strategic initiatives. This model would be suitable in a stable environment where operations would not be expected to undergo significant changes.

Caplice and Sheffi (1994) produced a taxonomy of logistics performance measures from a study of various metric criteria mentioned in literature (Caplice and Sheffi, 1994). They identify eight criteria: validity, robustness, usefulness, integration, economy, compatibility, level of detail and behavioral soundness as being 'comprehensive and succinct in their coverage of (the) characteristics (of metric criteria mentioned in literature)' (1994:14). Caplice and Sheffi explain that it is not possible to excel in all of the criteria due to 'interactions or tradeoffs between some of the criteria'. Developing on the idea that business activities are often modeled as transformational processes, the authors explain three forms of measurement can be used to capture the performance of a transformational process: utilization, productivity and effectiveness. Productivity compares the outputs of the process to the inputs. Effectiveness compares the actual output to a standard output, and utilization compares the actual input to a normal input.



**Fig 4.** A Taxonomy of Logistics Performance Measures (*Caplice & Sheffi, 1994*)

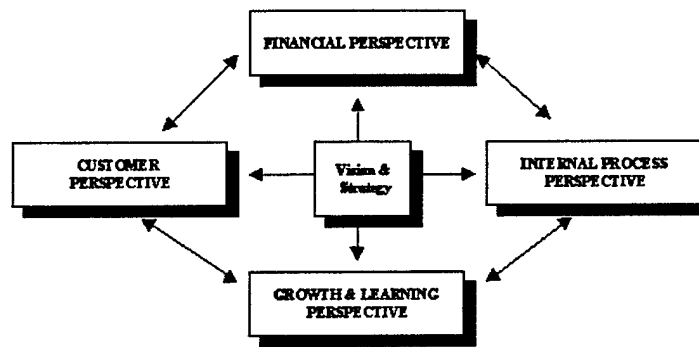
Expanding on these categories as generic measurement forms, Caplice and Sheffi produced a taxonomy of logistics performance measures at Fig 4. This structure permits the analysis of the system of measures as a whole, without being restricted by individual metric definitions.

### **The Balanced Scorecard Performance Measurement System**

In 1992, Kaplan and Norton proposed a system called the 'Balanced Scorecard' as a way for organizations to effectively link their long-term strategic objectives to their everyday, operational activities. The system involved defining a balanced range of objectives to support the company's vision and strategy statements, and developing and communicating measures, targets and initiatives to support the longer term goals, at both of the lower levels of planning.

The essence of the system is described in a 'scorecard' – set of metrics used to communicate and link departmental and individual objectives. The features which distinguish the BSC methodology from other strategic planning techniques include: use of non-financial measures; use of leading, as well as traditional lagging performance measures, and explicit linkages between the shorter term performance measures at the operational level and long range performance measures at the highest levels of an organization.

The BSC approach is developed using four perspectives: Customer; Internal Processes; Financial; Innovation and Learning (refer to figure 5). These areas serve as the foundation for the development of objectives and performance measures in support of the organization's strategic plan.



**Fig 5 The Balanced Scorecard Framework**

*(adapted from Kaplan & Norton, 1996)*

In the words of the authors, Kaplan and Norton:

‘For people to act on the words in vision and strategy statements, those statements must be expressed as an integrated set of objectives and measures, agreed upon by all senior executives, that describe the long-term drivers of success’. ‘The scorecard give managers a way of ensuring that all levels of the organization understand the long term strategy and that both departmental and individual objectives are aligned with it,’ (1996).

Judging by the growing number of Web sites dedicated to the subject, e.g.s (Ergometrics, 1997) and (Metrus Group, 1997), the Balanced Scorecard strategic performance measurement system has generated a significant amount of interest in the business world, including the public sector. A Report by a Panel of the National Academy of Public Administration for the U.S. Department of Defense, speaks to the attractiveness of the BSC approach:

'The balanced scorecard forces managers to look at measures for all four critical areas in the context of the total enterprise, thus limiting the danger of sub-optimizing by concentrating on any one area at the expense of the others. Each perspective is tied in the strategic plan to a number of specific goals which in turn are tied to performance measures. It is the balance of these measures that brings together different and often competing perspectives of the organization's agenda.'

(<http://www.dtic.mil/dodim/naparpt1.html#executive> Jan 1996).

## **Relevance of BSC Perspectives for Air Force Logistics**

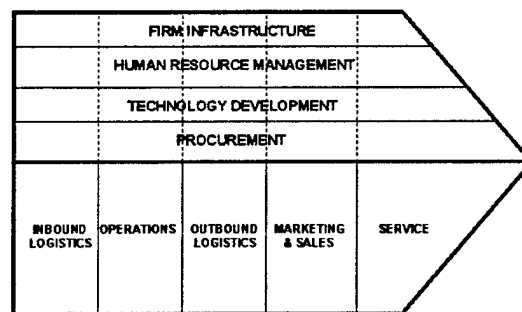
*Logistics (definition) 'The organization, planning, implementation and control of the acquisition, transport, and storage activities from the purchase of raw materials up to the delivery of finished products to the customer' (NEVEM Working Group, 1989:1)*

Although the BSC was conceived as a strategic performance measurement system for organizations in general, it seems particularly well suited for logistics applications.

**Customer Scorecard Perspective.** Fulfilling customer needs is the *raison d'être* for logistics operations. Customer-focused performance areas that might have relevance for AF logistics include customer satisfaction and customer retention. The need to satisfy customers is fundamental and is normally measured using customer satisfaction surveys. More recently, the retention of customers is developing into an issue for Air Force logistics organizations. Now, a range of specialist logistics services is available from the private sector. Operational commanders may have the option of obtaining logistics services from alternative sources if this route offers better value for money.

**Financial Scorecard Perspective.** In a public sector organization such as the Air Force, this perspective is normally budget-driven. The budget constrains the range of options available for achieving the organization's goals. However unlike the private sector, financial performance is unlikely to be the overriding performance area for the organization and alternative sources of funding sometimes exist for worthwhile initiatives. Financial themes that could be of interest to a logistics strategy include: cost reduction, productivity improvement, reducing indirect costs, and/or sharing common resources with other business units

**Internal Processes Scorecard Perspective.** Kaplan and Norton explain that managers should identify the critical processes at which they must excel if they are to meet the objectives of customers. (1996:92). Porter (1985:46) defines a value-chain model (refer Fig 6) that shows how primary activities such as inbound logistics, operations and outbound logistics, and support activities such as information technology (IT) development and human resource management interrelate to form what are, in effect, the business' core internal processes.

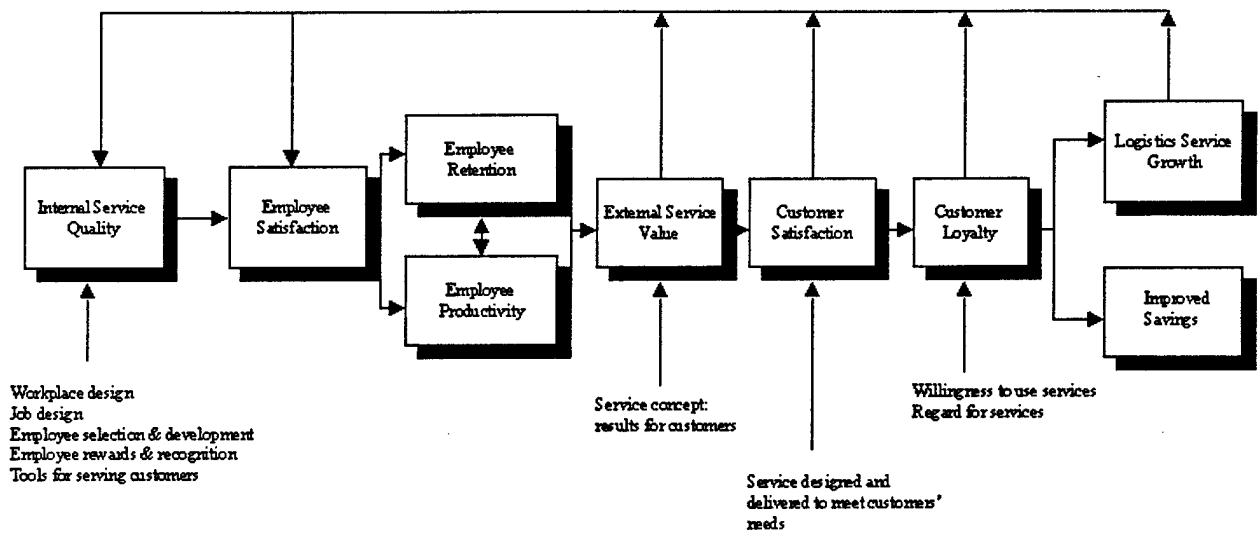


**Fig 6. Generic Value Chain**

*(Adapted from M.A. Porter, Competitive Advantage: Creating and Sustaining Superior Performance, 1985:46)*

Identification and analysis of the primary and supporting activities of the organization's value chain could provide ideas about which internal process factors would be important in a strategic performance measurement system. Caplice and Sheffi describe the logistics process as a transformational process with either perfect or imperfect deliveries as the output possibilities. (1995:67). The factors in the process that result in imperfect deliveries (from the customer's viewpoint) are likely to be key internal process factors and candidates for scorecard performance measures.

Growth and Development Scorecard Perspective. Heskett et al discuss the relationships between employee satisfaction, loyalty and productivity in the organizational service-profit chain (1994). These researchers identified a chain of employee-related factors that impacted on the productivity of some organizations (refer to Fig 7). In more than one case it was found employee turnover costs had a dramatic impact on productivity (1994:167). Perhaps not surprisingly, employee satisfaction was found to be a driving factor for employee loyalty. Heskett and his fellow researchers define a construct called 'internal quality' which is measured by such things as the feelings employees have towards their jobs, their colleagues and the organization. Internal quality, it was argued, contributes most to employee satisfaction. The authors also indicate that a primary source of job



**Fig 7. Links In The Logistics Service Chain**

*(adapted from Heskett et al 1994:166)*

satisfaction is 'the service workers' perceptions of their ability to meet customer needs', (1994:169).

It is this type of cause and effect hypothesizing that Kaplan and Norton claim will identify important growth and development factors that will impact on the objectives of the organization. Three categories identified under the organizational growth and development perspective are: employee capabilities, information system capabilities, and (individual and departmental) motivation, empowerment and (goal) alignment, (1996:127). It is in these domains that Kaplan and Norton claim, from their first hand experience, that a significant portion of the organization's growth and development potential can be found.

## **Evaluation of Performance Measurement Systems**

Caplice & Sheffi (1995) have developed a set of evaluation criteria for logistics performance measurement systems (as distinct from their separate criteria for logistics performance metrics). They argue that collectively, the performance measures used should complement and support each other and provide a balanced picture of the logistics process. Managers need the minimal number of performance measures that give a balanced picture of the target system, process, or plan, for decision-making purposes. Performance measures, according to the authors, should be evaluated at the system-wide level, as well as at the individual performance measure level to ensure the measures are relevant and effective for management decision-making purposes.

The criteria listed by the authors for the logistics performance measurement system includes: comprehensive, causally-oriented, vertically-integrated, horizontally-integrated, internally-comparable, and useful. The system must be comprehensive enough to capture the effect that management policies have on relevant stakeholders, including customers. The system must be causally-oriented to track the 'root causes' of performance. A system is vertically integrated if 'it translates the overall strategy of the organization to all decision makers within the organization and connects metrics at each level to the appropriate reward system'. The system is horizontally integrated if it accounts for all the activities, functions and departments involved in the process. If tradeoff decisions can be made between different dimensions of performance then the system is said to be internally compatible. High internal compatibility is easier to achieve where there are few dimensions and the measurement units used, are similar such as for example, dollars. However, as the system becomes more comprehensive, internal compatibility is difficult. Finally, the system is useful if it is easily understandable and provides 'a guide' for the necessary action to be taken. '(performance

measurements)...should be selected and maintained as a system, so they complement and support each other and provide the decision makers with a well balanced picture of the logistics process' (Caplice & Sheffi, 1995:61).

Air Force Instruction 90-501, 'Criteria for Organizational Performance Excellence' (issued 31 Mar 97), provides a comprehensive description of the Air Force criteria for developing and assessing organizational performance. The criteria are aligned with the Malcolm Baldrige National Quality Award Criteria for Performance Excellence, and cover strategic planning and strategy deployment at the unit level. Area 2.1.b. of the criteria states as one of the assessment areas: '[h]ow the unit creates strategies to reach desired performance levels and how it translates those strategies into goals & objectives'. Category Seven (of seven) titled Performance Results, includes the areas of customer satisfaction, mission performance, unit efficiency, human resources, suppliers quality and regulatory results. Specific details of achievements are listed for each area.

A report by a panel of the National Academy of Public Administration for the U.S. Department of Defense, discusses PM evaluation criteria:

'To be valid and useful, performance measures should meet a number of criteria.

Key evaluation criteria include:

1. Are we measuring the right thing? Does the measure(s):
  - Address improvement in performance of mission?
  - Address improvement in performance of goals and objectives?
  - Assess the "value-added" contribution made by:
    - The organization's overall investment in information management?
    - Individual programs or applications?

- Capture the requirements of internal and external customers?
  - Address the internal performance of the IM function?
  - Reflect improvements in organizational learning and innovation?
  - Address costs, benefits, savings, risk, or return on investment (ROI)?
2. Do we have the right measures? Is the measure(s):
- Targeted to a clear outcome (results rather than inputs or outputs)?
  - Linked to a specific and critical process in the organization?
  - Understood at all levels that have to evaluate and use the measures?
  - Effective in prompting action?
  - Credible and possible to communicate effectively to internal and external stakeholders?
  - Accurate, reliable, valid, and verifiable?
  - Built on data that are available at reasonable cost, appropriate, and timely for the purpose?
3. Are the measures used in the right ways? Is the performance measure(s) used:
- In strategic planning (for example, to identify baselines, gaps, goals, and strategic priorities?
  - To guide prioritization of program initiatives?
  - In resource allocation decisions?
  - In day-to-day management of tasks, dollars, and personnel?
  - To communicate results to stakeholders?

## **Metrics Development Methods**

Hamner and Le Fleur (1993) explored methods used to develop metrics in non-manufacturing organizations. They compared several techniques including the Air Force Support Command (AFSC) Method, Basili & Rombach Paradigm, Hayes & Miller Process, Kinlaw Process Improvement Model, a number of different Office of Management and Budget OMB approaches and the Thamhain Model. They found the (OMB) Generic Method was most likely to produce high-quality metrics for continuous process improvements. The OMB Generic method was rated more highly than other methods because 'the OMB steps were highly executable...and provided a continuous service-oriented example through every step in the method.' Furthermore '...it was the only (process) to specifically require identification of the ...customers as well as their requirements and expectations.' The only factor that needs to be remembered with the OMB method is that the analysis begins with process goals rather than organizational goals. It is necessary to start the analysis at the organizational level for a strategic performance measurement system, to ensure the performance measures are based upon processes that are aligned with the objectives and goals laid out in the strategic plan. Hamner and Le Fleur rated the AFSC Method highly. This method begins with 'Identify your Purpose' to ensure your purpose is aligned with the organization's mission, goals and objectives.

The complete listing of steps is as follows:

1. Identify Your Purpose
2. Develop Your Operational Definition Starting with Your Customer
3. Identify and Examine Existing Measurement Systems
4. Generate New Metrics If Existing Metrics are Inadequate
5. Rate Your Metric Against The "Eight Attributes of a Good Metric"

6. Select Appropriate Measurement Tools
7. Baseline Your Process
8. Collect and Analyze Metrics Data Over Time
9. Finalize The Metric Presentation
10. Initiate Process Improvement Activities

Caplice and Sheffi (1995) make mention of the following considerations for measuring and managing logistics:

- a. The definition of logistics process output should be transaction based. The basic transaction is a completed delivery to a customer (including all sub activities within a process),
- b. The measurement system must focus on downstream player in supply chain – the customer. The customer may be the next area in the process chain, as well as the end user.
- c. Classify a logistics process output as ‘perfect’ or ‘not perfect’ by comparing each delivery completed, to the key characteristic(s) requested by customer (‘promised’ versus ‘provided’ in accordance with customer requirements). Using this definition of the output may assist with determining what it is the customer considers most important in the products and services delivered by the organization.

## **Research Methodology**

A qualitative case study was selected as the most appropriate methodology for this research for several reasons. Although it is possible to benchmark-compare some measures, strategic plans and details of performance measurements are peculiar to individual organizations. For this reason, a field study was deemed necessary to ensure

all relevant information was collected about the internal organization and the local environment that might have a bearing on the results. Confidence in 'well collected qualitative data' is 'buttressed by local groundedness' (Miles & Huberman, 1994). Another advantage of this methodology is that the 'richness' of field-collected data has the potential for disclosing underlying complexities and relationships that might serve as the basis for future research.

## **Summary**

This chapter provided background information on planning, strategic management and control, performance measurement systems and performance measures, criteria for evaluating performance measurement systems, and the Balanced Scorecard strategic performance measurement system. This information is needed to understand the process of scorecard development and the significance of the results of the field study.

### **III. Methodology**

#### **Chapter Overview**

This chapter discusses the Balanced Scorecard (BSC) development process and explains how the basic BSC method was tailored for the production of a performance measurement system to suit an AF logistics organization.

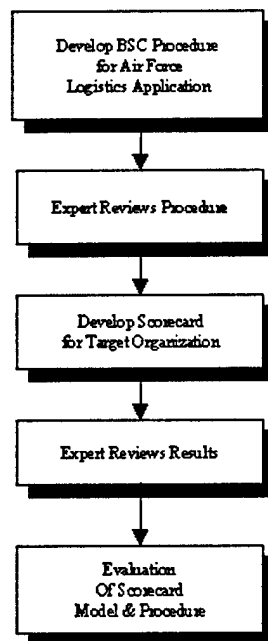
#### **Issue**

There needs to be a structured method for selecting only those few measures that are important to the strategic management process. The issue is whether it is possible to take a general procedure and produce performance measurements for Air Force logistics agencies, for strategic decision-making purposes. In addition to acting as a useful management tool, the performance management system must satisfy the minimum criteria for a good performance measurement system.

#### **Overview of Thesis Methodology**

The method used for testing the issue of interest in this thesis was to take a model for a strategic performance measurement system – the Balanced Scorecard (BSC)– and develop the procedure for producing a BSC for a logistics organization. The BSC was selected over other possible systems since not only did it stress the need for linking measures into a meaningful strategy, but it also stressed the need for leading performance measures to provide early feedback about the theorized cause and effect relationships of the strategy, so that management has a means of gauging the effectiveness of the adopted strategy. Other systems discussed the need for linkages or leading measures but none proposed both features.

A performance measurement expert familiar with organizational performance measures reviewed the developed procedure for consistency and completeness. The procedure was to be consistent with the intent of the general BSC concepts and it needed to address all of the key elements of logistics performance from the strategic organizational perspective. Following review, the completed procedure was used to develop a set of performance measures for an Air Force logistics business unit. The final step involved having the resulting performance measures evaluated against a set of criteria for performance measurement systems. Figure 8 below outlines the steps in the process. Each step is discussed in detail in the following paragraphs.



**Fig 8. Steps in Research Methodology**

## Developing a Procedure for AF Logistics Balanced Scorecard

Developing a Basic Balanced Scorecard. As discussed in chapter two, Kaplan & Norton have laid out a general procedure for developing a Balanced Scorecard (BSC) (Kaplan & Norton, 1996). Figure 9 below outlines the basic steps involved in producing a basic BSC for an organization. Each step will now be described in turn.

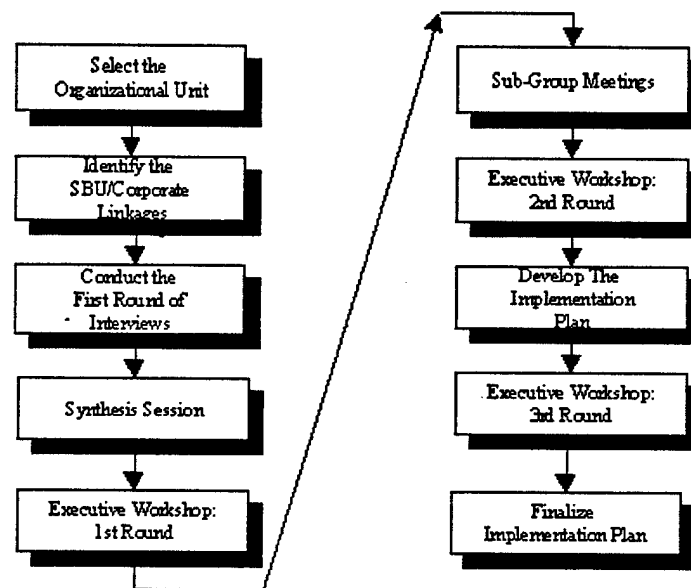


Fig 9 . Steps in Logistics BSC Development Process

Building a Basic BSC. The first step towards building a balanced scorecard is to select the target organization. The BSC can be used at almost any level of an organization. Kaplan and Norton explain that the ideal target organization (or strategic business unit) is one that conducts a wide range of activities (such as a logistics organization). The question that needs to be asked is whether a strategy is necessary for

the strategic business unit (SBU) to achieve its mission. In cases where units have a very narrow focus, such as a single department, product or customer, it may be sufficient to simply develop and monitor key performance measures.

The next step is to research and understand the context in which the SBU conducts operations. Information is gathered about the organization's mission, goals, objectives, overriding corporate themes and linkages to other SBUs. Once this information has been collected, the 'BSC architect' distributes the information to each senior manager in the unit. Additional information about the industry, business environment, market trends, competition and technological developments may also be included with the distributed information. After the executives have had time to review the material, the architect interviews each executive to obtain initial input on the unit's strategic objectives and ideas for measures in the four BSC areas.

Following interviews, the BSC architect reviews interview responses and develops a tentative list of objectives and measures. The architect and (if employed) supporting team members produce a ranked list of objectives in the four BSC areas, with non-attributed comments from the interviews that explain and support the objectives. The development team tries to determine whether the tentative list of prioritized objectives represents the business unit's strategy. The team also tries to determine whether cause-and-effect linkages exist across the four areas. The architect conducts a meeting with the management team with the objective of gaining consensus on the scorecard 'kernel'. When consensus has been reached on the unit's mission and strategic objectives, the question is posed: 'If I am to succeed with my vision and strategy, how will my performance differ for each of the four BSC areas? Each area (finance, customers, internal processes, growth and development) is addressed in turn.

The proposed objectives, their rankings and comments from the interviews are used to assist with deliberations. Each objective is discussed in its own right with a view

to producing suitable performance measures. A vote is taken to choose the final objectives in each area. At this stage the management team will have identified three to four objectives for each BSC area, a descriptive statement for each area and a list of potential measures for each objective. Next, four sub-groups are formed to refine the objectives and measures in each area. Additionally, key linkages are established between measures in each area (internal linkages) as well as linkages between measures in different areas (external linkages). Efforts are also made to identify how each measure influences others. When this stage of BSC is completed, a second executive meeting is held to build ownership of the objectives and measures and the scorecard process.

The objective at the end of this session is to have determined the way in which the scorecard is to be communicated to all of the employees of the organizational unit. A secondary objective would be to have meeting participants develop stretch targets for each of the measures with targeted rates of improvement. Typically targets would be set for three to five years into the future. An executive team is formed to develop the BSC implementation plan. next a third executive meeting is held to validate stretch targets. Finally, the BSC is integrated into the organization's management system so that its use becomes part of the unit's operational routine.

Developing a Logistics Balanced Scorecard. The steps described by Kaplan & Norton for the development of a basic BSC were adapted for use in the development of a Balanced Scorecard procedure for a logistics organization. This process involved looking at each of the four BSC areas and determining how the business of logistics related to each area. In this way it would be possible for a logistics unit to take the procedure and develop a usable BSC, using a minimum of time and resources. The resulting procedure for developing an Air Force Logistics Scorecard is attached at Appendix A. The procedure closely follows that of the general BSC procedure and includes specific information about logistics operations of relevance to air force

operations. In addition to providing a concise list of preliminary questions for the initial executive interviews, details were included to streamline the identification of possible logistics objectives and performance measures in each BSC area. The procedure was developed for general use therefore every consideration will not necessarily be applicable for each individual logistics organization.

The first area to be considered is the Customer area. Customer satisfaction and customer retention are two common ways of judging an organization's performance in this area. Routine customer satisfaction surveys are the most common way of gaining up-to-date information about the latest priorities and issues. If relevant information is sought often enough, the survey can serve the feed-forward or leading performance measurement role, by indicating which areas the customer expects the organization to perform well in, in the future. A logistics customer service audit was adapted from an example by Robeson and Copacino, (1994) to use in conjunction with the BSC procedure (refer Appendix A, Attachment 5).

Where no other competition exists, it may not make sense to consider the concept of 'customer retention'. However, if the service provided is non-essential, customers may instead choose to boycott the service or reduce communications to the organization as a way of expressing displeasure with the unit's performance. These behavioral actions can provide clues about the health of the unit's customer relations.

### **Review of Logistics BSC Development Procedure**

After the procedure for developing a logistics Balanced Scorecard was written, the results were sent to an expert in the field of Air Force logistics performance measurement for review. The reviewer was to indicate whether the details in the procedure were sufficient and complete for developing strategic performance measures for an Air Force

logistics unit. The reviewer was required to be familiar with Air Force operations and have expert knowledge about organizational performance measurement.

### **Review of Logistics BSC Results**

After the procedure was used to produce a scorecard, the results were sent to an expert in the field of logistics performance measurement systems, for review. In addition to the BSC results, the reviewer was supplied a summary description of the organization, and brief details about the organization's mission, its relationships with its customers and future organizational plans. A set of criteria developed for use on logistics performance measurement systems, was selected for evaluating the scorecard. This section describes how the results are to be evaluated against each of the criteria.

### **Air Force Logistics Balanced Scorecard Development Procedure**

Appendix A is the general procedure followed for the production of the strategic performance measures for an Air Force logistics organization. Additional details were included to assist with producing objectives and performance measures for an organization with logistics as its main focus. Although some organizations have been identified within the procedure for illustrative purposes, the procedure's focus is intentionally general so that it may be useful as a method for developing strategic performance measures for other organizations in the future.

### **Procedure Review**

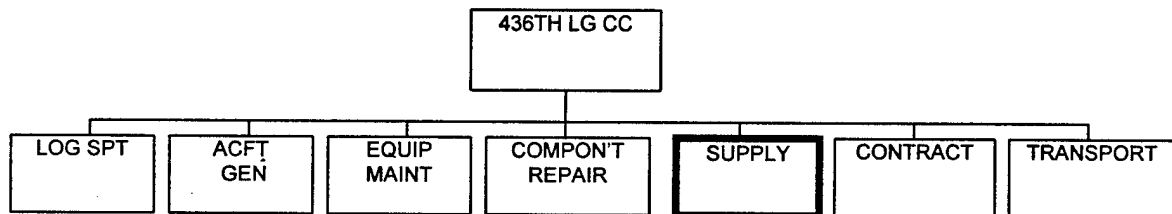
Mr. John Hamberg, President of Apex Consultants Incorporated, carried out the independent review of the procedure. Mr. Hamburg is an expert on organizational performance measurement and a retired Air Force officer. A summary Mr. Hamberg's extensive experience in dealing with the Air Force and with organizational performance

measures is contained at Appendix D. In his review, Mr. Hamburg indicated that the draft procedure at Appendix A was a solid basis for developing strategic performance measures for an Air Force logistics organization. Mr. Hamberg recommended adding 'a few words to draw the linkage' between the expected performance of the target organization's own suppliers and the target organization's critical performance areas. The advice given was 'don't assume the units will figure (the connection) out'. Drawing upon his extensive knowledge and long experience with the Malcolm Baldrige Quality Award (MBQA) Criteria Mr. Hamberg compared the point he was making with the section of the MBQA criteria titled 'Supplier and Partner Results', where examples of performance measures for this area are given. Rather than create a different balanced scorecard area for this consideration, supplier performance is to be treated under the area of Internal Processes. This approach was used since all organizations involved in the supply delivery chain are effectively part of a single internal process which delivers products and services to the customer, in this case, the logistics group. Treating supplier performance in this way emphasizes that processes do not stop at organizational boundaries. Mr. Hamberg's advice to devote efforts to reinforce the general awareness of the supplier process linkages was accepted and a section of the procedure focussing on Supplier Performance was inserted in the BSC development procedure, under the Internal Processes perspective.

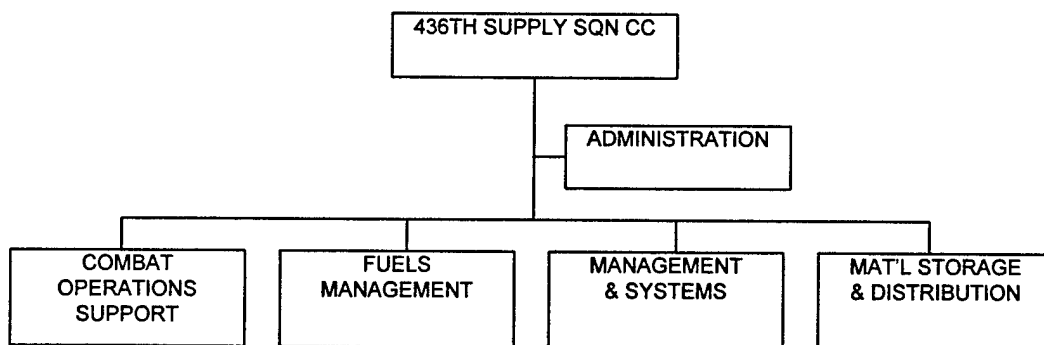
### **Overview of 436<sup>th</sup> Supply Squadron Organization**

The 436<sup>th</sup> Supply Squadron agreed to act as the target organization for this study. The 436<sup>th</sup> Supply Squadron (LGS) is one of seven squadrons working for the 436<sup>th</sup> Logistics Group (LG) at Dover Air Force, Delaware, in support of C-5 aircraft operations.

The LGS is organized into four flights and includes command and administrative elements, comprising 295 personnel in total. The four flights are: Combat Operations Support Flight (C Flight), Materiel Storage & Distribution Flight (D Flight), Fuels Management Flight (F Flight) and Management & Systems Flight (P Flight). The four flights report to the Lieutenant Colonel Supply Squadron Commander (CC), who is directly responsible to the Colonel Commanding the Logistics Group. Figures 10 & 11 outline the organizational charts for the Logistics Group and the Supply Squadron, respectively.



**Fig 10.** 436<sup>th</sup> Logistics Group Organizational Chart



**Fig 11.** 436<sup>th</sup> Supply Squadron Organizational Chart

LGS is primarily responsible for delivery of aircraft and aircraft support parts to its customers; the primary one being the 436<sup>th</sup> Logistics Group. Key processes used by the squadron to achieve these objectives include requesting and issuing spare parts (including repairable items), safe-keeping and storage of parts, forecasting parts requirements, storage and issue of fuels, squadron human resource management, finance and assets management and maintenance of wartime readiness kits. In broad terms, the supply squadron provides the interface between the many supporting supply chains and the aircraft maintainers. The squadron also assists the maintainers with determining spares requirements.

### **Execution of the BSC Development Procedure**

Identification of Strategic Business Unit. The Defense Logistics Agency (DLA) was consulted for advice on a suitable logistics unit to act as the target organization for this study. DLA Materiel Management (MM) became interested in sponsoring this study because of an initiative under way in MM to improve their own customer support to weapon system logistics support units. Organizations considered for the study included a C-141 Logistics Group, C-17 Logistics Group, a C-5 Logistics Group and a C-5 Supply Squadron. The 436<sup>th</sup> (C-5) Supply Squadron was selected over the other organizations because the C-5 weapon system is a mature weapon system, using a significant number of parts managed by DLA. The Supply Squadron was selected over the Logistics Group because it reduced the operational burden of providing data and participating in necessary group development work to a manageable level. The 436<sup>th</sup> Supply Squadron is responsible for providing a wide range of products to its customers. The Squadron normally maintains its own strategic plan with a mission statement, goals

and performance measures. These features suggested the Squadron was of a sufficient size and at an appropriate level in the organization's structure, for scorecard development.

Background Material. The 436<sup>th</sup> Supply Squadron was contacted and requested to supply a copy of the last squadron strategic plan. Information was gathered about other strategic plans that might be of relevance. Appendix B summarizes the results of this background research and contains a list of recurring strategic logistic planning themes in higher level planning documents. The Squadron Quality Manager indicated the LGS was in the process of aligning the Squadron's new strategic plan, with the 436<sup>th</sup> Logistics Group's plan, issued June 1997. For this reason, and because it is consistent with the BSC process to align the plan with the higher organizational plans, this researcher decided to use the LG's goals at table 1 as the starting focus for the development of scorecard objectives for the supply squadron. Although some of the more complex strategic themes such as lean logistics are not articulated in the LG plan, the LG goals are not inconsistent with the broader themes. The more complex, and therefore riskier approach, might have been to attempt to develop LGS scorecard objectives relating directly to strategic themes contained in other higher level logistics planning documentation, such as AFMC or AFSLP. The existence of a myriad of strategic plans relating to logistics raises the issue of how commanders and planners decide which themes are of most significance to their organization (refer Appendix B).

**Table 1.** 436<sup>th</sup> Logistics Group Goals (1997 Plan)

1. Generate Mission Ready Aircraft – Provide Reliable Aircraft to Sustain Mission Requirements
2. Human Resource Development – *Promote Technical, Professional, and Personal Development of Group Members*
3. Logistics Support - *Manage Resources to Sustain Mission Requirements*
4. Provide a Safe Working Environment – *Ensure Production Processes Minimize Risk to Personnel, Equipment and Environment*

Delivery of BSC Package. Commander 436<sup>th</sup> Supply Squadron agreed to this researcher's request to visit Dover Air Force Base for four days to assist with developing a balanced scorecard for the Squadron. Introductory BSC presentation material was sent by email to the Squadron in advance, together with preliminary questionnaires (Appendix A, Attachment Two) for the Squadron executives to complete. The questionnaires were not circulated to participants until the time of the interviews, since the Squadron was of the opinion that most of the information could be gathered from files held by the Squadron quality manager.

Interviews and BSC Objectives. The following management team members took part in this study: the Commander (CC) Supply Squadron, Deputy Chief of Supply, and the head, or deputy head, of each of the Squadron's four component flights. The Squadron Quality Manager was also involved in the data collection process. CC was unable to assist until the last day of the visit, however he did manage to provide valuable input into Squadron goals. He also took part in the voting on the scorecard objectives, which took place the following week.

The team that participated in the scorecard's development was considered representative of the Squadron's management. Owing to scheduling constraints, not all interviews could be conducted prior to a mass brief to the development group on the BSC concepts. For this reason, additional time was taken during early interviews, to ensure the BSC concepts were clearly understood at the individual level.

The mass briefing, personal interviews and discussions with Squadron members and customers, consumed most of the available field study time.

**BSC Objectives Ballot.** The statements given by interviewees in response to the questions: "What do you see as the organization's strategic goals in each of the following (BSC) areas?" were used by the researcher to compile the list of BSC objectives tabled at Appendix C. Following the introduction to the concept of the BSC, voting on suitable BSC objectives was conducted in a group session led by the commander. Voting took place during the week following the data collection visit (in the absence of the researcher). The following paragraphs outline the results of data collection using the BSC procedure.

### **Compiled Questionnaire Responses**

Appendix D shows how the objectives data was refined from the Squadron interview questionnaire responses, to produce the BSC objectives. The information gained from the interview questionnaires was used to compile a list of initial objective suggestions. The list was emailed to the Squadron the week following the field study, and a vote was taken during a squadron staff meeting. Seven management team members, including the commander, were involved in the vote. Each member had three votes to allocate to the three objectives they felt were the most important strategic objectives in the BSC area. The voters were asked to consider the Logistics Groups goals

(Table 3.1) when casting their vote – in recognition of the need to maintain consistency and support for the larger organizational planning framework and to remind voters that the Squadron objectives reflect the strong customer focus of the Support Squadron. The full listing of strategic (BSC) objectives, including ballot details is included at Appendix D.

### **Summary**

This chapter covered the methodology used to develop and evaluate a strategic performance measurement system for an Air Force logistics organization. Chapter IV contains the results of using the methodology to produce a balanced scorecard.

## **IV: Data Description and Analysis**

### **Chapter Overview**

The main discussion in this chapter centers on the process of data collection for scorecard development, and the resulting scorecard performance measures.

### **436<sup>th</sup> Supply Squadron Balanced Scorecard Proposal**

The cause and effect relationships integral to the scorecard are discussed in the following paragraph. These relationships are shown in table 2 and are represented in the diagram by the arrows connecting the performance drivers to the strategic outcomes. It is interesting to note that some of performance drivers are expected to affect strategic outcomes in other areas. For example, 'Strong supplier partnerships' is expected to lead to improved parts delivery times in the Internal Processes area and also improved stock effectiveness in the Customer area.

The planned improvements which have started to take place to information systems used by the Squadron are expected to lead to improved Squadron productivity. Recent work to link the GO81 aircraft maintenance information system to the Standard Base Supply System (SBSS) is expected to streamline supply item order processing. The Air Force's plan to introduce the future Global Communications Supply System (GCSS) is also expected to improve visibility of global assets, so that it is possible to manage off-base inventory more closely. There may also be other potential opportunities to leverage information technology to improve productivity, such as the example of the automatic tank gauging system recently installed in the large fuel storage containers.

IT improvements may make it possible to reduce the time delay between when a part need is recognized, to the time an order for the part has been placed with the supply

system. Automatic transfer of information between the GO81 system and SBSS will lead to reduced manual keypunching and therefore lower manpower costs for this work.

The performance of each of the Supply Squadron's own suppliers is critical to the Squadron's mission performance. Organizations which take part in the so-called 'supply service chain', such as aircraft depots, government agencies and prime contractors, all have important roles to perform in the delivery of the products and services to the Squadron's customers. Failure of these organizations to perform, is passed on 'down the chain'. It is important for the Squadron to maintain good, strong relationships with its suppliers.

Some of the Squadron's primary customers also have a dual role as a Supply Squadron supplier. For example, the Component Repair Squadron (CRS) is expected to supply an unserviceable item for each repairable item the CRS demands of the supply system. Reductions in the efficiency of the repair pipeline cycle can result when this exchange is not completed properly.

Squadron supplier performance monitoring is needed to ensure minimum acceptable delivery standards are being maintained and to determine areas where gains in responsiveness might be achieved. Specific gains delivered through stronger partnerships could include improved parts delivery cycle times, and reduced routine aircraft servicing delays. Improved parts forecasting methods could also be employed to reduce routine aircraft servicing delays. It may be possible to use IT to assist with this problem.

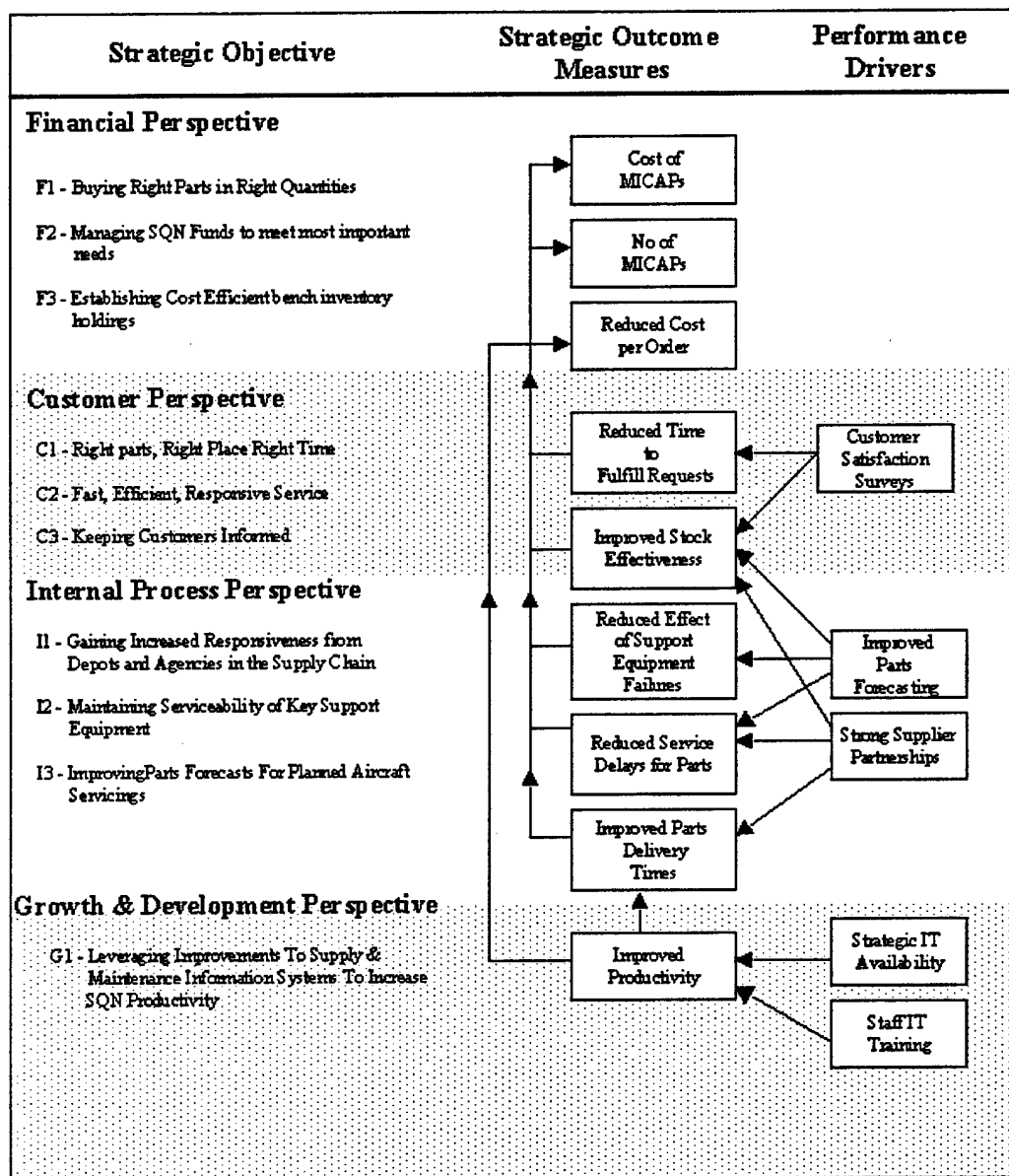
Failures of primary support equipment can have a devastating effect on parts delivery targets. It is important to ensure that policies are in place for the identification and delivery of parts for mission supporting equipment, in addition to aircraft spares.

Detailed parts forecasting methods are employed, however as this function has a large influence over the effectiveness of the Squadron, it would be advisable to monitor and review methods used, in efforts to minimize parts inabilities.

Improved responsiveness is perceived as one of the keys to keeping the Squadron's customers content. Forecasting methods are one of the main tools available for determining routine inventory requirements, however customer feedback is essential for determining non-routine requirements and for confirming that routine stock policies. Customer satisfaction is the Squadron's main focus, however the budget is one large constraint on the options available for meeting customer requirements. Available resources have to be used to attain the maximum benefits.

The balanced scorecard developed for the 436<sup>th</sup> Supply squadron is tabled at Appendix E. An abbreviated version is reproduced at table 3.

**Table 2. 436<sup>th</sup> Supply Squadron BSC Cause and Effect Relationships**



**Table 3. 436<sup>th</sup> Supply Squadron Balanced Score Card**

| Strategic Objective Area                                                                                                                                                                                                                                                                                                              | Strategic Outcome Measures<br>(lagging PMs)                                                                                                                            | Proposed Performance<br>Drivers (leading PMs)                                                                             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| <b>AREA ONE: FINANCIAL OBJECTIVES</b>                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                        |                                                                                                                           |
| Using available budget to buy right parts in right quantities<br>Managing internal SQN funds so that most important needs are met<br>Establishing policies for cost efficient bench inventory holdings                                                                                                                                | Cost of MICAPs for Period<br>No of MICAPs for Period<br><br>Avg Cost Per Supply Order<br><br>Avg Cost of Bench Inventory                                               | Nil                                                                                                                       |
| <b>AREA TWO: CUSTOMER OBJECTIVES</b>                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                        |                                                                                                                           |
| Right parts, right place, right time<br>Faster, efficient, responsive customer service<br>Larger parts store closer to customer for improved responsiveness<br>Keeping customers informed about supply issues.                                                                                                                        | Average Customer Order-to-Delivery Cycle time<br>Stockage Effectiveness %                                                                                              | Customer Satisfaction Surveys                                                                                             |
| <b>AREA THREE: INTERNAL PROCESS OBJECTIVES</b>                                                                                                                                                                                                                                                                                        |                                                                                                                                                                        |                                                                                                                           |
| Improved responsiveness from depots and government agencies that are part of the supply delivery chain<br>Maintaining serviceability of key equipment (including hydrant, fuel system services)<br>Improving parts forecasts for planned routine and special aircraft servicings                                                      | Agency Average Supply Cycle time<br>Agency Average Delivery Variance<br>% Routine Servicing Demands Satisfied On-time<br>Cost of Support Equipment Failures for Period | No. of Strategic Supplier partnerships<br><br>Parts Forecasts (Routine servicings)<br>Parts Forecasts (Support Equipment) |
| <b>AREA FOUR: GROWTH and DEVELOPMENT OBJECTIVES</b>                                                                                                                                                                                                                                                                                   |                                                                                                                                                                        |                                                                                                                           |
| Taking advantage of the opportunities offered by the new interface between GO81 Maintenance System and SBSS<br>Taking advantage of the inter-base inventory management improvements opportunities offered by the future Global Communication Supply System (GCSS).<br><br>Introducing other Information Technology (IT) improvements. | Avg Need-Order Time<br><br><br>No. of Order Errors                                                                                                                     | SQN Business-Supporting IT Availability (versus planned)<br><br><br>Staff IT Skill Development (versus planned)           |

### **436<sup>th</sup> Review of Proposed Balanced Score Card**

Appendix G contains the complete responses by LGS to the proposed balanced scorecard for the Squadron. Mr. Mulvania, Assistant Chief of Supply performed the review. Mr. Mulvania commented on the importance of the composition and voting rights of the members in the group voting on the goals to be included in the score card. Each person who voted on the objectives was given an equal say in objective rankings (three equal votes in each area), irrespective of their management position, or time at the Squadron. However, Mr. Mulvania was satisfied that the goals (BSC objectives) included in the score card appeared reasonable. Another point raised was in relation to the cause and effect relationships. Although the cause and effect relationships give good overall coverage to the Squadron's strategic concerns, they need to be more detailed. Also, two of the proposed measures: 'Average cost per supply order', and 'Average cost of bench inventory' did not appear to have a strong connection with the strategy. A perceived problem is the lack of available cost information. Mr. Mulvania concludes by saying 'If done properly I believe the balanced scorecard can be a useful tool for planning and strategic performance monitoring'.

### **Independent Review of Balanced Score Card Results**

Mr. Caplice was requested to review the results of developing a strategic performance measurement system for the 436<sup>th</sup> Supply Squadron, against criteria he co-developed with Sheffi. Mr. Caplice is a logistics expert currently working for the Princeton Transportation and Consulting Group. His biographical details are included at Appendix H. As discussed in Chapter II, the criteria to be used for the evaluation of the scorecard include whether the scorecard measures are causally-oriented, comprehensive,

horizontally integrated, vertically integrated, internally consistent and useful. Mr. Caplice was asked to comment on the first five areas, since the system's usefulness can only be determined by 436<sup>th</sup> Supply Squadron in this instance.

Mr. Caplice's comments are contained in the following sections:

Causally Integrated

'It looks like you have caught most of the causal factors, but I am too unfamiliar with your process to see this clearly.'

Comprehensive

'From a system perspective, the metrics appear to be comprehensive in that you are trying to capture different perspectives of the process. However, I do not see any asset utilization metrics or any real financial elements. The metrics appear to be very specific to the squadron thus they are probably difficult to benchmark across different industries (to the private sector, for example). I also note that there are no metrics which capture any other elements of the delivery process besides time (Average Customer Order - to - Delivery Cycle Time).'

Horizontally Integrated

'I cannot really tell if these metrics are vertically or horizontally integrated'.

Vertically-Integrated

'I cannot really tell if these metrics are vertically or horizontally integrated. Are these metrics top tier with supporting diagnostic metrics underneath them?'

Internally Consistent

Mr. Caplice could not determine the internal consistency of these broad metric areas without further details of supporting metrics. Some of these metrics still required development. e.g. leading performance measures.

## **Discussion of BSC Development**

Collecting information for the scorecard is a highly consultative process. The time required for interviews and briefings was longer than expected, and Squadron operational commitments prevented the development of detailed performance measures for each scorecard area. Although organizational information such as mission statement, Squadron composition, LGS and LG organizational charts and a general description of the squadron's four flights were sent to Mr. Caplice, Mr. Caplice indicated that he was not familiar enough with the Squadron's role and responsibilities to determine whether or not the scorecard was vertically or horizontally integrated.

Mr. Caplice's review identified another issue. A strategic performance measurement system will not provide visibility of all of the underlying measures in the logistics performance measurement system. That is, the system is only intended to contain information relevant to the strategy. Caplice and Sheffi's evaluation criteria was intended for an entire logistics performance measurement system, which would include all of the measurements being gathered and used for all logistics purposes and not just measures of strategic interest. It may be necessary for future evaluation purposes to make a clear distinction between strategy evaluation and performance measurement system evaluation. Of course, strategy evaluation was not conducted for this study since time available did not allow collection and use of scorecard data.

## **Summary of Results**

A general procedure was developed for producing strategic performance measurement systems for Air Force logistics organizations. The procedure was used to produce a Strategic Performance Measurement tool - a balanced scorecard - for a base

level Air Force Logistics Organization. The development of this scorecard has raised a number of issues about planning and performance measurement that require further investigation, including organizational strategic planning relationships, the strategic management process and the evaluation of strategic performance measurement systems.

## **V. Conclusion and Recommendations**

### **Chapter Overview**

This chapter covers the major findings and limitations of the study and makes recommendations for future follow-on research.

### **Main Findings**

It is possible to operationalize a strategy for a logistics organization using a performance measurement system that is integral to the planning process. The areas of Finance, Customer, Internal Process and Growth and Development appear to provide an adequate structure for such a performance measurement system. At an operational air force base the focus of logistics is on supporting current operations. Currently, significant strategic logistics initiatives are the responsibility of higher-level logistics organizations, such as AFHQ and AFMC. This arrangement does not preclude the base-level logistics organization from aligning local strategic plans to higher level initiatives. In addition to operational support objectives, plans could include provisions that also address organization-wide logistics themes, at the local level. This approach could forge stronger linkages between plans at different levels and improve intra-organizational cooperation on longer term initiatives of relevance to the larger organization. Issues that still need to be addressed for the scorecard to work as a strategic management tool include sourcing resources for the pursuit of scorecard objectives, and identifying the factors that would motivate managers to consider using a strategic management process.

The BSC method could be used as a framework for developing PMs for an AF logistics organization. The scorecard produced resulting from this study identified the need for new PMs, however more iterations are required to define these PMs in detail, determine how data is to be sourced, and put in place the resources and processes to

collect the data. Detailed PM data is necessary to test the hypothesized cause and effect relationships in the strategy. Collection of data for newly proposed PMs may require implementation of new business processes, which may require significant organizational commitment. One way to reduce the effort required to collect data may be to use proxy measures for which data is currently available, although a larger number of proxy PMs are likely to be required to gain the same information.

The first research hypothesis was that a structured approach to performance measurement can be useful for strategic management in an AF logistics agency. This study has shown that simple steps can be taken to develop a strategic performance measurement system that links key performance measures together in support of the organization's overall strategy. The system can be used to communicate the strategy internally to those members responsible for its implementation. The system can also be used to communicate the unit's strategy to external organizations with investments in the organization's performance, such as repair depots and aircraft maintainers. The system provides a means for controlling implementation of the strategic plan and the leading measures are the key to checking the validity of the strategy premises.

Although the independent review of the scorecard results was inconclusive about whether the scorecard measures were vertically and/or horizontally integrated, this can be partially attributable to the reviewer's lack of first hand knowledge of the squadron and its operations. Further iterations of the scorecard measures was not likely to have led to the addition of extra diagnostic measures in the scorecard. The issue is whether a strategic performance measurement system is complete without all other metrics routinely gathered by the unit that could be used in association with the scorecard. An example might be collecting additional information to diagnose a proposed cause and effect relationship. As part of the strategic management process, it is assumed the scorecard

measures will prompt questions that can only be answered with the use of other 'drill-down' measures that are not contained in the scorecard.

Developing the strategy and the scorecard measures with reference to the LG goals provided an explicit connection between the different organizational planning levels. As a consultative process was used for the scorecard's development, it should be clear to all squadron decision makers involved in developing the scorecard, how the scorecard strategy supports the squadron and LG's mission. It may be possible to evaluate personnel performance with reference to achievements in each of the scorecard areas, although detailed measures and agreed target levels would be required for this to happen.

With respect to the horizontal integration criteria, more specific measures would be required to account for the contribution of the squadron's flights and other areas involved in the strategy-supporting processes. For strategy evaluation purposes, the squadron commander may decide that broad, aggregated scorecard measures such as those produced, would suffice.

The cause and effect relationships linking the measures also serve to describe the squadron's strategy. The performance measurements should make it clear to managers and personnel concerned, which achievement areas that are most critical to the strategic plan and why. If the scorecard can do this then it would be useful for communicating strategic imperatives. If strong relationships are found to exist between scorecard variables then the scorecard has use as a strategic control tool. The same relationships may also indicate how tradeoff decisions can be made. For example, reducing average stock levels on certain classes of items may not lead to an appreciable rise in the number of MICAP arisings. In this case funds may be redirected to address other high priority support needs.

The four perspectives of the scorecard: Growth and Development, Internal Processes, Customer and Financial give good coverage of the kinds of resource issues that should be of concern to an organization. Personnel, materiel, money and information needs can all be accommodated in the scorecard framework. Use of the scorecard perspectives also balances concern for achieving internal efficiencies with the need to satisfy external customer and stakeholder demands for effectiveness.

The process reviewer, Mr. Hamburg, commented on the need to explicitly address external supplier relationships. Even though a separate perspective for external processes is not including in the scorecard, an additional perspective was not found to be necessary. Supplier relationships were accommodated under Internal Processes – since all units in the goods and services supply chain, including suppliers, are effectively part of one large ‘internal organizational process’ from the customer’s perspective.

The scorecard Growth and Development objectives focused on human and information resources and stressed the need for training and innovation to improve productivity and responsiveness. The Internal Process area emphasized the need for the squadron to work with other agencies and concentrate on improving parts forecasting methods as the way to deliver effective customer service. In the Customer area, availability and responsiveness were considered to be key requirements demanded of the supply squadron by its customers. Both of these elements are essential to the LG’s (the customer’s) mission reliability and sustainment requirements.

These observations together with the review carried out by the 436<sup>th</sup> LGS’s Assistant Chief of Supply indicate that all four organizational performance measurement areas of Customer, Internal Processes, Financial and Growth and Development are necessary. There were no strategic issues raised during the field study that were not accommodated by one of the four perspectives and for this reason it appears the set of

scorecard perspectives is sufficient for establishing a structured framework of strategic performance measures for an Air Force logistics organization.

### **Limitations of Study**

This case study focused on a base level Air Force logistics organization. The procedure used to collect data was developed with an air force logistics organization in mind. The strategy and supporting performance measures would probably be quite different in the public sector where profits are normally an important goal. The organizational strategic plan at the base level is likely to be different than at other higher levels in the logistics organization because of the nearer term operational support focus of these plans. The scorecard objectives were selected by representatives from each of the squadron's flights, however each had equal voting rights, which doesn't reflect differences in position, knowledge or experience of the member. The cause and effect relationships used to describe the squadron strategy were very general. Some of the performance measures required for the system are not currently collected and it may not be cost effective to gather them without the use of new processes. The squadron's performance is very reliant on the performance of other logistics agencies, such as the repair and maintenance depots. This reliance may affect the control the squadron has over strategic issues, which in turn, could impact the squadron's performance. This is performance dependency was raised as an issue during scorecard development.

Evaluation of a strategic performance measurement system is a twofold task. Part of the task involves evaluation of the strategy, which requires an examination of the cause and effect relationships proposed in the strategy, to gauge their validity. The other part of the task is an evaluation of the measures selected, to determine if the measures are providing useful information about the strategy. The methods of PM evaluation

discussed in this study have been designed for evaluating a complete operational logistics PM system, and do not indicate the significance or usefulness of individual performance measures for a proposed strategy.

## **Research Recommendations**

A number of recommendations can be made for follow-on research from this study:

- a. Development of further logistics BSCs would provide additional information about whether the four perspectives are necessary and sufficient for logistics operations. BSCs might be considered for the command level logistics manager. (A corporate level BSC).
- b. Development of BSCs for operations other than logistics would provide more information about the method's versatility across different organizational groups.
- c. Development of information system requirements for hosting and using BSC information across an organization. This research might include how to address the significant problem of implementing new measures easily, using the currently available systems, or systems with only minor changes.
- d. A longitudinal case study would be desirable to permit collection of actual scorecard PM data over a period of time. Such a study could focus on the strategic management process, including the testing of cause and effect

relationships and adjustments to strategy . However, as the normal timeframe for an organizational strategy is in the order of years, it may not be feasible to undertake a field study of this nature. Instead, some form of experiment may be set up to test the types of strategies (if any) that seem to work for a given set of circumstances.

- e. Further development of the Logistics BSC procedure would be desirable, to address the most effective ways of producing detailed performance measures.

## **Conclusion**

The balanced scorecard method is useful for producing strategic performance measures for an Air Force logistics organization. The four organizational perspectives used as the framework for developing the performance measurement system appear to capture all of the strategic logistics concerns for a base-level Air Force logistics organization. The development and use of strategic performance measures raises questions about how strategic management might be used as a process to improve the development, communication and implementation of organizational plans.

**Appendix A: Balanced Score Card Development Procedure**

**Balanced Score Card  
Development Procedure**

Flight Lieutenant Michael Grover  
GIR 97D  
School of Logistics and Acquisition Management  
Air Force Institute of Technology  
September 1997  
Revision 1.0

## Table of Contents

| Topic                                                                                           | Page |
|-------------------------------------------------------------------------------------------------|------|
| Procedure for Developing Balanced Scorecard Logistics Performance Measures .....                | 62   |
| 1.0 Overview of Balanced Scorecard and Performance Measures .....                               | 62   |
| 2.0 Aim of this Document.....                                                                   | 62   |
| 3.0 Procedure Steps.....                                                                        | 62   |
| 4.0 References.....                                                                             | 66   |
| Attachments: .....                                                                              | 67   |
| ATTACHMENT ONE: Steps in Process for Developing Balanced Scorecard<br>Performance Measures..... | 68   |
| ATTACHMENT TWO: Preliminary Questions for Executive Interview .....                             | 69   |
| ATTACHMENT THREE: Logistics Organization Customer-Related Audit Questions..                     | 71   |
| ATTACHMENT FOUR: Logistics Information System Questions .....                                   | 72   |
| ATTACHMENT FIVE: Customer Questions.....                                                        | 73   |
| ATTACHMENT SIX: Attributes of a Good Metric and Good Metrics Systems .....                      | 75   |
| ATTACHMENT SEVEN (1): Conceptual Model of Logistics Process .....                               | 77   |
| ATTACHMENT SEVEN (2) Example Logistics Process Map .....                                        | 78   |
| ATTACHMENT SEVEN (3): Generic Value Chain.....                                                  | 79   |
| ATTACHMENT EIGHT: Links in the Logistics Service Chain .....                                    | 80   |
| ATTACHMENT NINE: Hierarchy of Strategic Logistics Planning Documents .....                      | 81   |

## Procedure for Developing Balanced Scorecard Logistics Performance Measures

### **1.0 Overview of Balanced Scorecard and Performance Measures**

The Balanced Scorecard (BSC) is a conceptual framework for creating a balanced set of financial and non-financial performance measures, which link the organization's strategies to the business processes used to realize the strategies (refer Kaplan and Norris, 1996). The framework is built upon four categories: Financial, Customer, Internal Processes and Growth and Development. A description of the Balanced Scorecard approach is contained in the slide presentation that is to be used in association with this document.

### **2.0 Aim of this Document**

This document outlines a procedure for developing BSC metrics for an Air Force Logistics Organization. The process is not prescriptive – there is no one, single correct set of performance measures that could be used as an organizational strategic management tool. This method has been employed in private and public business sectors.

2.2 The outcome of this process is the production of a BSC for the individual Logistics-Oriented Air Force Strategic Business Unit (SBU). Typically, a SBU would be an easily identifiable organizational unit, such as a Logistics Group, although the BSC can be developed for logistics agencies at other levels in the larger organization, where strategic performance measures may be of value.

### **3.0 Procedure Steps**

Attachment 1 outlines the steps to be taken for developing a Balanced Scorecard for an Air Force Logistics Organization. The following paragraphs in this section provide guidance for execution of the main steps. The sponsor is to co-ordinate interviews, facilitate group discussion sessions and generally lead BSC development efforts.

Step No.

1. (Sponsor:) Identify Strategic Business Unit. Review all applicable Strategic Plans that impact on the Logistics SBU, including Department of Defense (DoD), Air Force (AF) and other higher command strategic logistics plans (e.g. Air Mobility Command, Numbered Air Force Command). Also review SBU's latest strategic plan. Identify all significant relationships between SBU and other organizational SBUs, including civilian contractor organizations.
2. (Sponsor/SBU Executives) Sponsor gathers information about the organization, its plans and its current logistics and business issues. Ahead of scheduled sessions, send questionnaires (refer Attachments 2-5) to organization's executives and customers, to assist with this task. Sponsor conducts interviews with executives and if possible primary SBU customers, to clarify and refine financial constraints, corporate themes (e.g.s logistics initiatives, environment, safety, employee policies, and community relations). During these interviews discuss BSC and possible themes for each Balanced Scorecard Area. Next, sponsor presents briefing material formally introducing concept of BSC. Also overview current DoD, Air Force and most recent SBU Logistics missions and strategies during same session.

Step No.

3. (SBU Executives:) Review briefing material and provide input on company's strategic objectives, key business processes and tentative ideas for measures in each of the four BSC areas.
4. (Sponsor:) Synthesize executive views and develop an initial prioritized list of objectives and measures for each BSC area that will provide the starting point for group executive meeting.
5. (SBU Executives:) Meet and discuss objectives and measures and rank objectives in each of the four BSC areas. Identify issues to be resolved. Determine if results reflect the SBU's strategy and whether the objectives across the four perspectives appear to be linked in cause-and-effect relationships.
6. (Sponsor/SBU Executives:) Facilitate meeting of executives to confirm mission and gain consensus on strategy (i.e. BSC objectives and supporting, descriptive statements). Sponsor facilitates session where each BSC area is looked at in turn (refer presentation slides). Each BSC area is addressed in turn, asking the question "If the organization is to succeed with its mission and strategy, how will our performance differ in this area?" beginning with Customer, then Financial followed by Internal Processes, and finally Growth and Learning. Group votes on top three or four candidate objectives for each BSC perspective. Sponsor is to document a short description for each objective. Executives then brainstorm measures for each objective.
7. (Sponsor:) Sponsor prepares and distributes results of accomplishments to executives.
8. (Sponsor/SBU Executive Sub-groups:) Refine description of strategic objectives, identify best measure(s) for each objective, identify sources of information for measure(s) and identify key linkages between measures - both within each BSC perspective and between BSC perspectives. Compare measures with criteria for good measures and good measuring systems, listed at Attachment 6.
9. (SBU Executives:) At this point, the executives present results to middle management to gain consensus and develop implementation plans. The desired outcome would be to produce aids for communicating scorecard intentions and contents to the rest of the SBU members.
10. (SBU Executives and Middle Managers:) Agree on stretch objectives (milestones) and targeted rates of improvement for each of the proposed measures.
11. (Sub-Group leaders:) Develop plans for storing and maintaining measures using Information Systems resources and communicating the BSC throughout the organization.
12. (SBU Executives:) A meeting is held to finalize the BSC and validate stretch targets. Other active change initiatives are aligned to BSC objectives. Plans are made to integrate the BSC into the management philosophy and support the BSC using IS resources.
13. (Organization's Management:) BSC integrated into management system, through phase-in plan. Executives, including the senior executive, review scorecard measures at regular intervals to monitor progress against objectives and check causal assumptions made about leading performance measures.

### **3.1 Detailed Information for Discussion of Individual Balanced scorecard Areas**

The following paragraphs provide further details to guide development of relevant strategic imperatives in each of the four Balanced Scorecard areas during group discussions. Unless special circumstances prevail, addressing Customer concerns is at least equally important as Financial considerations for a government sector organization, (where profit is not an over-riding motivating factor.)

#### **3.1.1 Customer Focus**

The main points for discussion in this area are the Customers, and the Products and Services demanded by customers. Customer performance areas that may be relevant for a particular logistics organization include:

- a. Customer Satisfaction. Identify the products and services demanded by customer and the characteristics of these products and services that the customer feels are most important. Factors such as timeliness, quality, cost, 'after-sales' or follow-up support could be considerations.
- b. Customer Retention. Although the organization's customers may have no alternative formal logistics support organization to rely on, informal support channels may be found, when normal channels don't work. The frequency and extent to which this situation occurs, can be indicative of a lack of responsiveness to customer's needs and demands. This situation may have been highlighted in the Preliminary Customer Questionnaire responses at Step 2.

Factors which can be used to measure Customer Value Propositions, include:

- Product/Service attributes (which encompass the functionality of the products & services, their prices and quality).
- Customer relationships (delivery of the product, service to customer, customer feeling in regards dealing with organization)
- Organizational Image and Reputation (sometimes referred to as intangible preferences)

The results of a customer service audit are useful for identifying variables considered critical to the customer (One such example adapted from 'Logistical Excellence', Bowersox, and et al. Digital Press, 1992, is included at Attachment 3, and is to be used to gather information for step 2).

#### **3.1.2 Financial Perspective**

Identify the main financial theme that drives organizational strategy. Typical themes include:

- a. Cost reduction/productivity improvement –lowering direct costs of products and services, reducing indirect costs and sharing common resources with other business units.
- b. Asset utilization / investment strategy
- c. Revenue growth and mix -expanding product & service offerings.

It is worth noting that for the government sector, the financial perspective is generally a constraining factor. Kaplan and Norton (p180) discuss this issue: 'Success for government and not-for-profit organizations should be measured by how effectively and efficiently the products and services meet the needs of their constituencies.' Financial performance discussions will probably focus on how important logistics initiatives can be pursued within the constraints of the group's financial system. Performance measures are likely to be driven by the established budget process.

### **3.1.3 Internal Processes**

Managers should identify the *Critical* Processes at which they must excel if they are to meet the objectives of shareholders and of targeted customer segments. These processes can require significant effort to identify and prioritize. In the words of Hammer and Champy (*Reengineering the Corporation, 1993*), processes are '...often fragmented and obscured by the organizational structures.' After the customers and the customers' needs have been defined, the logistics support process is modeled using a framework such as a Generic Value Chain Model or a Business Process Map as a starting point (refer figures included at Attachment 7.)

#### **Stage One: Innovation Process**

These first steps should already have been covered during the Customer Focus session:

- a. Identify primary customers.
- b. Identify customer needs (Products and Services).
- c. Define the Product/Service offering.

#### **Stage Two: Operations Process**

This stage stresses delivery of products & services to customers, identifying time, cost, quality and other associated performance characteristics.

Identify the Logistics Processes Critical to Delivery of Products and Services

- a. Discuss the Generic Value-Chain Model (refer Attachment 7 (3)).  
A key point to be made during this discussion is to highlight the impact that all participants in the value-chain have on the outputs of the system. Organizations involved earlier in the process determine the success or otherwise of the organizations 'downstream'. It is important that the earlier organizations recognize their process-role responsibilities and be held accountable for their process performance requirements. One method for doing this is to negotiate explicit partnerships between organizations for delivery of the required performance. (This paragraph was added following procedure review)
- b. Discuss methods used to source the Product/create the Service.
- c. Discuss Business Processes and Business Process Maps (Refer Attachments 7 (1), (2)).
- d. Generate a High-Level Organizational Business Process Map to identify

key business processes.

- e. If necessary, prioritize key business processes, allocating broken or dysfunctional processes highest priority.

Note: An important aspect often overlooked during process analysis is actual delivery of the Product/Service to the customer. Ensure each business process is complete by considering the conditions under which the customer is expecting to receive the product or service. This also applies to secondary supporting business processes, where the customer may be internal to the organization.

### **Stage Three: Post Sales Process**

During this stage, issues such as warranty repairs, defects, returns, payments, other administrative matters that may be considered important factors to the customer, are considered.

#### **3.1.4 Learning and Growth**

There are three main Learning and Growth categories which may provide guideposts for strategies and associated measures:

- a. Core Employee Measurement Group
- b. Employee satisfaction, retention and productivity
- c. Employee capabilities

Situation Specific Drivers of Measurement and Growth include:

- 1. Reskilling the Workforce
- 2. Information System Capabilities. The IS related questionnaire and business process modeling carried out previously will provide information about possible strategies.
- 3. Motivation, Empowerment, and Alignment

Use the Links in the Logistics Service Chain (Attachment Eight), to discuss how factors that influence employee satisfaction and retention may be drivers of customer satisfaction.

One example suggested by K&N might be to track employee improvement suggestions. (Kaplan & Norton p137). However, with reference to measures related to key aspects of the BSC, including strategic information availability, organizational alignment and *employee skills*, K&N indicate that 'companies have devoted virtually no effort for measuring either the outcomes or the drivers of these capabilities'. For this reason, a novel solution may be required.

## **4.0 References**

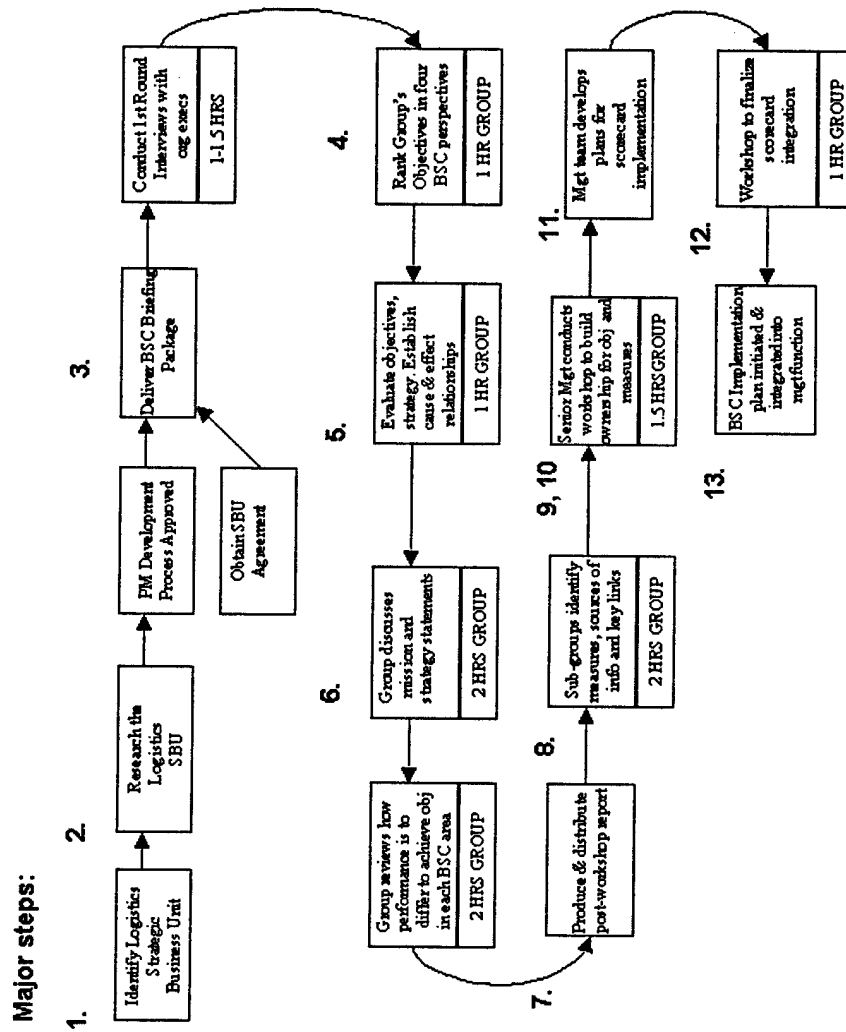
- 1. R.S. Kaplan, D.P. Norton, The Balanced ScoreCard, HBS Press, 1996.

2. M. Hammer, J. Champy, Reengineering The Corporation, HarperBusiness, 1993.
3. J.F. Robeson, W.C. Copacino, The Logistics Handbook, The Free Press, 1994.
4. C. Caplice, Y. Sheffi, A Review and Evaluation of Logistics Performance Measurement Systems, The International Journal of Logistics Management, Vol 6, No. 1, 1995.
5. USAF AFMC Metrics Handbook

**Attachments:**

1. Diagram of Steps in Process for Developing BSC Performance Measures
2. Preliminary Executive Interview Questions
3. Preliminary Internal Customer Review Questions
4. Preliminary Logistics Information System Questions
5. Preliminary Customer Questions
6. Qualities of a Good Metric & Metrics Systems
7.
  - (1) Conceptual Model of Logistics Process
  - (2) Example Logistics Process Map
  - (3) Generic Value Chain
8. Links In The Logistics Services Chain
9. Hierarchy of Strategic Logistics Planning Documents

# ATTACHMENT ONE: Steps in Process for Developing Balanced Scorecard Performance Measures



## **ATTACHMENT TWO: Preliminary Questions for Executive Interview**

### **Logistics Planning System**

What is the mission of the logistics organization?

Who are the organization's main customers?

Does a formal planning procedure exist?

How is the process described? (What is the planning model used?)

Does a strategic business plan exist?

Does a separate strategic logistics plan exist?

What is/are the planning horizon of the strategic plan(s)?

What strategies are behind current developments in your logistics organization? Where do they originate from?

What are the main goals of the plan(s)?

What are the key objectives of the plan(s)?

How does the strategic logistics plan relate to current logistics operations?

How often are the plans updated? Is currency maintained?

What elements are included in the plan?

How is the performance against the plan assessed?

Is the logistics planning process linked to the business unit planning?

Does the logistics organization have input into corporate and business unit strategic planning?

## **Organization Structure Review Questions**

How integrated is the logistics organization? (What are the functional areas?)

Where do logistics functions report?

What are the main lines of communication: between functions? across organizational borders?

What level of importance is placed on logistics by weapon system operators?

What is the level of the senior logistics executive? Who does that executive report to?

When was the last reorganization? How often does a reorganization take place?

How does the current organization structure enhance or hinder completion of the logistics mission?

## **Specific Questions related to BSC**

What do you see as your organization's longer-term goals in each of the following general areas:

a. Financial Performance

b. Customers

c. Internal Processes

d. Growth & Development

Can you think of some measures that might be useful for gauging performance in these areas? (Please list)

What do you consider to be your organization's key business process(es)?

Which other organizations does your organization rely on for these processes to work?

With respect to internal business processes, which process(es) do you consider to be critical to achieving your longer-term logistics goals?

### **ATTACHMENT THREE: Logistics Organization Customer-Related Audit Questions**

Does a formal customer service policy exist? Please summarize features (or attach copy). Do you consider the policy to be adequate? Is the policy generally adhered to and understood?

Which organizational personnel have direct contact with customers? What is the nature of that contact?

How flexible are logistics operations? Can special customer service requests be adequately handled?

What level of responsiveness currently exists? What level of responsiveness should exist?

What internal information is shared with customers? What are the general responses of customers when comparing actual performance to stated plans?

What is the typical length of the normal order cycle? (i.e. receipt of request to issue of order) How long should it be?

What are the customer's primary expectations? What variables impact customer expectations?

Do you have any special expectations of your customers? If so, do logistics personnel provide unambiguous instructions to customers about these expectations?

What customer satisfaction measurements are used? Do measurements address the central issue of customer need satisfaction?

Who administers the customer satisfaction information?

How frequently is this information collected?

## **ATTACHMENT FOUR: Logistics Information System Questions**

Which business processes do your information systems (IS) currently support?

What segments of the logistics group's business do the logistics information systems encompass?

Which business processes are still without adequate IS support?

Is the current system able to address key logistics information requirements?

How would you describe the level of cross-functional IS integration? (e.g. between procurement and finance areas)

Have logistics information requirements changed much since the system was implemented?

Has the minimum level of required information system performance increased since system implementation?

How seamless is the logistics information system? Are the system's organizational boundary-spanning capabilities adequate? (e.g. between logistics organization and suppliers, between logistics organization and customers)

Is information received by the logistics organization timely, accurate, readily available and appropriately formatted?

What visibility into logistics processes exists? Does the system accurately reflect status and location of parts/ items?

How difficult is it to change systems to reflect current business requirements? Who makes the changes to the logistics information systems? What priority level do logistics system change requirements have within the total organization?

Do logistics personnel have to improvise to complete everyday tasks? Is the formal system logistics personnel are supposed to use, equivalent to the informal systems actually used?

How much flexibility is built into the system? Can the logistics system handle special customer requests such as unique shipping instructions or requests to expedite?

What roadblocks exist to implementing new technology (where required)?

How often are information systems reviewed?

## **ATTACHMENT FIVE: Customer Questions**

Who are your main logistics products/service vendors (Are there any, other than the Logistics Group)?

How often do you order products/ services from your logistics vendor(s)?

What is the typical lead-time encountered in replenishing inventories from your major vendors?

What percentage of the product ordered is normally delivered by your requested delivery date?

What amount of lead-time would you prefer?

\* What is the current performance by each of your major vendors with respect to order-cycle (lead) time and fill rate?

\* If a supplier is unable to commit to an order by your requested "date wanted", what percentage of the time do you:

- a. cancel your order
- b. back-order with supplier
- c. request substitution
- d. back-order and also submit to a second source

What percentage of the time do you use the following techniques to transmit orders to your major suppliers?

- a. on-line terminal
- b. inwards WATS telephone service
- c. telephone paid by you
- d. mail
- e. hand delivered order

What percentage of your orders would you classify as emergency/Ship ASAP?

Do any of your major suppliers furnish you with any of the following types of written information/reports on a regular basis?

- a. order confirmation
- b. open order status reports
- c. product availability/inventory status data
- d. advance notice of shipping information

\* Do any of your major suppliers offer incentives for ordering in larger quantities such as pre-paid freight, quantity discounts, claims handling for damage, extended payment terms?

\* What criteria do you use to select suppliers?

\* How has the number of vendors with whom you regularly do business changed in the last three years?

\* How do you anticipate this will change in the future?

What are the distinguishing features/services of those suppliers who consistently provide you with desired/satisfactory customer service – versus those who do not?

How have your suppliers improved their customer service, deliveries and information with respect to your orders in the past 12-18 months?

What services would you like suppliers to provide with respect to logistics/customer service that are not presently available to you?

What are the normal/published lead-times you normally supply to your customers?

What method do your customers use to submit their orders to you?

Have you experienced, or are you experiencing any changes in the ordering characteristics of your customers?

Do you have a computerized inventory record keeping/customer order status system, which identifies balance on hand, on order and back-order by individual items?

Do you know your annual inventory turnovers by item?

Do you use or are you contemplating using a just in time/zero inventory concept when ordering from your major vendor(s)?

Do you attempt to carry different levels of safety stock for fast movers versus low-volume items?

(\* Question assumes alternative logistics products & services vendors are available)

## **ATTACHMENT SIX: Attributes of a Good Metric and Good Metrics Systems**

### **ATTRIBUTES OF A GOOD METRIC**

**Meaningful in Terms of Customer Requirements**

**Tells how well organizational goals and objectives are being met through processes and tasks**

**Simple, understandable, logical and repeatable**

**Shows a trend (measures over time)**

**Unambiguously Defined**

**Data Economical To Collect**

**Timely**

**Drives "Appropriate Action"**

### **ATTRIBUTES OF GOOD METRICS SYSTEMS**

**Comprehensive**

**Causally Oriented**

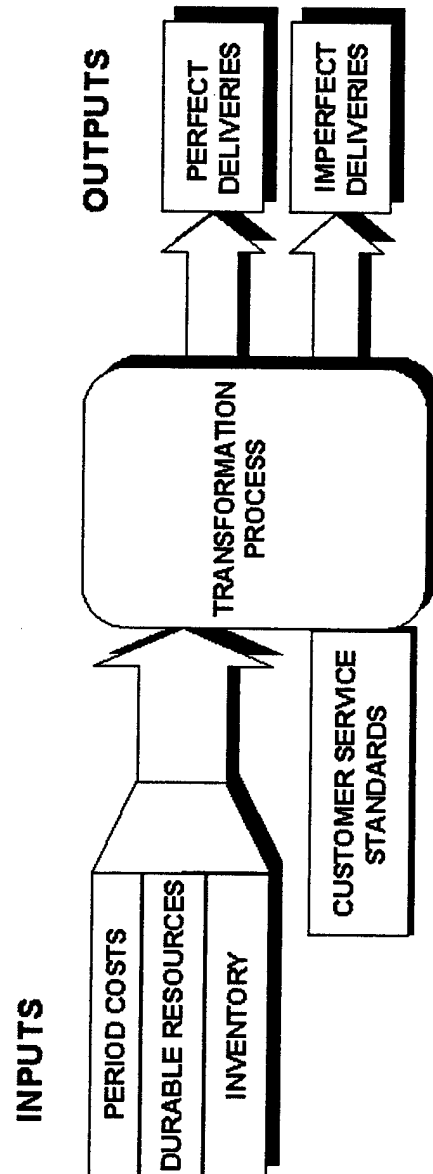
**Vertically Integrated**

**Horizontally Integrated**

**Internally Comparable**

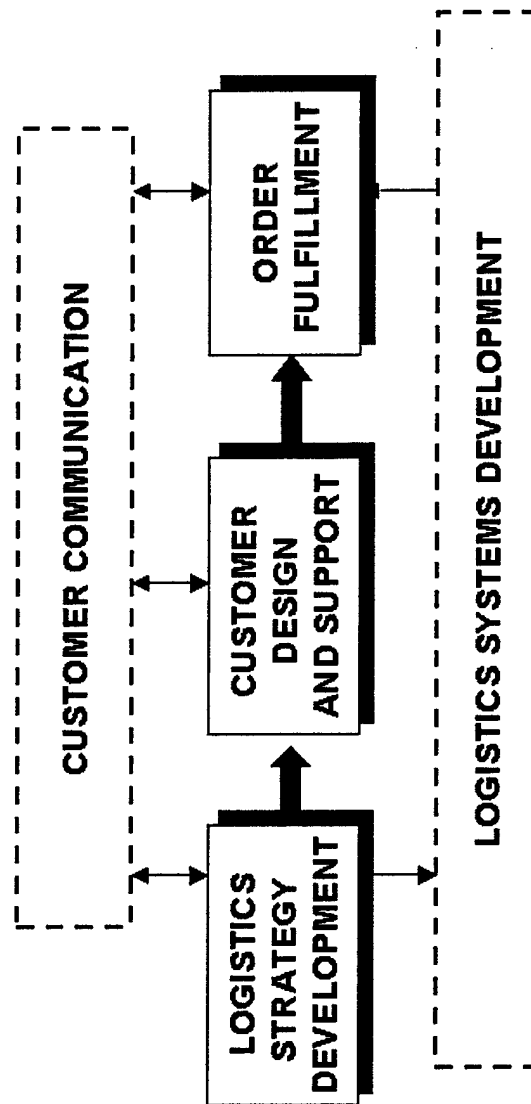
**Useful**

**ATTACHMENT SEVEN (1): Conceptual Model of Logistics Process**



*(Adapted from Caplice and Sheffi 1995: 6)*

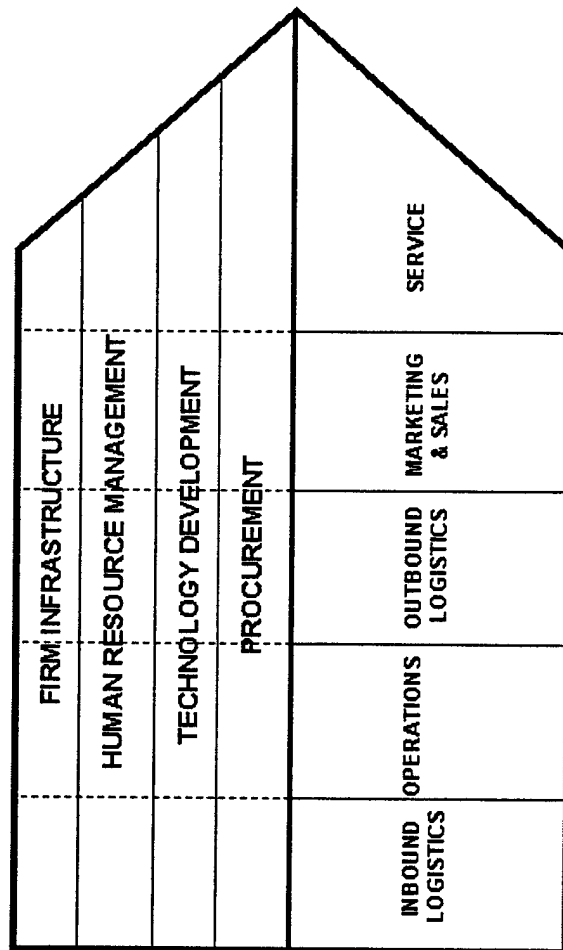
**ATTACHMENT SEVEN (2) Example Logistics Process Map**



*(adapted from Reengineering the Corporation, Hammer and Champy, 1993)*

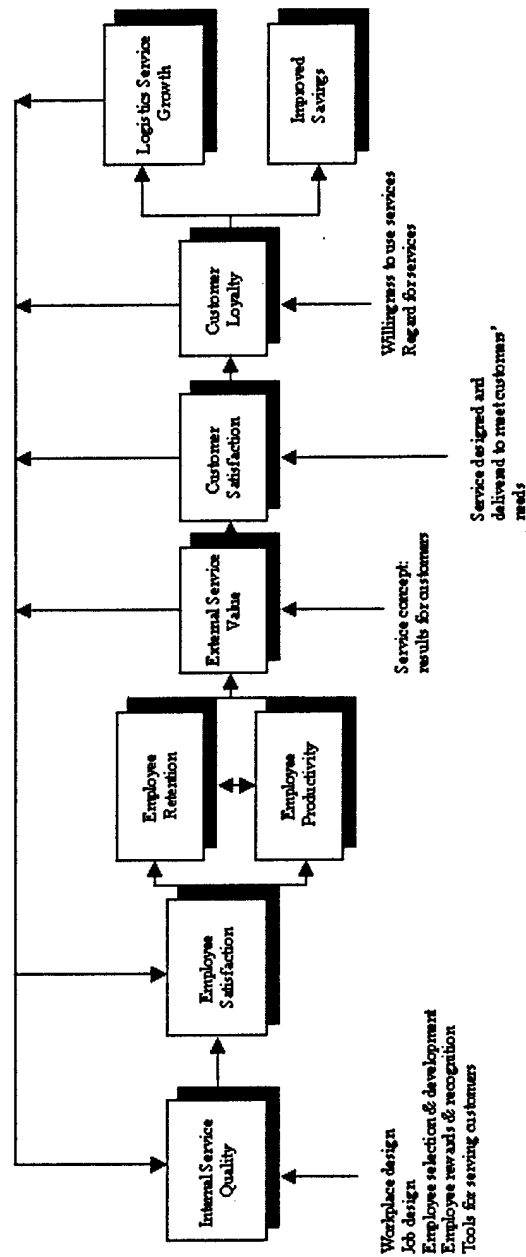
# ATTACHMENT SEVEN (3): Generic Value Chain

## Generic Value Chain



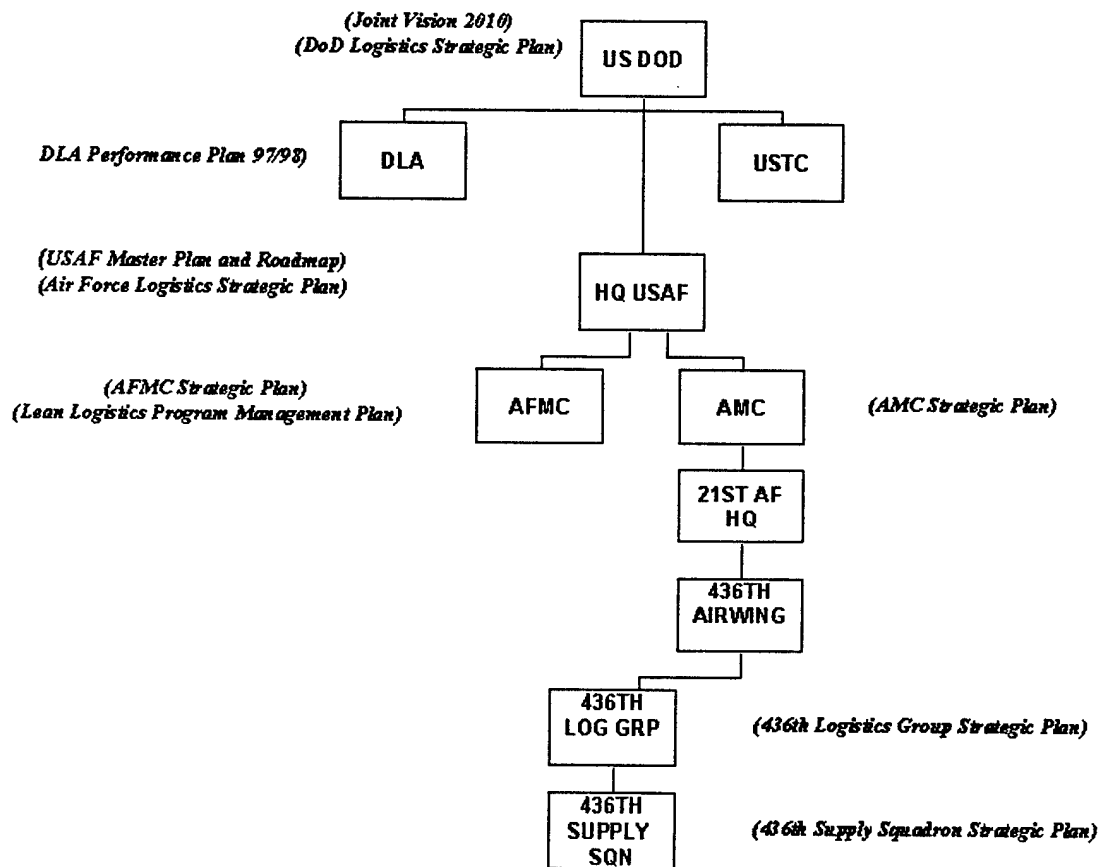
(Adapted from M.A. Porter, *Competitive Advantage: Creating and Sustaining Superior Performance*, 1985:46)

## ATTACHMENT EIGHT: Links in the Logistics Service Chain



Links in the Logistics Service Chain  
*(adapted from Heskett et al. HBR March April 1994)*

## ATTACHMENT NINE: Hierarchy of Strategic Logistics Planning Documents



## **Appendix B: Summary of Relevant Organizational Strategic Planning Documents**

A broad review of higher level logistics planning documents was carried out to identify significant topics which may provide themes for the development of the Squadron's Balanced Scorecard. The plans that were most relevant for strategic logistics planning included the following:

- Department of Defense Logistics Strategic Plan
- Defense Logistics Agency Performance Plan Fiscal year 1997/1998
- USAF Logistics Strategic Plan (1996 Draft)
- Global Engagement: A Vision for the 21<sup>st</sup> Century Air Force (1997)
- Air Force Material Command Strategic Plan (1995, 1996)
- Air Force Mobility Command Strategic Plan (1996)
- 436<sup>th</sup> Logistics Group Strategic Plan (1997)
- 436<sup>th</sup> Supply Squadron Strategic Plan (1995)

Information was obtained from the most recently available versions of these documents. Although the 436<sup>th</sup> AW has a strategic plan it is operational in nature and any logistics content of significance to the supply squadron is communicated through the LG strategic plan. In the case of the AFMC Strategic Plan, details of the 1995 plan were used to supplement the general information contained in the 1996/7 plan. Defense Logistics Agency's Performance Plan was considered relevant because DLA is one of the Squadron's key providers of spares and consumable items. A summary of key logistics topics appearing in these documents is shown in Table 1, in order of frequency.

**Table 1. Strategic Planning Logistics Themes**

Reduced Cycle Times  
Lean Logistics  
  
Effectiveness  
Streamline Logistics  
Flexibility  
Total Asset Visibility  
  
Seamless Logistics  
Improved Communications  
Customer Satisfaction  
Parts Accessibility  
Shorter Lead Times

Some of the listed themes are closely related. For example, the Lean Logistics program is comprised of a number of sub-programs which are intended to streamline logistics infrastructure and improve overall logistics effectiveness. Seamless Logistics, Streamlined Logistics and Effectiveness could be considered different facets of Lean Logistics. A problem with just using a many-faceted concept such as Lean Logistics as a theme at the operational level is that it may be difficult to identify with the overall theme, unless all sub-themes can be shown to have relevance to future operations. In this situation, the phrases used to describe facets of Lean Logistics can act as themes in their own right, to bridge this conceptual gap.

Producing a list of the logistics themes of most importance to the Air Force at this time should make it easier to identify and select Squadron logistics issues that can contribute most towards the strategic issues that matter to the overall organization in the longer term. The list could also reinforce the links between seemingly separate Squadron level goals, by showing how each of the Squadron goals directly relate back to into a higher level program, such as the Lean Logistics program.

## **Description of General Logistics Concepts Referred to in Plans**

The following definitions are provided to assist with understanding some of the recurring logistics planning themes:

Focused Logistics. The fusion of information, logistics, and transportation technologies to provide rapid crisis response, to track and shift assets even while en route, and to deliver tailored logistics packages and sustainment directly at the strategic, operational and tactical level of operations.

Lean Logistics. A major program for reshaping Air Force logistics to better support operational commanders and their combat units. Major goals include reducing logistics response time, developing seamless logistics systems and streamlining the logistics infrastructure.

Seamless Logistics. This concept is discussed as a goal under the Lean Logistics program. The idea is to produce a system in which logistics information and materiel flows freely throughout the supply chain across logistics functions, between organic and commercial service providers, between combat and support units and from the shop level up to theater headquarters levels.

Streamline Logistics (Infrastructure). This is another goal of the Lean Logistics program which involves the use of a centralized, continental US-based time-definite, more responsive repair and distribution system. Two-level maintenance is the program strategy currently under way to realize this ambitious goal.

Reduced Cycle Times. Cycle times refers to the time required to receive a part back after it has been induced into the repair pipeline. Reducing the cycle time is expected to

produce significant cost savings by reducing the amount of inventory required to keep the repair pipeline operational.

Readiness-Based leveling (RBL). RBL is designed to allocate the worldwide requirement for parts among AF bases and the depot to minimize base expected backorders.

Total Assets Visibility (TAV). TAV refers to the ability of the logistics system to gather information about the quantity, location and condition of assets anywhere in the logistics system at any time and to apply that information to improve logistics processes.

Flexibility. Flexibility refers to the ability of the logistics support system to adapt to changes in the mission and/or the environments in which operations are planned and implemented. An example would be being able to take supply items enroute to one base and redirect these supplies to another base where they are urgently required. Total Asset Visibility supports the flexibility concept.

Lead-Time. The time between when a customer places an order for an item and when the item is delivered to the customer.

Efficiency. Doing things right.

Effectiveness. Doing the right things.

## Discussion of Planning Information Relevant For Balanced Scorecard Development

Defense and higher level Air Force logistics plans provide the foundations for the goals from which suitable score card measures can be derived. The main point of the general review was to obtain visibility of broad, higher level strategic initiatives, which serve as the starting point for the development of the Squadron's objectives. The next highest level planning document for the Supply Squadron is the Logistics Group Strategic Plan. This plan has the most direct bearing on the content and composition of the Supply Squadron plan because LGS CC is directly answerable to the LG CC in the chain of command.

Like the other Squadron commanders, LGS CC is a member on the LG Quality Council which supports overall LG planning efforts and guides individual Squadron quality improvement initiatives. To be able to link the balanced scorecard measures back to the highest level plans of the organization, it is important that the LG plan is consistent with higher level directions on strategic logistics issues.

## Discussion of LG Goals

The current goals of the Logistics Group plan are stated in table 2. These goals are broad and focus primarily on operational support imperatives. These goals complement the strategic logistics goals of higher organizational logistics plans. The logistics group's goals are operational in nature, and they do not address strategic logistics issues, since the current planning process at this level in the organization, does not consider strategic issues which do not have a bearing on operations in the shorter term. A new cognitive process is required within the planning framework to address long term logistics initiatives. It is proper that this framework includes the base-level squadrons, where the

broader strategic initiatives ultimately have most affect on logistics operations. Managers at this level are also in the position to be aware of local environmental factors which will probably have a bearing on the achievement of the planning objectives.

**Table 2.** 436<sup>th</sup> Logistics Group Goals (1997 Plan)

1. Generate Mission Ready Aircraft – Provide Reliable Aircraft to Sustain Mission Requirements
2. Human Resource Development – *Promote Technical, Professional, and Personal Development of Group Members*
3. Logistics Support - *Manage Resources to Sustain Mission Requirements*
4. Provide a Safe Working Environment – *Ensure Production Processes Minimize Risk to Personnel, Equipment and Environment*

## **Appendix C: Biographical Details of John Hamberg, President of Apex Inc.**

Mr. Hamberg started Apex Inc. in January 1996, shortly after retiring from the Air Force. Some of the firm's current major clients include the Department of the Army, Defense Logistics Agency, General Services Administration, and United States Postal Service. Apex Inc performs consultancy work in all areas of business improvement, including: Leadership; Strategic Planning; Customer Relationship Management; Information Management; Human Resource Management; Process Management; and Business Results Reporting.

Served four terms on the Board of Examiners for the Malcolm Baldrige National Quality Award, as the United States' guest evaluator for the first-ever Australian Quality Prize, and as the head judge for similar inaugural Baldrige-based awards programs for the Air Force, Army and Defense Contract Management Command. Currently serving as a judge for United Way of America's Quality Excellence Awards, President's Quality Award and USA Today's Quality Cup Team Awards.

Senior manager at KPMG Peat Marwick L.L.P., one of the "Big Six" accounting firms. KPMG's top expert in the application of the Malcolm Baldrige National Quality Award (MBNQA) criteria to public and private sector, and not-for-profit business operations.

Benchmarking advisor to the Office of the Vice President's National Performance Review. Led its first-ever multi-agency benchmarking study, a huge success, involving the Social Security Administration, Internal Revenue Service and other Federal agencies. Received a personal note of thanks from Vice President Al Gore. Co-developed the

Federal Quality Institute's benchmarking course for Government executives and instructed the first session.

Principal business improvement strategist and personal advisor to the chief executive for the Department of Defense's contract management operations, a global business with fiduciary responsibility for over \$800 billion in Government contracts. Designed a Baldrige Award criteria-based assessment for conducting and validating self-assessment and operations improvement efforts, sharing "best practices" across the organization's worldwide operations.

Deputy director of manufacturing and quality for a major Defense procurement of the highest national priority. Responsible for full Mil-Q-9858A and commercial software quality assurance specification implementation at the prime contractor's operating locations and across a global supplier base. Led a cost reduction review that identified over \$2 billion in savings to the \$30 billion production-related component of a \$40 billion program budget.

U.S. Air Force Academy graduate with a masters in business. Retired Air Force Officer. Adjunct professor, and benchmarking and reengineering course developer for Anna Maria College's TQ masters program.

Elected Fellow by the American Society of Quality Control (ASQC). Listed in Who's Who of America's Business Leaders and the International Who's Who in Quality. Past Deputy Treasurer, ASQC. Past Chair, ASQC training board. Co-developer of the Certified Quality Manager program. Co-developer of ASQC's Certified Quality Engineer refresher training. Technical reviewer of proposed ASQC Quality books and member of the Editorial Advisory Board for ASQC's Quality Management Journal. Certified Quality

Engineer, Certified Reliability Engineer, and co-author of the book, 'Linking Quality to Profits: Quality Based Cost Management', published by ASQC's Quality Press.

## Appendix D: 436<sup>th</sup> Initial Supply Squadron Balanced Score Card Objectives

| 436 <sup>th</sup> Supply Squadron Balanced Score Card Objectives (results of vote)                                                                                                                          | Number of Votes | Ranking |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| <b>Area One: Financial Objectives</b>                                                                                                                                                                       |                 |         |
| 2. Using available budget to buy right parts in right quantities                                                                                                                                            | 7               | 1       |
| 3. Managing internal SQN funds so that most important needs are met                                                                                                                                         | 6               | 2       |
| 1. Establishing policies for cost efficient bench inventory holdings                                                                                                                                        | 2               | 3       |
| 4. (other?)                                                                                                                                                                                                 | 0               |         |
| <b>Area Two: Customer Objectives</b>                                                                                                                                                                        |                 |         |
| 6. Right parts, right place, right time                                                                                                                                                                     | 6               | 1       |
| 3. Faster, efficient, responsive customer service                                                                                                                                                           | 4               | 2       |
| 5. Larger parts store closer to customer for improved responsiveness                                                                                                                                        | 3               | 3       |
| 7. Keeping customers informed about supply issues (eg status updates on supply inabilities)                                                                                                                 | 3               | 3       |
| 2. Increased responsiveness through consolidated customer service area                                                                                                                                      | 2               | 4       |
| 1. Increased customer support through improved DSS operations                                                                                                                                               | 1               | 5       |
| 4. Availability of parts to all primary customers                                                                                                                                                           | 1               | 5       |
| 8. (other?)                                                                                                                                                                                                 | 0               |         |
| <b>Area Three: Internal Process Objectives</b>                                                                                                                                                              |                 |         |
| 1. Improved responsiveness from depots and government agencies that are part of the supply delivery chain                                                                                                   | 5               | 1       |
| 8. Maintaining equipment serviceability (eg. Hydrant, fuel system services)                                                                                                                                 | 5               | 1       |
| 9. Improving parts forecasts for planned routine and special aircraft servicings                                                                                                                            | 4               | 2       |
| 2. Improving the contracting arrangements for local parts procurement                                                                                                                                       | 2               | 3       |
| 6. Improved management of inventory stock levels (eg stockage priority code items)                                                                                                                          | 2               | 3       |
| 4. Building on recent improvements to extend store operations to the flight line area                                                                                                                       | 1               | 4       |
| 7. Moving more aircraft store items closer to flight line would be desirable                                                                                                                                | 1               | 4       |
| 3. Improving Issue system process (demand to delivery process)                                                                                                                                              | 0               |         |
| 5. Bay service store operation improvements (customer pickup operations)                                                                                                                                    | 0               |         |
| 10. (other?)                                                                                                                                                                                                | 0               |         |
| <b>Area Four: Growth and Development Objectives</b>                                                                                                                                                         |                 |         |
| 2. Taking advantage of the opportunities offered by the future interface between GO81 Maintenance system and the supply system (SBSS)                                                                       | 7               | 1       |
| 4. Taking advantage of the opportunities offered by the future Global Communication Supply System (GCSS) which is expected to supersede SBSS and permit better inter-base inventory management and control. | 5               | 2       |
| 3. Introducing other IS improvements such as, for example, automatic tank gauging systems                                                                                                                   | 3               | 3       |
| 5. Improving current information systems so that it is possible to take advantage of supply bar code technology capabilities (eg. For tracking items)                                                       | 2               | 4       |
| 1. Taking advantage of opportunities offered by regionalizing Information system support.                                                                                                                   | 1               | 5       |
| 8. Encourage personnel participation in non-essential computer training courses held on-base                                                                                                                | 1               | 5       |
| 9. Encourage personnel to take advantage of college training opportunities on-base/off-base                                                                                                                 | 1               | 5       |
| 6. Improved network bandwidth to gain better access to government supply & logistics agency web homepage information                                                                                        | 0               |         |
| 7. Improving opportunities for cross training to cover manpower shortages and peak workload periods                                                                                                         | 0               |         |
| 10. (other?)                                                                                                                                                                                                | 0               |         |

## Appendix E: 436<sup>th</sup> Supply Squadron Balanced Score Card

| 436th SUPPLY SQUADRON Balanced Score Card                                                                                                                                                                                                                                                                                         |                                                                                                                                                                              |                                                                                                                      |                                                                                                                                                                                                                                                                                         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Strategic Objective Area                                                                                                                                                                                                                                                                                                          | Strategic Outcome Measures (lagging PMs)                                                                                                                                     | Proposed Performance Drivers (leading PMs)                                                                           | Narrative                                                                                                                                                                                                                                                                               |
| <b>AREA ONE: FINANCIAL OBJECTIVES</b>                                                                                                                                                                                                                                                                                             |                                                                                                                                                                              |                                                                                                                      |                                                                                                                                                                                                                                                                                         |
| Using available budget to buy right parts in right quantities<br>Managing internal SQN funds so that most important needs are met<br>Establishing policies for cost efficient bench inventory holdings                                                                                                                            | Cost of MICAPs for Period<br>No of MICAPs for Period<br>Avg Cost Per Supply Order<br>Avg Cost of Bench Inventory                                                             | Nil                                                                                                                  | Budget targets are a constraint on organizational performance. Funds need to be allocated to supporting delivery of the "items and services that matter most" to the customer.                                                                                                          |
| <b>AREA TWO: CUSTOMER OBJECTIVES</b>                                                                                                                                                                                                                                                                                              |                                                                                                                                                                              |                                                                                                                      |                                                                                                                                                                                                                                                                                         |
| Right parts, right place, right time<br>Faster, efficient, responsive customer service<br>Larger parts store closer to customer for improved responsiveness<br>Keeping customers informed about supply issues.                                                                                                                    | Average Customer Order-to-Delivery Cycle time<br>Stockage Effectiveness %                                                                                                    | Customer Satisfaction Surveys                                                                                        | Customer satisfaction surveys provides continuous feedback about their specific product and service needs                                                                                                                                                                               |
| <b>AREA THREE: INTERNAL PROCESS OBJECTIVES</b>                                                                                                                                                                                                                                                                                    |                                                                                                                                                                              |                                                                                                                      |                                                                                                                                                                                                                                                                                         |
| Improved responsiveness from depots and government agencies that are part of the supply delivery chain<br>Maintaining serviceability of key equipment (including hydrant, fuel system services)<br>Improving parts forecasts for planned routine and special aircraft servcings                                                   | Agency Average Supply Cycle time<br>Agency Average Delivery Variance<br>% Routine Servicing<br>Demands Satisfied On-time<br>Cost of Support Equipment<br>Failures for Period | No. of Strategic Supplier partnerships<br>Parts Forecasts (Routine servcings)<br>Parts Forecasts (Support Equipment) | Identify parts with most impact on customer responsiveness, so that processes can be developed to manage these parts<br>Improved forecasting methods will                                                                                                                               |
| <b>AREA FOUR: GROWTH and DEVELOPMENT OBJECTIVES</b>                                                                                                                                                                                                                                                                               |                                                                                                                                                                              |                                                                                                                      |                                                                                                                                                                                                                                                                                         |
| Taking advantage of the opportunities offered by the new interface between GO81 Maintenance System and SBSS<br>Taking advantage of the inter-base inventory management improvements opportunities offered by the future Global Communication Supply System (GCSS).<br>Introducing other Information Technology (IT) improvements. | Avg Need-Order Time<br>No. of Order Errors                                                                                                                                   | SQN Business-Supporting IT Availability (versus planned)<br>Staff IT Skill Development (versus planned)              | Developing IT for directly supporting achievement of business process performance targets. Also assists with performance measurement process.<br>Key skills for leveraging benefits of IT need to be identified and training programs developed to support key productivity initiatives |

## Appendix F: Compiled 436 LGS Interview Questionnaire Responses

### Preliminary Questions for Executive Interview

#### Logistics Planning System

What is the mission of the logistics organization?

*Proud professionals providing quality supply, equipment and fuel support to sustain the 436<sup>th</sup> AW and 512<sup>th</sup> AW global airlift mission.*

Who are the organization's main customers?

*Wing personnel with involvement in warehouse operations.  
Aircraft Generation Squadron (AGS)  
Component Repair Squadron (CRS)  
Equipment Maintenance Squadron (EMS)  
National Guard Units (off-base)  
Vehicle Maintenance Squadron  
Vehicle drivers  
AMC  
436 LG  
436 AW  
512 AW*

Does a formal planning procedure exist?

*No. Format decided by LGS CDR and higher planning authorities*

*AFI 90-501 Criteria For Organizational Performance Excellence covers guidelines for organizational planning and mandates annual self assessment IAW detailed criteria covered in the instruction.*

How is the process described? (What is the planning model used?)

*Not known. Dedicated planning committee has developed plans in the past. The new strategic plan is to be more closely aligned to LG plan, by using LG goals as reference.*

Does a strategic business plan exist?

*Yes*

Does a separate strategic logistics plan exist?

*No, logistics covered under same document.*

What is/are the planning horizon of the strategic plan(s)?

*Ranges offered:*

*1-2 years*

*2-3 years*

*(Note: CDR normally in position for 2-3 years)*

What strategies are behind current developments in your logistics organization? Where do they originate from?

*Manpower cuts as part of cost savings measures by Federal Govt*

*Morale considerations*

*Readiness Base Leveling*

*2 Level Logistics Concept*

*Outsourcing*

*Inventory Reduction Measures*

*Information System Improvements (e.g. G081)*

*Privatization of flight line operations and parts of supply process.*

What are the main goals of the plan(s)?

Latest Issued Supply Squadron Strategic Plan :

- 1. Allocate resources in an effective and efficient manner to achieve mission requirements*
- 2. Provide first class facilities to enhance operations*
- 3. Provide all personnel with quality tools and equipment to enhance daily operations*
- 4. Ensure work processes minimize harm to the environment*

Draft Supply Squadron Strategic Plan (to be reviewed before issue)

- 1. Provide reliable and timely supply support*
- 2. Promote technical, professional and personnel development of squadron members*
- 3. Manage resources to sustain mission requirements*
- 4. Ensure work processes minimize risk to personnel, equipment and environment*
- 5. Provide first class facilities to enhance operations*

What are the key objectives of the plan(s)?

*(refer latest strategic plan)*

How does the strategic logistics plan relate to current logistics operations?

*They are closely related. PMs in the plan are collected, monitored and used to drive performance improvements in the SQN's key business areas.*

How often are the plans updated? Is currency maintained?

*Twice in the past 5 years, however the plan is a living document and minor changes are being incorporated constantly.*

What elements are included in the plan?

*Refer strategic plan*

How is the performance against the plan assessed?

*By the monthly performance report ('How Goes It?') which contains includes Base and also HQ achievement standards, against certain performance measures*

*Many other metrics are used at operational level to collect information about organizational performance*

*Select PMs are also reported and compared against other Strategic Airlift bases PMs, particularly Travis AFB, which is most similar in aircraft support operations to Dover AFB, in most aspects except Engine support.*

*Much of the PM information is generated by the supply system (SBSS), but has to be keyed into the database which is used to generate the slide reports for analysis by SQN and higher HQ personnel. Data is sent to HQ and the same reporting software is used to generate reports comparing different bases operations.*

Is the logistics planning process linked to the business unit planning?

*It is the same process*

Does the logistics organization have input into corporate and business unit strategic planning?

*Yes. The LGS CDR provides input into higher level plans on relevant issues (e.g. base integrated facility plan)*

### **Organization Structure Review Questions**

How integrated is the logistics organization? (What are the functional areas?)

*Very integrated. Close communications maintained with all other organizations involved in delivery of products and services to Squadron's customers.*

Where do logistics functions report?

*Chief of Supply*

What are the main lines of communication: between functions? across organizational borders?

*Squadron meetings: weekly staff meetings, Quality council meetings (twice monthly), Inventory adjustment meetings, daily meetings with LG customers, email available to over 90% of SQN*

*Telephone, face-to-face, email*

What level of importance is placed on logistics by weapon system operators?

*N/A - A customer question*

What is the level of the senior logistics executive? Who does that executive report to?

*Lt Col, CDR LGS reports to Colonel, LG*

When was the last reorganization? How often does a reorganization take place?

*There was a significant reorganization 1.5 to 2 years ago (only one in last 5 years), however minor section size changes and reporting chain changes, occur far more frequently.*

How does the current organization structure enhance or hinder completion of the logistics mission?

*Organizational structure is suitable for supporting achievement of the SQN's mission*

### **Specific Questions related to BSC**

What do you see as your organization's longer-term goals in each of the following general areas:

**a. Financial Performance**

*Downsizing may be on the horizon for the SQN, as a way of cutting costs.  
Fuel Flt has an allocated quarterly budget for administrative supplies  
Establishing policies for cost efficient bench inventory holdings  
(D Flt recommends the items MNT SQN should target for buys; doesn't control a/c funds)  
With respect to stock funds, including administration and spares: Buying right parts in right quantities  
(meeting unit cost ratios for on-base repairables and spares)  
Managing internal SQN funds so that most important needs are met  
Managing Unit Cost Ratio (buying right spares and at the same time reducing inventories)  
Managing funds better (maintaining the minimum amount of inventory under environment of increasingly tighter control)*

**b. Customers**

*Increased customer support through improved DSS operations  
Increased responsiveness through consolidated customer service area  
Faster, efficient, responsive customer service  
Availability of parts to all primary customers  
Larger parts store closer to customer for improved responsiveness  
Right parts, right place, right time  
Keeping customers informed about supply issues (e.g. updates on supply inabilities)  
Educating customers about jobs that supply has traditionally been responsible for but for which they themselves will have to assume more responsibility (e.g. local purchases less than \$2500)*

**c. Internal Processes**

*Improved responsiveness from depots and government agencies that are part of the supply delivery chain.  
Improving the contracting arrangements for local parts procurement  
Issue system process improvements (demand to delivery process)  
Recent improvements to extend store operations to the flight line area  
Bay service store operation improvements (customer pickup operations)  
Improved management of inventory stock levels (e.g. stockage priority code items)  
Moving more aircraft store items closer to flight line would be desirable  
Maintaining equipment serviceability (e.g. Hydrant, fuel system services)  
Improving parts forecasts for planned routine and special aircraft servicings*

*Improving the efficiency of processes, mainly because of increasing competition from alternative service providers (target performance is MEO, most efficient organization)*

d. Growth & Development

*Regionalizing IS support is in the pipeline.*

*G081 Maintenance IS is now able to interface with supply IS (SBSS). The interface is currently under evaluation. Will negate the need to manually keypunch item demands into SBSS. Demands will be automatically generated.*

*IS improvements being implemented (e.g. G081 to SBSS interface, automatic tank gauging systems)*

*Global Communication Supply System (GCSS) expected to supersede SBSS to permit better inter-base inventory management and control*

*Improving IS so can take advantage of bar code technology*

*Improved network bandwidth to access govt agency homepage information*

*Improved opportunities for cross training to cover manpower shortages and peak workload periods*

*Clear career fields exist in the supply line of work (warehouse, records, IS, fuel). Note: Training packages and OJT generally considered of high quality for expected range of supply tasks.*

*Encourage personnel participation in non-essential computer training courses held on-base*

*Encourage personnel to take advantage of college training opportunities on-base/off-base*

*Understand potential benefits of IT which may assist with organizational performance (e.g. automated inventory tracking and bar code scanning technologies already in use at Eglin and Shaw)*

Can you think of some measures that might be useful for gauging performance in these areas? (Please list)

*Supplier responsiveness is an issue (esp. for Repairable Asset Cycle Center, RACC)*

*D14 reports, stockage effectiveness*

What do you consider to be your organization's key business process(es)?

Key Processes

*Requisition and Issue of parts*

*Safekeeping parts*

*Storage/issue of fuels*

*Human resource management*

*Finance and asset management*

*Maintenance of wartime readiness requirements*

*(as per proposed plan, yet to be reviewed for approval):*

*Provide serviceable assets to our customers*

*Human resource development*

*Provide resources*

*Provide a safe working environment*

*Facilities*

*Storage to Ordering Process*

*Shipping to Storage Process*

*Shipping to Receiving Process*

Which other organizations does your organization rely on for these processes to work?

*Depots and Government agencies (DLA, GSA - for office supplies)*

*Civil Engineers (facilities maint)*

*Management Systems Flt for computer support*

*Receiving section*

*Pickup & Delivery section*

*Fedex*

*Roadway*

*Other pickup/delivery agents*

*AMC*

*Other AFBs*

*MNT SQN (acts as supplier and customer)*

With respect to internal business processes, which process(es) do you consider to be critical to achieving your longer-term logistics goals?

*Issue Process (Order request to item delivery process)*

*Due in for maintenance (Return of repairables) process*

*Analysis of Availability problems (by stock control section) Note: ALC item managers deal with contractor supply issues)*

## **Appendix G: 436<sup>th</sup> Squadron Review of Proposed Balanced Score Card**

The following responses were given by the 436<sup>th</sup> Supply Squadron in answer to questions about the proposed balanced scorecard. Information supplied to the Squadron for its review, included:

- a. Description of the cause and effect relationships titled 'Hypothesized Balanced Scorecard Cause and Effect Relationships' (2 sheets)
- b. Table of the Hypothesized Cause and Effect Relationships (1 sheet)
- c. Balanced Scorecard information (1 sheet)
- d. A copy of the results of the Squadron's Objectives vote (1 sheet)

(Responses provided by Mr. Jim Mulvania, Assistant Chief of Supply, 10 Nov 97)

1. In your opinion, do the goals that were voted into the Scorecard by the SQN seem reasonable?

The goals that were voted into the scorecard seem reasonable. One problem that I see is that the scoring can be biased by a work section.

2. Do the goals give good coverage of the SQN's strategic concerns?

Coverage is good but not all inclusive.

3. Do proposed Cause and Effect Relationships sound reasonable?

The cause and effect should be more detailed. If financial authority is limited or

wrong parts are obtained what was the cause and what is the effect.

4. If not, can you suggest any changes/improvements?

Great care must be taken when compiling a balanced scorecard. One possibility is to ask individually then regroup for a consensus.

5. Do any of the Cause and Effect relationships seem weak? Which ones? Why?

Cause and effect is to general

6. Does the overall description of the Cause and Effect Strategy seem complete?

Were any significant issues not addressed?

No, see above

7. Regarding the Score Card itself, What do you think about the suggested measures?

The balance scorecard for growth and development deals with future technologies or new technologies that are currently being tested. I believe a good and proper measurement must be adaptive and changing. Financial measurements are difficult to measure. I not sure what the average cost of bench inventory has to do with a cost efficient inventory. The number of MICAPS and cost of MICAPs would be extremely useful information. At base level I'm not sure that would be done right while providing the right information. The average cost per supply order. Where does this measurement fit in versus objectives?

8. Can you suggest any changes/improvements to the measures?

True costs for MICAPS would be hard to figure. Supply has a variety of measurements that provide good information or can be derived from databases.

I'm not sure this information is always used correctly to optimize the ability of the Air Force. Performance measures for new technologies need to be developed.

9. Is all measurement information currently available for collection?

Costs for MICAPS is not.

10. Do you see any difficulties with routinely collecting the measures to use in a strategic performance measurement system?

No.

11. Can you suggest possible stretch targets for the measurement areas?

What is your definition of a stretch target

12. What is your overall impression of the balanced scorecard (e.g. usefulness for planning, strategic performance monitoring)?

If done properly I believe the balanced scorecard can be a useful tool for planning and strategic performance monitoring.

## **Appendix H: Chris Caplice's Biographical Details**

In 1995, Chris Caplice was a doctoral candidate at the Massachusetts Institute of Technology's Center for Transportation Studies. He received his BSCE from the Virginia Military Institute and a MSCE in Transportation at the University of Texas at Austin. Prior to arriving at MIT he taught for two years at the Virginia Military Institute. His research interests include supply chain integration, network optimization, and transportation bidding and contracting. Mr. Caplice co-authored two papers dealing with the evaluation of logistics performance measurements. Mr. Caplice currently works for the Princeton Transportation and Consulting Group in Richmond, Virginia.

## **Bibliography**

Andersson, P., H. Aronsson and N. G. Storhagen. 'Measuring Logistics Performance', Engineering Costs and Production Economics, 17, 253-262, 1989.

Bowersox, D. J, P. J. Daugherty, C. L. Droge, R. N. Germain and D. S. Rogers. Logistical Excellence: It's Not Business As Usual, Digital Press, 1992.

Caplice, C. and Y. Sheffi. 'A Review and Evaluation of Logistics Performance Measurement Systems', The International Journal of Logistics Management, 6, No 1, 61-74, 1995.

Caplice, C. and Y. Sheffi. 'A Review and Evaluation of Logistics Metrics', The International Journal of Logistics Management, 5, No 2, 11-28, 1994.

Department of the Air Force (DAF). The Metrics Handbook.. HQ AFSC/FMC, Andrews AFB, August 1991 (AD-A248 591).

----. AFMC Strategic Plan, Wright-Patterson AFB OH, June 1995.

----. AFMC Strategic Plan, Wright-Patterson AFB OH, 1996.

----. 'Criteria for Organizational Performance Excellence', Air Force Instruction 90-501 Washington: HQ USAF, 13 March 1997.

----. 'Logistics for the 21<sup>st</sup> Century', Supportability Investment Decision Analysis Center Publication, Washington HQ USAF, 1996.

----. 'Strategic Planning and Resources Tool' (SPART), Windows Version 1.0A July 1996, prepared by Booz Allen and Hamilton, Inc. for HQ USAF/LGXX.

---- USAF 436<sup>th</sup> Logistics Group Strategic Plan, Dover AFB DE, June 1997.

---- USAF 436<sup>th</sup> Supply Squadron Strategic Plan, Dover AFB DE, 1995.

Department of Defense Information Management, 'A Report by a Panel of the National Academy of Public Administration for the U.S. Department of Defense', WWWeb, <http://www.dtic.mil/dodim/naparpt1.html#executive> January 1996.

Ergometrics Ireland Ltd. 'Ergometrics Balanced Scorecard Page' WWWeb, <http://www.ergometrics.com/comments.htm>, 23 November 1997.

Gigliani, G. B. and A. G. Bedeian. A Conspectus of Management Control Theory 1900-1972, Academy of Management Journal, 17, 2, 292-301, 1974.

Gluck, F. W., S. P. Kaufman and S. Walleck. 'Strategic Management for Competitive Advantage', Harvard Business Review, Jul-Aug, 154-161, 1980.

Goold, M. "Strategic Control in the Decentralized Firm", Sloan Management Review Winter, 69-81, 1991.

Hammer, M. and J. Champy. 'Reengineering the Corporation', Harper Business, 1993.

Hamner, K. L. and C. A. Fleur. An Exploratory Survey of Measures Used To Develop Performance Measures, MS Thesis AFIT/GSM/LAS/93S-6. School of Logistics and Acquisition Management, Air Force Institute of Technology, Wright-Patterson AFB OH (AD-A273945).

Heskett, J. L., T. O. Jones, G. W. Loveman, W. E. Jr. Sasser and L. A. Schlesinger. 'Putting the Service-Profit Chain to Work', Harvard Business Review, Mar-Apr 164-174, 1994.

Jelinek, M. 'Institutionalizing Innovation', Thesis, Harvard University, 1977.

Kaplan R. S. and D. P. Norton. *The Balanced Scorecard: Translating Strategy Into Action*, Harvard Business School Press, 1996.

Kaplan, R. S. and D. P. Norton. 'Using the Balanced Scorecard as a Strategic Management System', Harvard Business Review, Jan-Feb, 75-85, 1996.

Metrus Group Homepage, 'Experts in balanced scorecards, strategic performance measurement...', WWWeb, <http://www.metrus.com/>, 23 Nov 1997.

Miles, M. B. and A. M. Huberman. *Qualitative Data Analysis: An Expanded Sourcebook*, Sage Publications, 2<sup>nd</sup> Edition, 1994.

Mintzberg, H. 'The Fall and Rise of Strategic Planning', Harvard Business Review, 107-114, Jan-Feb 1994.

Mintzberg, H. 'The Rise and Fall of Strategic Planning', Prentice Hall, 1994.

Mintzberg, H. 'Patterns in Strategy Formation', Management Science, 24, No 9. 934-948, May 1978.

NASA, 'Organizational Level Performance Measures for External Benchmarking', WWWeb, <http://technology.ksc.nasa.gov/WWWaccess/95report/ief/ie14.html>. 11 April 1996.

Neven Working Group, Performance Indicators in Logistics, IFS Publications, 1989.

Porter, M. E. 'Competitive Advantage: Creating and Sustaining Superior Performance', The Free Press, 1985.

Robeson, J. F. and W. C. Copacino (eds), The Logistics Handbook, The Free Press, 1994.

Simons, R. "Control in an Age of Empowerment", Harvard Business Review Mar-Apr 1995.

van der Meulen, P.R.H. and G. Spijkerman. 'The Logistics Input-Output Model and Its Application', International Journal of Production, Distribution and Material Management, 15, No 3, 17-25, 1985.

## **Grover Vita**

Flight Lieutenant Michael Anthony Grover is from Melbourne, Australia. He graduated from the Victoria University of Technology in 1991 with a Bachelor of Engineering in Electrical Engineering. After receiving his commission into the Royal Australian Air Force and completing the Engineering Officers Basic Course, Flight Lieutenant Grover was assigned to Maintenance Squadron East Sale Victoria, as the Officer in Charge of Avionics Workshops.

Following a two year tour to East Sale, Flight Lieutenant Grover was assigned to the newly formed Tactical Fighter Logistics Management Squadron (TFLMSQN) at Williamstown, New South Wales. Flight Lieutenant Grover served as Officer in Charge of logistics and engineering for Macchi avionics systems for one year, before transferring to take up responsibilities as Officer in Charge of logistics and engineering for F/A-18 avionics systems, in the same squadron.

In 1996, Flight Lieutenant Grover entered the Air Force Institute of Technology at Wright-Patterson AFB, Ohio, and graduated in 1997 with a Masters degree in Information Resource Management. Following graduation, he was assigned to the newly formed Defence Corporate Information Program in Canberra.

Permanent Address:

11 Fulford Street

Wodonga, Victoria 3690

Australia

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                             |                                                            |                                                                       |                                                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|------------------------------------------------------------|-----------------------------------------------------------------------|-----------------------------------------------------|
| <b>REPORT DOCUMENTATION PAGE</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                             |                                                            | Form Approved<br>OMB No. 074-0188                                     |                                                     |
| Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of the collection of information, including suggestions for reducing this burden to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503                                                                                                                                                                                                                                                                                                                                                                   |                                                             |                                                            |                                                                       |                                                     |
| 1. AGENCY USE ONLY (Leave blank)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                             | 2. REPORT DATE<br>December 1997                            |                                                                       | 3. REPORT TYPE AND DATES COVERED<br>Master's Thesis |
| 4. TITLE AND SUBTITLE<br>STRATEGIC PERFORMANCE MEASUREMENT IN AN AIR FORCE LOGISTICS ORGANIZATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                             |                                                            | 5. FUNDING NUMBERS                                                    |                                                     |
| 6. AUTHOR(S)<br>Michael A. Grover, Flight Lieutenant, RAAF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                             |                                                            |                                                                       |                                                     |
| 7. PERFORMING ORGANIZATION NAMES(S) AND ADDRESS(S)<br><br>Air Force Institute of Technology<br>2750 P Street<br>WPAFB OH 45433-7765                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                             |                                                            | 8. PERFORMING ORGANIZATION<br>REPORT NUMBER<br><br>AFIT/GIR/LAL/97D-8 |                                                     |
| 9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)<br><br>Defense Logistics Agency HQ -Materiel Management<br>8725 John J. Kingman Rd, Suite 2533<br>Fort Belvoir, Virginia 22060-6221                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                             |                                                            | 10. SPONSORING / MONITORING<br>AGENCY REPORT NUMBER                   |                                                     |
| 11. SUPPLEMENTARY NOTES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                             |                                                            |                                                                       |                                                     |
| 12a. DISTRIBUTION / AVAILABILITY STATEMENT<br><br>Approved for public release; distribution unlimited                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                             |                                                            | 12b. DISTRIBUTION CODE                                                |                                                     |
| 13. ABSTRACT (Maximum 200 Words)<br><br>Strategic performance measures are being used to define and communicate longer-term planning imperatives to organizational members and external stakeholders. These measures are designed to support the concept of a strategic management process, in which the progress towards strategic goals, and also the goals are continuously reviewed and updated. The measures are linked through associations and communicate the strategy as a series of hypothesized cause and effect relationships. One such performance measurement system, the balanced scorecard, describes the organizational strategy with reference to four common organizational perspectives: Financial, Customer, Internal Process and Growth and Development. A case study is performed to produce a balanced scorecard for a base level Air Force logistics organization. The four perspectives were found to provide a good framework for the squadron's strategic concerns. More research is required to gauge the effectiveness of the strategic management process. |                                                             |                                                            |                                                                       |                                                     |
| 14. SUBJECT TERMS<br>strategy logistics logistics planning logistics support planning measurement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                             |                                                            | 15. NUMBER OF PAGES<br>118                                            |                                                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                             |                                                            | 16. PRICE CODE                                                        |                                                     |
| 17. SECURITY CLASSIFICATION<br>OF REPORT<br>UNCLASSIFIED                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 18. SECURITY CLASSIFICATION<br>OF THIS PAGE<br>UNCLASSIFIED | 19. SECURITY CLASSIFICATION<br>OF ABSTRACT<br>UNCLASSIFIED | 20. LIMITATION OF ABSTRACT<br><br>UL                                  |                                                     |

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)  
Prescribed by ANSI Std. Z39-18  
298-102

**AFIT RESEARCH ASSESSMENT**

The purpose of this questionnaire is to determine the potential for current and future applications of AFIT thesis research. **Please return completed questionnaire to: AIR FORCE INSTITUTE OF TECHNOLOGY/LAC, 2950 P STREET, WRIGHT-PATTERSON AFB OH 45433-7765.** Your response is **important**. Thank you.

1. Did this research contribute to a current research project?      a. Yes      b. No
2. Do you believe this research topic is significant enough that it would have been researched (or contracted) by your organization or another agency if AFIT had not researched it?      a. Yes      b. No

3. **Please estimate** what this research would have cost in terms of manpower and dollars if it had been accomplished under contract or if it had been done in-house.

Man Years \_\_\_\_\_ \$ \_\_\_\_\_

4. Whether or not you were able to establish an equivalent value for this research (in Question 3), what is your estimate of its significance?

- a. Highly      b. Significant      c. Slightly      d. Of No  
Significant      Significant      Significance

5. Comments (Please feel free to use a separate sheet for more detailed answers and include it with this form):

\_\_\_\_\_  
Name and Grade

\_\_\_\_\_  
Organization

\_\_\_\_\_  
Position or Title

\_\_\_\_\_  
Address