

THE MEASUREMENT OF HUMAN  
INTELLECTUAL CAPITAL IN THE  
UNITED STATES AIR FORCE

THESIS

Thomas J. Wagner, Major, USAF

AFIT/GOR/ENS/98M-26

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

Wright-Patterson Air Force Base, Ohio

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UNITED STATES AIR FORCE

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Presented to the Faculty of the Graduate School of Engineering  
of the Air Force Institute of Technology

Air University

In Partial Fulfillment of the Requirements for the  
Degree of Master of Science in Operations Research

Thomas J. Wagner, B.S.

Major, USAF

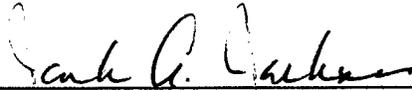
March 1998

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Thomas J. Wagner, B.S.  
Major, USAF

Approved:



\_\_\_\_\_  
Jack A. Jackson, Lieutenant Colonel, USAF  
Assistant Professor of Operations Research  
Department of Operational Sciences  
Air Force Institute of Technology

10 March 98  
date



\_\_\_\_\_  
Richard F. Deckro  
Professor of Operations Research  
Department of Operational Sciences  
Air Force Institute of Technology

10 March 98  
date

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I want to thank my father. He was always there.

**(Dr. Eugene Paul Wagner, 1926-1998)**

*'Tis prize enough to be his son. Henry VI*

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## Abstract

For centuries, companies used basically the same accounting system developed in the fifteenth century to measure economic performance. Through much of this period the tangible value of a firm, its plants, property and equipment, was closely related to the market value of the firm. With the dawning of the information age, America has evolved from a manufacturing based economy to a service oriented economy. Closely related to this change from a blue collar to white collar workplace has been the widening gap between the market value of a company and its tangible assets. Roughly equal before, now the tangible assets may represent as little as ten percent of the market value of a company. This difference in value between the tangible assets and the market value represents the value of the intangible assets. Many people define the intangible assets of a company as its intellectual capital. Since the intangible assets might represent ninety percent of the value of the firm, investors and managers alike are seeking ways to define and measure these assets.

The Air Force, in many ways, is similar to a large corporation. It deals with budgets, rapidly changing world environments, performance expectations, retention, training and similar concerns. The Air Force reduced

the officers in the active duty force from 98,059 in 1989 to 69,892 in 1997.

This research addresses the affect of the draw-down on the USAF's intellectual capital. The uniqueness of the military is discussed and measures are developed specifically for the Air Force. The measures developed for the Air Force are evaluated for the years of the military draw down and conclusions are made based upon the results.

## CHAPTER I

### INTRODUCTION

**Background.** In 1494, Luca Pacioli, a mathematically minded Venetian monk, originated the double entry book keeping system that is still roughly the basis for accounting today. In his *Summa de Arithmetica, Geometrica, Proportioni et Proportionalita*, Pacioli tried to provide “all the rules that a good merchant needed,” (Davidow 1996, Stewart 1997). What the merchants of the time needed was a method to keep track of how much money they had, owed or were due, and a way to record the value of their physical assets. The physical, or tangible, assets of a company are its plants, property and equipment. Pacioli’s system was used for over three hundred years with only minor modifications until the balance sheet took its present form in 1868 remaining virtually unchanged to the present day (Stewart 1997).

When Henry Ford developed his mass production system in the early 1900’s, the skill of the workers involved in production was not an important consideration. It made little difference how experienced an employee was when working on the assembly line. Each employee was a body with no more value than the next. Indeed, Ford treated his workers as interchangeable as

the parts on his assembly line with an employee turnover rate of more than 300% in one year (Davidow 1997). For Ford, and the other industrialists of the time, the old accounting system was still accurate in determining the value of a worker. While mass manufacturing did recognize skill classes, workers within these classes were considered interchangeable. The skill and talents of a firm's workforce were not considered tangible assets for accounting purposes for a firm in a mobile society with sufficient labor.

A little noticed milestone in employment was passed in 1956. For the first time there were more white-collar workers than blue-collar workers in America (Naisbitt 1982). Since this milestone there have been more people producing income by managing people and information than by actually making tangible products. Daniel Bell, a Harvard sociologist, termed this new era the post-industrial society, suggesting the leaving of one era for another, yet undetermined, era (Naisbitt 1982). This trend has continued through the 90's as manufacturing jobs dropped to 15.8% of the American labor force in 1995, and are projected to further drop to approximately 10% by 2017 (Longman 1997).

The next milestone was reached in 1995 when the number of companies such as advertising agencies, law and accounting firms, management consultants, and real estate brokers, i.e., those *servicing* industry, outnumbered those *working* in industry (Sveiby 1997). White-collar workers and companies serving industry both deal in knowledge,

information and communication. Peter Drucker labeled these knowledge-intensive industries (McRae 1997). This description has caught on as 375 of 431 organizations surveyed in the U.S. and Europe described their business as knowledge intensive (Ernest & Young 1997). Indeed, as we enter the 21<sup>st</sup> century, the question is not so much which companies are knowledge based, but which companies are not (Edvinsson 1997). Thomas Stewart, author of Intellectual Capital: The New Wealth of Nations, suggests the fundamental sources of wealth in this new age are knowledge and communication and no longer natural resources and physical labor (Stewart 1997).

*Whether we like it or not, manufacturing and mercantile operations have become over time a smaller and smaller segment of the economies of the United States and many other developed nations. Much of the value added by business enterprises in those economies now comes from services: business and personal services, and financial services. These are businesses in which physical assets, plants, inventories, and the like, have little importance. (American Institute of Certified Public Accountants 1998)*

Joel Barker, a futurist for Infinity Limited said in the early 1980's, "Corporate intellectual properties will be more valuable than their physical assets in the 21st century" (Petrash 96). In 1990, Charles Handy, author of The Age of Unreason, stated that the intellectual assets of a corporation are usually worth three or four times their physical assets or tangible book value (Handy 1990). The book value of a corporation represents the monetary amount by which an asset is valued in business records or the accounting value of a business. A company's book value might be more or less than the market value of the company. This monetary value refers to

the firm's tangible assets of property, plants, and equipment (American Heritage Dictionary of the English Language 1992). A few years later, Leif Edvinsson, in Intellectual Capital: Realizing Your Company's True Value by Finding Its Hidden Brainpower, said the ratio of market value to book value was somewhere between five-to-one and sixteen-to-one (Stewart 1997).

*"I see this coming out of the change in our economy from one that is industrial-based to one that is knowledge-based, where intellectual property, soft assets, and other intangibles increasingly make up the bulk of the asset base for wealth production in our society."*

Commissioner Steven M.H. Wallman of the Securities and Exchange Commission (Myers 1996)

Often, the remaining value of a company, or the difference between the market value of a firm and its tangible assets, is lumped together in one line of the balance sheet and called goodwill. Many people define goodwill as the intangible value arising from such factors as longevity in the market, an existing customer base, and a trained staff and in place procedures and operating assets (Faust 1998). With the dawn of the information age people also began attributing the difference in value to the company's employees, relations with its customers, patents, and the databases the company owns. The name given by many to this difference between market value and a company's tangible assets is intellectual capital. How to define this intangible value and measure it at any given time in an organization is a problem for both the company itself and investors in that company.

*Just imagine that your company is suddenly struck by a knowledge blight that erases all your corporate knowledge from the storage media including the employee's minds. The difference between the market values of the company before and after the blight struck is the value of the company's intellectual capital. You might wish to continue the thought experiment by estimating how much will it cost to recreate the lost intellectual capital and to restore it to its original functionality, and you will have a measure of the lost value. (Nasseri 1996)*

In the sixties and seventies, 25% of the differences in stock price changes of companies could be attributed to differences in reported earnings, but by the early nineties less than 10% could be accounted for in this way (Lev 1997). In November, 1997, Microsoft stock was selling for over 17 times its book value indicating only 6% of the value of the company was accounted for by plants, property and equipment or its book value. This would imply that the hard assets of Microsoft contributed far less to the value of its ultimate products or services than the other assets or intangible assets (Stewart 1997). This suggests the other 94% of Microsoft is not just company earnings. Stewart (1997) states that these intangible assets are the relationships a company has with its customers, the efficacy of its management systems, and the talents of its employees.

Thirty-five million people use Microsoft's operating system. These customers are a captive audience as it is difficult to switch from one operating system to another (Sveiby 1997). The market believes this customer base has value, but the customer base alone does not represent all the firm's intangible assets. Microsoft has 22,000 employees (Brown 1997).

If the top 100 programmers walk out the door Friday afternoon and do not come back the share prices would surely fall, yet current accounting methods might actually show an improvement in the company's financial situation due to fewer salaries and benefits to pay (Roos 1996). Microsoft would not have one less chair, desk, computer, plant, property or equipment, but people do not buy Microsoft for the tangible assets, they buy it for its intangible assets. Microsoft recognizes this and works very diligently to maintain a low turnover rate (near 7%) (Levering 1997). Every employee who chooses to leave the company is interviewed to learn why he or she is leaving (Murray 1997). Microsoft realizes that its employees *are* the company and the loss of every person represents a loss of expertise and, hence, a loss of value to the firm.

Joinson (1997) contends the Air Force can be treated like a company or business. It deals with budgets, rapidly changing world environments, performance expectations, retention, training and similar concerns. The tangible assets of the military include bases, tanks, jets, and ships. The intangible assets include the men and women in the Air Force and, more specifically for this thesis, the officer corps. In many ways the potential value of these officers is unknown. Every officer is labeled with a rank and job title that may create a tightly defined box that he or she must work in. While providing the service with some broad common denominators, this can restrict the officers' potential contributions to the Air Force as a whole. The

officers are seen as job descriptions first and as unique people second (Willis 1997). The Air Force has a potential to ignore many of the other contributions these officers could make to the Air Force (Brooking 1996). How many officers have underutilized masters degrees? Unused ability to speak a foreign language or learn a foreign language? Years of experience or other skills not being recorded, passed on, shared or profited from? Companies make large investments in training workers and the most productive companies value the knowledge and skills of a dedicated work force above all else (Davidow 1997).

The United States Air Force has approximately 373,000 individuals with 70,000 officers, including 273 generals (MPC 1998). If all 273 of the generals resigned on the same day, there would be no reduction in the number of jets, bases, or missiles, yet few would trust that the Air Force would be as effective a deterrent and fighting force. If all the generals resigned on the same day, the Air Force could simply promote the next 273 colonels yet there would be a loss in knowledge and capability. This lost capability could be defined as intellectual capital.

Thousands of officers retire or separate from the Air Force every year even as new men and women pin on second lieutenant bars to replace them. The Air Force should be concerned because every time an officer leaves, a chunk of corporate memory leaves with him (Brooking 1996). What if a bit of this memory or knowledge, this intellectual capital, could be saved? What if the intellectual capital in the Air Force today could be increased? What if the

officers who have the type of knowledge or expertise the Air Force needs could be better identified and kept in the service longer, utilizing more of their expertise and, indeed, saving some of their knowledge for future officers to learn from? Retaining expertise is not a new idea, but Ernest & Young estimate that up to 80% of a company's resident knowledge is not exploited or recorded in a systematic and traceable manner (Ernest & Young 1997). To properly use and leverage intellectual capital one must first identify what intellectual capital in the Air Force is, measure it to see where the Air Force stands today, and use it to evaluate where the Air Force should go in the future.

**Problem Statement.** Is intellectual capital measurable? Stewart (1996) suggests that while intellectual capital may be an intangible value that does not mean it cannot be measured. Roos (1996) maintains that the growth and decline of intellectual capital can, indeed, be visualized and measured. He suggests that while intellectual capital cannot now be measured well, the market itself and the firm's competitors are measuring intellectual capital everyday as reflected by the difference between the market value and the tangible asset value (Roos 1996).

*“At this point, nobody’s holding his or her breath waiting for Corporate America to mount the slippery slope of full, legal disclosure of indicators of non financial performance. Tighter correlations, not to mention safe harbor rules, are needed before corporations will budge en masse. And the pioneers? They’re busy testing and refining these management tools. And they don’t seem to be sweating over the small stuff. Do we understand all the connections between the value drivers and the financials? No. Are we trying to map them? Yes. The point is to believe in the connection.”* (Birchard 1994)

There are numerous reasons to measure intellectual capital. In the near and distant future we will continue to see little increase, and more likely a decrease, in budget dollars in the Air Force. The identification, measurement, and development of intellectual capital offer a long-term resource that can be tapped for enhanced potential and capability (Agor 1997). Indeed, managers and Air Force leaders alike are always seeking better ways to apply organizational resources (Brooking 1996). To use, leverage, and exploit the resources of a company or the Air Force, one must understand what the resources of that company are. Before one can manage these resources, the manager must know where the company stands today or in the near past and this demands measurement. Vito Fabiano, of Pitney Bowes Inc., said, “You can’t begin to change anything unless you can measure it,” (Birchard 1994). Perhaps at its simplest, leaders might rely on an axiom of business schools that ‘one measures the things he or she values’ (Thornburg 1994), or from the general manager’s view point, which suggests ‘what gets measured is usually also what gets managed’ (Roos 1996).

*There is difficulty in evaluating intellectual capital by the prevailing accounting rules that are used to evaluate physical capital. It seems that this difficulty has regrettably discouraged investment in intellectual capital. Not with standing this, there cannot be any reasonable doubt that intellectual capital is very valuable. (Nasseri 1996)*

Eiley (1996) suggested that growth in a company's intellectual capital is important if for no other reason than smarter companies tend to do better over the long run than their dimmer rivals. Perhaps the most important reason to develop measures is that intellectual capital is rapidly becoming a measure of future performance while current accounting methods only look at past performance or, at best, a snapshot of the company's current position (Roos 1996).

There are two main purposes for measuring the intellectual capital of an organization and two distinct groups who are interested in the results (Sveiby 1997). Outwardly, investors, competitors, customers and creditors want to see how the company is performing and what its potential value will be in the future. Internal measurement, which is more relevant to the Air Force, is important so assets can be properly managed. Air Force leaders and managers need to know the trends, directions or vectors at any given time to see where the Air Force is going and make the necessary corrections.

*It might be said that the study of Intellectual Capital is in fact the search for ways to systematically capture, elucidate, and leverage the subjective, half-hidden information about a company now hidden in footnotes to its balance sheet. (Leif Edvinsson 1997)*

The Air Force is still adjusting to a 9 year long draw-down that reduced officers from 98,059 in 1989 to 69,892 in 1997 (MPC 1998). What effect this draw-down has had on the readiness of the Air Force is not well known. If the value of the people in the Air Force's cannot be measured, then the Air Force has no way of knowing if it is losing knowledge and expertise that might be needed in the future.

*"As we plan for the future, it is important to remember that what makes the Air Force successful will not change. Quality people define the Air Force. From the flight line to the depot to the workstation transmitting on-orbit satellite repair instructions, it is the professionalism and dedication of our people that makes the Air Force the preeminent air and space force to meet the nation's needs."* (Global Engagement: A Vision for the 21<sup>st</sup> Century Air Force, 1996)

How are quality people defined? What do these people have that makes them valuable? If these qualities or attributes are identifiable, can they be measured? If they can be measured, how is the Air Force doing? Based on the results, what recommendations can be made?

**Research Objective.** John White, Deputy Secretary of Defense, said in 1996, "We must dramatically change the way we do business, and to do that, we need to go outside the institution and into the marketplace for the best practices, products, services and ideas," (White 1996). One of the best new practices in the marketplace today, one may argue, is the identification, measurement, and management of intellectual capital.

This research will first define intellectual capital and its various components. Stewart (1991) said the first step in an intellectual capital

audit is to find the intellectual assets in the company and the second step is matching the company's intellectual needs with the strategic plan. (For this research, the author will identify the Air Force's strategic plan first, and then identify the intellectual assets the Air Force can use towards this strategic plan.) Third, measure those assets, assess where the company has been and where it is today, and use this to predict where it is heading. Finally, make recommendations for the future.

Intellectual capital can be divided into various categories including human capital, relational capital, structural capital and intellectual property. This research will focus on human capital measures in the Air Force. According to Leif Edvinsson, corporate director of intellectual capital for Sweden's Skandia Insurance company, producing supplemental reports on intellectual capital is not an expensive task. "The data was already there," he states, "it was more an effort to get the data into the reporting stream" (Myers 1996). The data to measure intellectual capital in the Air Force is largely already maintained in the military personnel system. Measures will be devised for a generic company. Separate measures will be defined for the Air Force and these measures will be evaluated over a nine-year period comprising the recent draw-down from 1989 to the present.

Chapter 2 provides the reader with a review of the intellectual capital concept, presents a working definition of intellectual capital and the various types of intellectual capital and presents a set of measures of intellectual capital for a generic company. Chapter 3 develops intellectual capital

measures for the Air Force. Chapter 4 applies these measures to the Air Force for the years of the draw-down 1989 through 1997 and evaluates the results. Chapter 5 offers the reader conclusions and recommendations for further research. Appendices A through D list potential intellectual capital measurements and selected definitions for the various forms of intellectual capital. Appendix E presents all the Air Force intellectual capital measurements and associated charts and appendix F condenses the data into a tableau format. Appendices G and H present articles supporting the importance of foreign language training and joint duty experience for the Air Force.

CHAPTER 1  
CHAPTER 2  
CHAPTER 3  
CHAPTER 4  
CHAPTER 5  
APPENDIX A  
APPENDIX B  
APPENDIX C  
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APPENDIX H

## CHAPTER II

### Intellectual Capital Defined and a Framework Developed

**Introduction.** This chapter will review the background and development of intellectual capital. The basic models of the leading authors and consultants are presented illustrating the various ways intellectual capital may be subdivided. The author presents a simple method to subdivide intellectual capital into four components. Each component of intellectual capital is defined with examples of each type of capital provided. Next, the various forms of measurement of intellectual capital are reviewed. Several examples of companies that currently attempt to measure their intellectual capital are presented. Appendices A through D list two hundred and fifty potential intellectual capital measures. A generic intellectual capital model is developed from the measurement lists and from the original four basic subdivisions of intellectual capital. The generic model provides a basic core from which to start for any company interested in measuring its intellectual capital.

**Background.** The first reference to "Intellectual Capital" is generally credited to John Kenneth Galbraith in a 1969 message to fellow economist Michael Kalecki, "I wonder if you realize how much those of us the world

around have owed to the intellectual capital you have provided over these past decades,” (Grantham 1997). This implied that intellectual capital is, indeed, something, that it has value, and can be shared or passed from one person to another. The statement also begs the question, what is it?

Edvinsson (1996) attempted a general definition by saying intellectual capital is simply what walks out of the door at the end of the business day. Stewart (1997) suggested the same when he described intellectual capital as the sum of everything the people of the company know which gives it a competitive advantage in the market. These definitions, however, are far too narrow. The employees do walk out, but certainly, the databases do not. Roos (1996) says intellectual capital includes what is in the heads of organizational members and what is left in the company when they leave. Intellectual capital is not just people then, but the knowledge resources of an organization (Bell, 1996) or, put differently, the stock of knowledge that exists in an organization at a particular point in time (Crossan 1997). Intellectual capital represents what has been learned by the firm in a cognitive sense (Crossan 1997). Intellectual capital is not limited to people or databases or written reports; intellectual capital is related to value. If the individual parts of intellectual capital were better defined then the overall definition and understanding of value might be clearer.

Leif Edvinsson and Michael Malone, in Intellectual Capital: Realizing Your Company's True Value by Finding Its Hidden Brainpower, divide intellectual capital into human capital and structural capital.

EDVINSSON AND MALONE

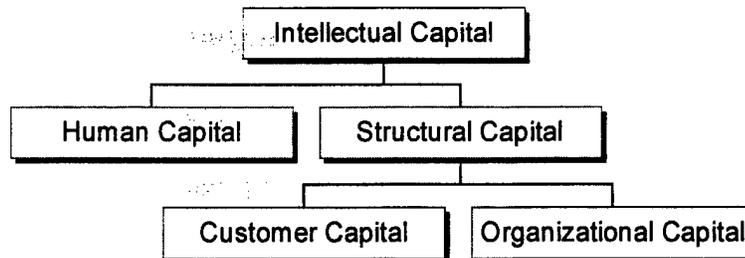


Figure 1. Intellectual Capital Model – Edvinsson and Malone

In Edvinsson and Malone’s model, human capital is “the combined knowledge, skill, innovativeness, and ability of the company’s individual employees to meet the task at hand,” (Edvinsson 1997). Structural capital is “the hardware, software, databases, organizational structure, patents, trademarks, and everything else of organizational capability that supports those employees’ productivity,” (Edvinsson 1997). Structural capital is further subdivided into organizational capital and customer capital. The primary distinction is between the intellectual capital that goes home at night and that which is left behind (Stewart 1997).

Gordon Petrash (1996), Global Director of Intellectual Assets and Capital Management for the Dow Chemical Company, identifies intellectual capital as human capital, organizational capital and customer capital. The label organizational capital is similar to structural capital. The significant difference from Edvinsson’s model is Petrash puts customer capital on the

same plane as human and organizational capital (Stewart 1997). The customers also do not stay at the firm at night.

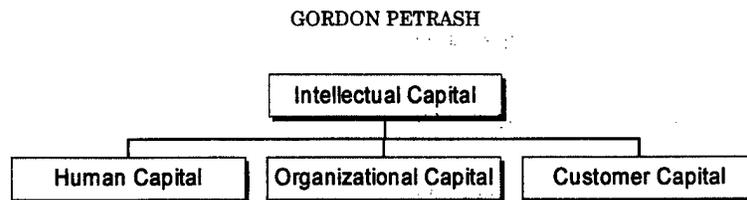


Figure 2. Intellectual Capital Model – Gordon Petrash

Annie Brooking, in Intellectual Capital: Core Asset for the Third Millennium Enterprise, uses four areas; market assets, intellectual property, human centered assets, and infrastructure assets.

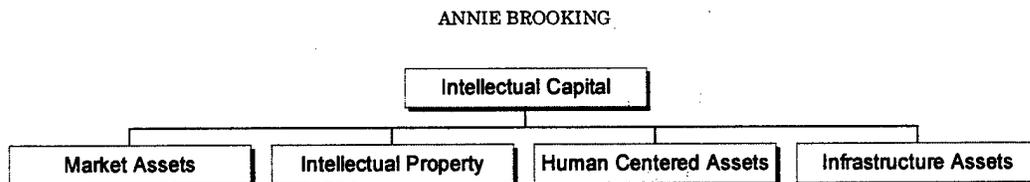


Figure 3. Intellectual Capital Model – Annie Brooking

Brooking's model is unique in that she recognizes intellectual property, such as patents and other legally protected assets, as an individual component of intellectual capital. Intellectual property represents the legal mechanism for protecting many corporate assets (Brooking 1996). Brooking (1996) says market assets are the potential an organization has due to

market-related intangibles. These assets give the company a competitive advantage in the market place. Human centered assets are the qualities that make up the personnel of a corporation while infrastructure assets are the technologies, methodologies and processes which enable the organization to function (Brooking 1996).

Nick Bontis, Director of the Institute for Intellectual Capital Research, Ontario, Canada, says intellectual capital consists of human capital, structural capital and relational capital (Bontis 1996).

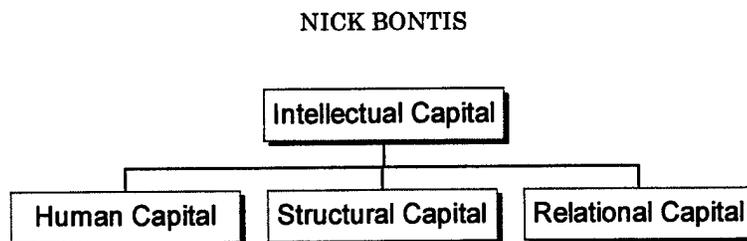


Figure 4. Intellectual Capital Model – Nick Bontis

Bontis (1998) suggests that customer capital does not fully illustrate all the connections present in a company. "Customer capital only looks at one direction of the value chain: forward," (Bontis 1998). Bontis (1996) describes relational capital as "the organization's relationships or network of associates and their satisfaction with and loyalty to the company." This relationship is between not only customers and the company, but also between suppliers, distributors, and all the people a company interacts with

on a day to day basis. More simply, relational capital is the knowledge embedded in the relationships established with the outside environment (Bontis 1997).

Based upon this literature search, the author will divide intellectual capital into four areas: human capital, structural capital, relational capital and intellectual property. This selection is based on two properties: mutual exclusivity and comprehensiveness.

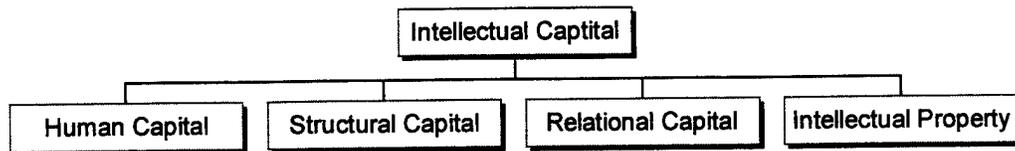


Figure 5. Intellectual Capital Model

**Human Capital.** Skandia (1997) states that human capital represents the capabilities of the employees. Capability is a talent or ability that has potential for development or the quality of being capable, physically, mentally and morally. Human capital then suggests both a potential ability and a present capability for a company to do something. Hubert Saint-Onge (1996) says this 'something' is the capability to provide solutions to customers. This implies an ability that stands alone with the employees while Grantham (1997) says it is the capability to apply knowledge to business problems. Bontis (1996) adds it is capability to extract the best

solutions from the knowledge of its people. Human capital then includes the capability or ability to use knowledge for a purpose to help an organization.

Edvinsson and Sullivan (1996) identify two types of knowledge; codified knowledge, which can be written down, transferred and shared, and tacit knowledge, which is transferred through demonstration and on the job training. Bontis (1997) suggested human capital uses the tacit knowledge embedded in the minds of the employees. Brooking (1997) defines tacit knowledge as knowledge that exists and can be used by individuals, but is extremely difficult to explain or write down. She adds two other types of knowledge; explicit knowledge, which can be written down, and implicit knowledge, which is hidden in the operating procedures, methods and the corporate culture of the company (Brooking 1997). Employees acquire this knowledge through education, training, experience, and cognition (Nasseri 1996).

Human capital then is, at least, the capability of employees to use knowledge to do productive work for the organization. Skandia (1997) said human capital includes the competence of the employees, i.e., each person's ability to act in various situations including one's skill, education, experience, values, and social skills (Sullivan 1997). A worker's capability and competence to use knowledge is the sum of the employee's genetic inheritance, education, experience, attitudes about life and business (Hudson, 1993), values, culture, philosophy, combined knowledge, skill, innovation, ability to meet the tasks at hand (Edvinsson 1997), collective

expertise, creative and problem solving capability, leadership, entrepreneurial and managerial skill (Brooking 1996) and employee intellect (Sullivan 1997). Perhaps the most important point to make about human capital is that it cannot be owned by anyone or anything but the person who possesses it (ICM Group 1997). For the purpose of this paper, *human capital is the employees' capability and potential to provide value.*

The definition implies several important points. The employees own or control this capital; the company does not. This capital represents a capability and a potential which means it does not have a value in of itself. An employee can be a genius with 20 years experience and still not help the company make a nickel. The employee, like all resources, is a potential value for the company. Used correctly, this value becomes an asset for the company, a profit maker. If a capability or potential is never used, it has no value. Knowledge, as defined above, can be tacit, implicit, explicit or codified. In the context of human capital, this means the knowledge available for the company lies within the employee herself as tacit knowledge. The employee is the key in making that knowledge valuable to the company.

**Examples of Human Capital include:** attitudes, training, education, abilities, talents, stability, experience, know-how, expertise, genetic inheritance, creative and problem solving capability, leadership, managerial skills, and competence.

**Structural Capital.** The author showed how intellectual capital is different from the plants, property and equipment of a firm suggesting that structural capital is something other than the defined assets on a balance sheet. Structure, says the dictionary, is the interrelation of parts or the principle of organization in a complex organization while capital is any form of material wealth used, or available for use, in the production of more wealth. Edvinsson (1996) asserts structural capital is what is left when the human resources go home. Again, an essential part of intellectual capital is capability and capability is, by definition, a present and potential value. For structural capital, it is the firm's capability to respond to environmental changes (Grantham 1997), meet market needs (Saint-Onge 1996), meet market requirements (Bontis 1996), and speed the flow of knowledge through the organization (Edvinsson 1996).

These definitions suggest structural capital serves a function for the firm. In general, structural capital provides value for the firm. Edvinsson (1996) says structural capital is the infrastructure that firms develop to commercialize their human capital. What is the infrastructure? The sum of the strategy, systems and processes (Grantham 1997), the hardware, software, databases, organizational structure, and everything else of organizational capability (Edvinsson 1997) including the organizational routines of the business (Bontis 1997), the models, computer and administrative systems (Sveiby 1997) and the company's operating philosophy (Edvinsson 1996).

Hardware, software, databases, models and computer systems are tangible assets. One can buy most software off the shelf. However, strategy, systems, processes, organizational structure, routines, administrative systems and operating philosophy are intangible items. Peter Keen (1997) defines business processes as financial capital, which, indeed, is contrary to traditional accounting that treats processes as an expense. Keen defines a process as “a collection of activities that takes one or more inputs and creates an output that is of value to the customer” (Keen 1997). Processes can be used to characterize a firm’s strategy, administrative systems, organizational structure, routines and operating philosophy as well as its computer hardware, software, databases and models. In this research, *structural capital is the capability and potential to provide value through the sum of the firm’s processes.*

While the employees own or control human capital, the firm controls the structural capital. While it may be difficult to see how a firm can control intangible items such as strategy, routines, or an operating philosophy, it might be easier if one simply considers that it does not leave the building every night as human capital does. Structural capital also represents a capability and a potential value for the company, i.e., it does not provide a value to the firm by itself.

**Examples of structural capital include:** processes, procedures, information systems, access to information, computer systems, data bases, communication systems, E-mail, web sites, teleconferencing abilities, culture, strategy, methods of managing a sales force, and plans.

**Relational Capital.** Various authors and consultants label this third type of intellectual capital as customer capital, relational capital or market assets. Grantham defines it as the loyalty of the firm's customers (Grantham 1997). Loyalty is the feeling of devoted attachment or affection. What leads to this loyalty? Annie Brooking (1997) says some factors are brand recognition, positioning, customer base, company name, backlog, distribution channels, collaborations, franchise agreements, licensing agreements, and favorable contracts. Grantham (1997) further suggests extra qualities such as the knowledge of channels, customer preferences, trends, and competitive intelligence. This suggests that customer capital is not just in the hearts of the customer, but it is also knowledge or data about those customers. Stewart (1997) says it is the value of an organization's relationships with the people with whom it does business. Relational capital then is a feeling the customer has for the firm, a data base about those customers, and the relationship developed with the customer. The relationship with the customer leads to the loyalty of that customer. Saint-

Onge (1996) suggests this when he defines customer capital as the depth, width, attachment, and profitability of customers.

Bontis coined the label, relational capital, to define this area of intellectual capital. He defines it as the knowledge embedded in the relationships established with the outside environment (Bontis 1997) or the network of associates and their satisfaction with, and loyalty to, the company (Bontis 1996). This includes more than just customers. It is the firm's network of associates, knowledge of market channels, suppliers, industry associations, allies, competitors, and understanding of government public policy (Bontis 1996, Fitz-enz 1997). Within this research, *relational capital is knowledge of, and relationships with, the firm's network of associates and customers, which leads to loyalty and potential profitability.*

**Examples of relational capital include:** brands, image, company name, loyalty, satisfaction, repeat business, longevity, growth, backlog of orders, efficiency, distribution channels, target marketing, data bases, preferences, customer base, collaboration, franchise agreements, licensing agreements, industry associations, market position, company reputation, contracts, personnel service agreements, innovation processes, confidential disclosure agreements, and lessons learned.

**Intellectual Property.** An intellectual asset is specific knowledge, codified, tangible or physical description, to which the organization may assert ownership rights (Edvinsson 1996) and readily trade in disembodied form (ICM Group 1997). An intellectual asset can be thought of as property of the mind (Brooking 1997). *Intellectual property is an intellectual asset protected by law.*

Intellectual property deserves a separate division of intellectual capital for several reasons. Intellectual assets are tangible. They can be measured, bought and sold. Intellectual assets are currently protected by law and one can readily count the number of patents or trademarks a firm owns. The cost to maintain a patent is included in standard accounting procedures. Patents themselves are a part of a standard audit though often listed as an expense and not an asset. Edward Kahn, president of EKMS Inc., an intellectual property management firm, stated, "It's certainly a recent development in American business to think of intellectual property as a strategic asset," (Ernest & Young 1997).

**Examples of intellectual property include:** patents, copyrights, software, trademarks, reports, books, manuscripts, articles, research papers, licenses, design rights, service marks and trade secrets.

**Measurement.** Once intellectual capital is defined and identified, the next problem is how to measure an asset that, by definition, is intangible. Pitney Bowes' U.S. Mailing division, headquartered in Stamford, Connecticut, started with a list of 500 "key" measures (McWilliams 1996). According to Mark Green, the division's director of business analysis, "We had to come up with a separate set of measures just to rank the measures," (McWilliams 1996).

A number of metrics has recently been created as a first cut to measure intellectual capital. James Tobin, an economics professor at Yale University, created a measure known as Tobin's Q. This is a ratio of the firm's market valuation as the numerator and the cost of replacing the firm's assets in the denominator. Tobin began with the physical assets of a company or the book value, and calculated the cost of replacing those assets rather than use the original cost. Next, he considered the securities market's valuation of the firm, i.e. what were people willing to pay for the assets of the firm. Firms in the steel industry, noted for their large capital assets, have a Q ratio of nearly 1.00 (Bontis 1990). This indicates the market mainly values the firm by the value of its replacement costs. Companies in the software industry, where intellectual capital is abundant, tend to have a Q ratio of 7.0 or greater. These firms are not being valued for their buildings and equipment; indeed, the Q ratio of Microsoft was approximately 17 in 1997! If the Q ratio for the steel industry with all its plants, property and equipment, is nearly one and the Q ratio of Microsoft, with their programmers and customer base,

is over 17, what might the Q ratio of the Air Force be? We could arrive at replacement costs for all the jets, missiles, and bases in the Air Force, but this would not account for the 373,356 people in the Air Force. Training and education costs can be calculated, but the experience of each individual would not be valued.

*“At the Department of Defense, where I started working on these issues, we realized that the value of a heavy armed division is not the tanks but the people who ride them. The cost of an armored division is largely the training the soldiers have received -- the Knowledge (Intellectual) Capital they have accumulated.”* Paul Strassmann (Manasco 1996)

A ratio similar to Tobin's Q with the market value in the numerator, but the denominator replaced with the standard book value of a firm, is the market to book ratio. The book value is the value of the plants, property and equipment of a firm as defined by the buyer, though, and not the seller (Stewart 1997). This method leaves the valuation of all the intellectual capital to the market. Many of the Air Force's assets do not lend themselves to a market value per se, such as F-15's and B-2's.

Another measure checks the relative progress of the firm itself. Measurements are defined for a firm and the values are compared against the historical data of the firm. A growing number of companies starting to measure their own intellectual capital are not releasing the results to the public. Without access to the competition's numbers, firms are forced to judge their results against themselves. While the Air Force can be treated, in some respects, like a corporation, it is undeniably a unique corporation.

Except for some comparison between the other services, such as the Army and Navy, comparing data with a civilian corporation would not necessarily be relevant. The mission statement of a civilian corporation does not include the capability to wage war against another nation. Clearly, there will be some measures similar to a civilian corporation, but others will be unique to a military organization.

Benchmarking is a method of identifying companies that are recognized leaders in leveraging their intellectual assets, determining how well they score on relevant criteria, and then compare how your own company measures in relation. As noted above, few companies release this data. Microsoft very closely tracks data such as personnel turnover rate and works diligently to keep it low (around 7%) (Levering 1998). However, they do not release these numbers to the public. Regardless, comparing against a civilian organization might not be very valuable for the Air Force leadership.

The value of intellectual capital can be looked at as its business worth. What would happen if a firm's current intellectual capital disappeared altogether? What would happen if the firm's intellectual capital was doubled? How does the intellectual capital value change after a week or a year? This type of evaluation focuses on lost opportunity costs from underutilizing intellectual capital. Since the Air Force is not a true profit and loss type of organization, bottom line dollar values would be difficult, if not impossible, to define.

Another method of valuation is known as the knowledge bank. Capital spending is treated as an expense (instead of an asset), while a portion of salaries and the cost of training and education is treated as an asset. The costs are considered an intellectual capital investment. This approach might be applicable to the Air Force. Training and education costs are available for schools and dedicated courses such as pilot training. Air Force units have on-the-job training, daily, monthly and annual training done 'in-house' and unit exercises at all levels. Indeed, separating daily training and basic job performance for many personnel would be next to impossible.

Stewart (1997), in Intellectual Capital: The New Wealth of Organizations, recommends three principles for a company in selecting what to measure. First, he suggests no more than three measurements each of human, structural, and customer capital and one number that gives an overall picture (Stewart 1997). Next, he says to measure what is strategically important to the company itself, and finally, measure activities that produce intellectual wealth (Stewart 1997). The following figure represents Stewart's concept of a radar chart to portray the intellectual capital data. The center of the circle for each measure represents the worst case scenario, e.g., zero customer satisfaction, while the outside edge represents the goal or optimal value. "What's inside the polygon is what you've got; what's outside is what you want," (Stewart 1997).

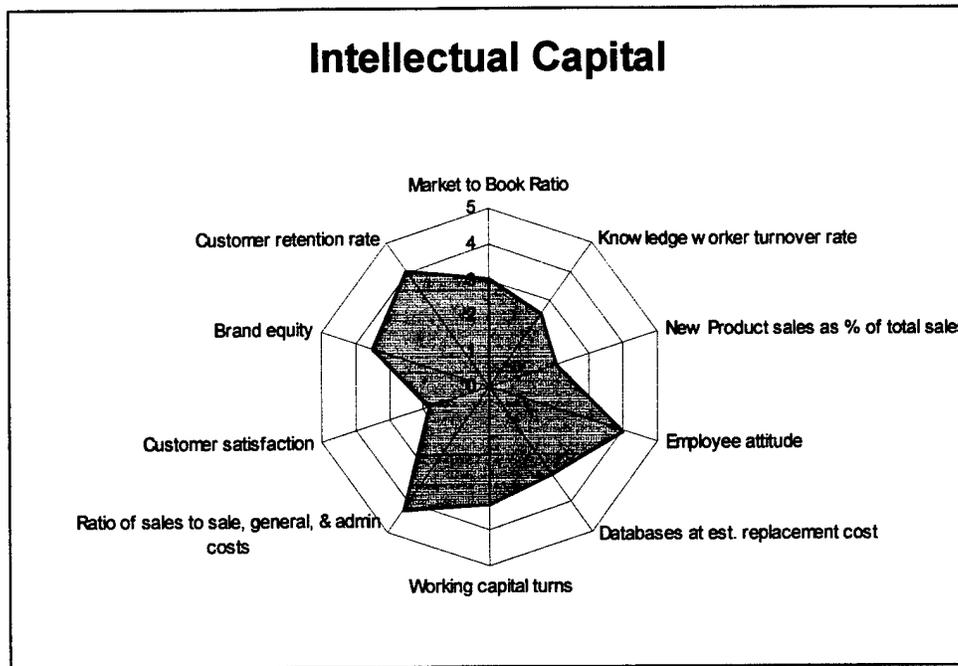


Figure 6. Thomas Stewart - Intellectual Capital Model

**Current Models of Intellectual Capital.** Numerous companies have recognized the need to define and measure their intellectual capital. Four specific companies are considered leaders in the development and measurement of intellectual capital in their corporations. Celemi is a Swedish company that develops and markets training tools. Dow Chemical is a global company producing over 2000 chemical related products with over twenty billion dollars in annual sales (Petrash 1996). Skandia is a large insurance and financial services company based in Sweden. WM-Data is the largest Swedish listed independent computer software and consulting company (WM-Data 1996).

Celemi publishes an Intangible Assets Monitor that divides the intangible value of a company into three areas; customers (external structure), organization (internal structure), and people (competence). Each of these groups is further broken down by growth/renewal, efficiency, and stability with one to four measures each. The measures are compared to Celemi's previous year. Celemi defines 'our customers' as an external structure of relationships with customers and suppliers, brand names, trademarks and reputation or image. 'Our organization' is a corporate internal structure consisting of patents, concepts, models, and computer and administrative systems, including general management. 'Our people' is the combined competence of Celemi's employees, such as their ability to act in a variety of situations (Celemi Annual Report 1995).

Table 1. Celemi Intellectual Assets Monitor - 1996

The Celemi Intangible Assets Monitor 1996										
Knowledge Capital										
Our Customers (Ext Structure)			Our Organization (Int Structure)				Our People (Competence)			
1996		1995	1996		1995	1996		1995		
<b>Growth/Renewal</b>			<b>Growth/Renewal</b>				<b>Growth/Renewal</b>			
Revenue Growth	50%	44%	IT investment % value added	6%	11%	Ave professional experience	8.0	2%	7.8	-25%
Image enhancing customers	46%	40%	Organization enhancing customers	44%	44%	Competence enhancing cust.	46%			43%
			Product R&D % value added	8%	18%	Total competence experts	343	15%	298	43%
			Total investment in org. %	14%	33%	Ave education level	2.3	0%	2.3	0%
<b>Efficiency</b>			<b>Efficiency</b>				<b>Efficiency</b>			
Sales/customers	39%	4%	Change in proportion of admin staff	-3%	4%	Value added per expert	816	-8%	867	-13%
			Growth in sales of admin staff	5%	-20%	Value added per employee	643	-3%	665	-13%
<b>Stability</b>			<b>Stability</b>				<b>Stability</b>			
Repeat orders	61%	66%	Admin staff turnover	8%	0%	Expert turnover	16%			10%
Five largest customers	34%	41%	Admin staff seniority	3	3	Expert seniority	3.4	47%	2.3	79%
			Rookie Ratio	32%	64%	Median age all employees	34	0%	34	-12%

In the early 90's, Dow Chemical began to investigate the value of their intellectual capital. Dow appointed Gordon Petrash as The Global Director,

Intellectual Asset and Capital Management. Petrash stated he was intrigued by futurist Joel Barker's statement that "Corporate assets will be more valuable than their physical assets in the 21<sup>st</sup> century." Petrash looked at Dow's Q ratio and decided that the reason it was greater than one was the value of its intellectual capital and intellectual assets. His problem at first was where to start? "It was decided to start in an area that was familiar to many, within the organization, had a high probability of success, would be an obvious value contributor, and could be implemented quickly," (Petrash 1996). He decided to begin with the more than 29,000 patents Dow maintains worldwide. Petrash classified each of the patents in three major categories; those Dow is 'using', 'will use', and 'will not use'. They aggressively sold or discontinued maintaining those they were not using. Dow claims they will save 40 million dollars in tax maintenance over ten years. Its income from licensing rights is now 25 million a year and projected to increase to 125 million by the year 2000! This was achieved at a cost of one million a year (Myers 1996, Stewart 1997, Petrash 1996). Petrash admits he went for the "low hanging fruit" first, but now Dow is assigning value to more than 130 intellectual assets including work processes, employee knowledge and R&D activities (Myers 1996).

Table 2. Dow Intellectual Property Measurements

Patent Classification Table Pending and Issued									
	Current Business Use			Potential Business use		No Business Interest			Total
	Practice	Defensive	License	Practice Use Def.	License	Avail for Lic.	Allow to Expire	Abandon	
2/6/06	2605	1597	2791	4085	2810	294	1429	654	16265
Percent	16%	10%	17%	25%	17%	2%	9%	4%	
	43%			42%		15%			

Skandia Assurance & Financial Services is a large Swedish insurance company that many credit with starting the intellectual capital revolution. In 1991, a Director of Intellectual Capital was appointed and tasked with devising ways of describing the hidden value in intellectual capital and to create an intellectual capital model the firm could use to chart its progress. The Skandia Market Value Model is presented below. The model shows how Skandia believes the value of the company is due partly to financial capital and the rest is due to intellectual capital.

SKANDIA MARKET VALUE SCHEME

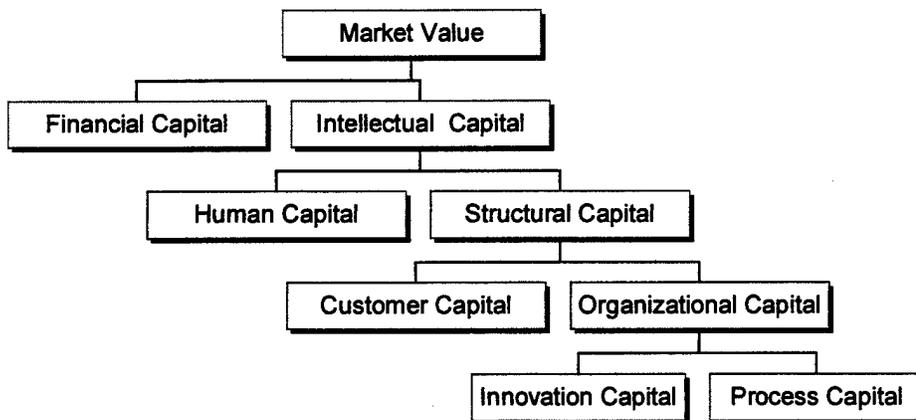


Figure 7. Skandia Market Value Scheme

Skandia imposed a requirement on the Director of Intellectual Capital. He had to keep the report to a single page document combining financial and non-financial data (Edvinsson 1997). In 1994, an intellectual supplement was published alongside Skandia's financial report (Birchard 1994). This intellectual supplement is called Skandia's Business Navigator. The model looks at five major focus areas: financial focus, customer focus, human focus, process focus, and renewal and development focus. Table 3 shows Skandia's intellectual capital measurements for the years 1993 through 1996.

Table 3. Skandia Intellectual Capital

	1996	1995	1994	1993
<b>Financial Focus</b>				
Return on capital employed (%)	31.3	28.7	12.2	24.3
Operating result (MSEK*) (*Swedish monetary unit)	579	355	115	96
Value added/employee (SEK 000s)	2,206	1,904	1,666	1,982
<b>Customer Focus</b>				
Number of contracts	133,641	87,836	59,089	31,997
Savings/contract (SEK 000s)	396	360	333	371
Surrender Ratio (%)	4.4	4.1	4.2	3.6
Points of sale	33,287	18,012	11,573	4,805
<b>Human Focus</b>				
Number of employees, full time	418	300	220	133
Number of managers	86	81	62	na
Of whom, women	27	28	13	na
Training expense/employee (SEK 000s)	15.4	2.5	9.8	10.6
<b>Process Focus</b>				
Number of contracts/employee	320	293	269	241
Admin expense/gross premiums written	2.9	3.3	2.9	2.6
Information technology expense/admin expense (%)	12.5	13.1	8.8	4.7
<b>Renewal &amp; Development Focus</b>				
Share of premiums written from new launches (%)	23.7	49.2	11.1	5.2
Increase in net premiums written (%)	113.7	29.9	17.8	204.8
Development expense/admin expense (%)	9.9	10.1	11.6	9.8
Share of staff under 40 years (%)	78	81	72	74

WM-Data is the largest of the Swedish independent computer software and consulting companies (WM-Data 1995). They consider financial measures useless for management control and designed a system of non-monetary indicators their top management uses to monitor the operation. WM-Data calls the measures their Intangible Assets Monitor (WM-Data 1995). WM-Data calculates the value of their intangible assets as the difference between the market value of the company and the net book value. The measures used include: number of employees, turnover, net profit per employee, market value per employee, return on capital employed, and return on equity.

WM-Data tries to keep staff turnover within a band of 7-10%. Like structural unemployment in an economy, some turnover of skill is required, but it must not be too rapid. Resources are allocated to foster loyalty. WM-Data defines the consultants and other staff that work directly with customers as Revenue Creating Person(s) (RCP). The administrative staffs are called non-RCP's. WM-data believes the proportion of non-RCPS should not exceed 10%. Efficiency is measured through profit per RCP. They track the median age of employees believing that a balance in age and experience is crucial. Heavy recruiting is done at universities to prevent the median age from creeping upwards. WM-Data defines rookies as new employees with less than two years experience. Rookies are carefully tracked as they are generally less efficient and more likely to leave (which effects staff turnover.) However, rookies also bring new competencies to the company.

**Generic Company.** A generic model of intellectual capital can now be constructed. This model serves as a basis for any company to use as a starting point for their organization. First, intellectual capital is broken down into its basic components of human capital, structural capital, relational capital and intellectual property.

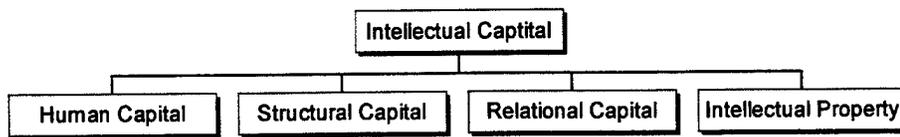


Figure 8. Generic Intellectual Capital Model

Next, each area or segment of intellectual capital is further decomposed into generally mutually exclusive subtopics. Two hundred and fifty intellectual capital measurements in use by corporations today or recommended by intellectual capital experts are listed in appendices A through D. The measures are divided into the various categories of intellectual capital and further subdivided to offer a choice to a generic corporation in selecting measures that adequately reflect the company in question. While every industry and, indeed, every company within an industry have their own unique idiosyncrasies, the author selected a single measure for each subtopic. These generic measures were selected based on their capability for use in a cross section of companies and industries.

**Generic Human Capital Model.** Human capital is divided into Potential, Growth/Renewal and Efficiency. Potential is subdivided into education and experience, and growth/renewal into stability and growth. Appendix A lists potential human capital measures.

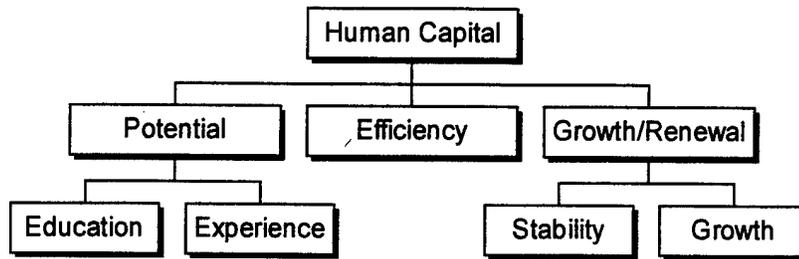


Figure 9. Generic Intellectual Capital Model – Human Capital

## Potential

### Education

*Level of education* (Sveiby 1997)

The level of education of experts affects the assessment of the quality of their competence and thus the knowledge company's ability to achieve future success. Sveiby feels the reason formal education is of interest is that the main competence gained by students at academic levels is how to process vast amounts of information (Sveiby 1997). Three general classes can be distinguished: Primary, Secondary and Tertiary; and an average education level of all the experts calculated.

## **Experience**

*Years of experience gained with replacements (Sveiby 1997)*

Experience is the other side of learning. While education shows a level of capability to learn, experience represents the actual learning of a skill. The more experience a company has the better able it will be to handle problems as they arise. Measures, such as the percentage of managers of different nationality than the company register, show a potential reserve of expertise to handle new situations that might arise due to international problems or cultural differences.

## **Growth/Renewal**

### **Stability**

*Rookie proportion (Stewart 1997)(Sveiby 1997)(WM-Data 1995)*

This is the proportion of people with less than 2 years employment. Recently employed people, on average, are less stable than workers with more tenure in an organization. They are also less efficient, because they have not yet socialized into the tradition of the organization, so they may not know the most efficient way around the organizational culture. There is usually a higher personnel turnover among people with less than two years of seniority in organizations.

*Proportion of veterans (Sveiby 1989)*

The proportion of veterans is the number of revenue people with at least three years' employment (over 20 years of employment in this research of the Air Force), as a percentage of the total number of revenue staff. A high figure indicates high stability, but too high a proportion may also suggest rigidity and lack of new development.

*Expert turnover rate (Sveiby 1997)*

The turnover rate is usually calculated as the number of people who leave during a year divided by the number of people employed at beginning of the year. Staff turnover is generally regarded as an indicator of stability. It is easy to calculate and to compare with other companies. A very low turnover (below 5%) often suggests a stable, but non-dynamic situation. A very high turnover rate (above 20%) can suggest that people are dissatisfied. Turnover should be kept in a "band". Sudden changes in the turnover rate is usually an indication that something has changed internally in the company. The turnover rate for experts is an indicator of stability in the important group of revenue creating people. Companies can actively use the turnover rate as a management tool to sustain a sufficient level of dynamics. The turnover rate can be made more or less sophisticated. It can be divided into external (people leaving the company) and internal turnover (job-rotation) or into the turnover rate for experts and administrative staff.

*Average age of employees* (Edvinsson 1997)(Sveiby 1989)(Sveiby 1997)

Older people are more "stable" than younger employees, that is, they tend to stay and not leave the company. An organization with more older experts is likely to be more stable than a younger organization in the same industry. The average age is a good indicator of stability. It is also, like turnover and seniority, an indicator of dynamics. A very high average age indicates a stable company with perhaps more wisdom than drive.

The average age has a habit of creeping upwards though, unless management is alert. A steadily increasing average age over a long period is considered a warning sign. With the aid of a deliberate recruitment policy, it is possible to maintain a stable age structure, but keeping the age and the experience of the staff in balance is not easy.

The significance of the average age in a company will vary for individual companies. Youth may provide needed energy and innovation while older employees are often more stable and experienced. Older people are generally more stable than younger ones and are often not as mobile, but an increasing age may not be good for the dynamism of the company.

*Average number of years of experience experts have in their professions*  
(Stewart 1997)

The experts' average years of experience represent the company's capability to sustain its value. Each year of experience adds further competence to the company.

## **Growth**

*Number of employees* (Edvinsson 1997)(Malone 1997)(Skandia 1996)(Sveiby 1989)

The number of employees shows at a glance whether the company is growing or diminishing its workforce. This measurement alone has little meaning in an intellectual capital context, but combined with other measurements such as percentage of experts, its significance becomes apparent. For example, if the number of employees is increasing yet the percentage of experts is decreasing, it might indicate that the company is becoming less efficient.

*Number of experts* (Malone 1997)(Sveiby 1997)(Edvinsson 1997)(Skandia 1996)

Sveiby (1997) recommends classifying all employees within one of two categories: professional or support staff. The term professional refers to the people who plan, produce, process or present the products or solutions in a corporation. WM-Data uses the Revenue Creating Person (RCP). Non-RCPs are administrative staff personnel. Employees can be categorized by degree of responsibility. Many companies, especially knowledge companies, have an informal or formal hierarchy depending on the degree of responsibility for customers carried by the employees (Sveiby 1997).

Companies strive to develop and retain as many people as possible with overall customer responsibility, because they are the people who

generate income. The Danish consulting firm PLS-Consult classifies its staff into: Generators (customer managers who are able to generate new customers); Leaders (competent of managing major projects); Teachers (who are skilled at passing on their competence to others). The author will use the following definitions for this paper. Managers are the decision-makers in an organization. They are concerned with developing the organization (Sveiby 1989). Employees and consultants work for the managers in the company. Companies hire consultants for their expertise on an as-needed basis. All



Figure 10. Intellectual Capital Job Descriptions

other people in the company are employees. Employees are classified as either experts or support staff. The experts of an organization are sometimes referred to as professionals, RCPs, generators, leaders or instructors.

These people are primarily concerned with their profession (Sveiby 1989). It is difficult to find people who are both skilled experts and good managers

(Sveiby 1989). All other employees are support staff and these can be full time or part time workers.

## **Efficiency**

### *Proportion of experts in the company (Sveiby 1997)*

An important indicator of efficiency is the proportion of experts in the firm; the number of experts, divided by the total number of employees. This measures how important the experts are to the firm. The experts are the revenue generators and if their percentage is falling within a company it means the profit per total employees is probably also falling. A company must identify what its true mission is, and who their essential personnel are, to carry out that mission. It is useful to compare companies in the same industry, provided the number of experts is calculated in the same way for all the companies compared. Note that the proportion of experts varies from one type of business to another, and thus can be used only for comparisons within similar industries.

### *Profit per expert (Sveiby 1997)*

Profit per expert is the profit of the company divided by the number of experts. It can be used to make comparisons between stock market-quoted knowledge companies because publicly held firms are required to report profits in a specific, documented manner. The advantage is that the figures are readily available. In the long term, it is first and foremost the ability of

the experts to generate profits that determines the market value of knowledge companies. Valuable insight might be gained comparing two similar companies with vastly different values for profit per expert. A difficulty can arise when the experts of a company are also the owners and, therefore, their salaries may not be market based.

**Generic Structural Capital Model.** Structural Capital is divided into Efficiency, Growth/Renewal and Information and each is further subdivided as illustrated below. Appendix B lists potential structural capital measures.

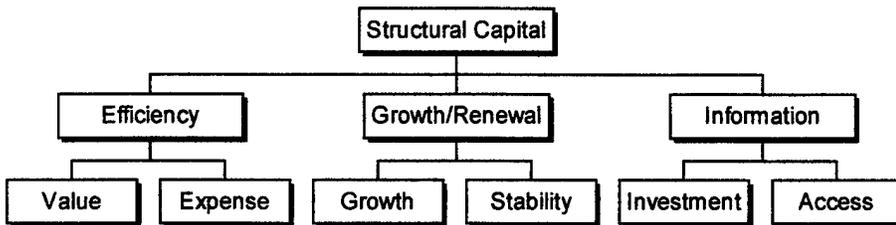


Figure 11. Generic Intellectual Capital Model – Structural Capital

## Efficiency

### Value

*Revenue per employee (Saint-Onge 1997)*

Total revenue divided by the number of employees.

### Expense

*Administrative expense/employee (Edvinsson 1997)*

The total administrative expenses divided by the number of employees. If this number is rising over the years it indicates a decrease in efficiency.

## **Growth/Renewal**

### **Growth**

*Customers contributing to internal structure (Sveiby 1997)*

The proportion of assignments devoted to customers that improve the internal structure of the company adds to the growth of the asset. Examples of projects that improve the internal structure are large projects where competence is passed on by tradition to several experts at once. Innovative projects involving new materials, new methods of calculation, new software, and so forth, come under the heading of R&D and should be classed as such.

### **Stability**

*Age of the organization (Sveiby 1997)*

Age provides an easy comparison. An old organization is generally more stable than a new one. Signs like "Est. 1887" are often used by retailers to indicate a business can be trusted through both boon and depression.

## **Information**

### **Investment**

*Investment in information processing systems (Sveiby 1997)*

Investment in information technology provides significant productivity enhancement. In many industries, it is also regarded as a measure of progress in accomplishing the corporate mission. An insurance company with more advanced information technology systems can solve its customers' problems more efficiently. An airline with a sophisticated ticket booking system may enjoy a competitive advantage over other airlines. Companies with systems for information retrieval and distribution have a powerful structure that supports the organization. Thus information technology investments, expressed as percentages of turnover or in absolute figures, can provide valuable clues about the renewal of company's internal structure.

### **Access**

*Personal computer (PC)/employee* (Skandia 1996)(Edvinsson 1997)

For a smaller corporation, the ratio of PCs to employees is a simple way to measure access to information. With a PC an employee has access to the web, E-mail, and whatever information technology system the corporation has in place. This measure might have little meaning in a blue collar assembly line production firm, but in an information/service firm the ratio has more relevance.

**Generic Relational Capital Model.** Relational Capital is divided into Growth/Renewal, Efficiency, and Satisfaction. Each is further subdivided as illustrated below. Appendix C lists potential relational capital measures.

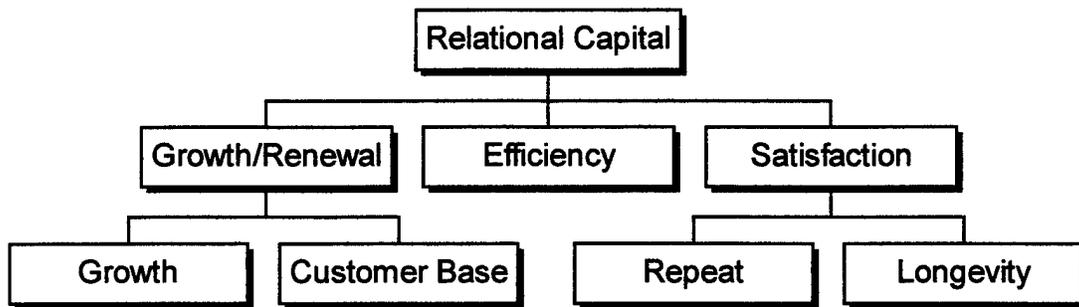


Figure 12. Generic Intellectual Capital Model – Relational Capital

## Growth/Renewal

### Growth

*Number of accounts* (Edvinsson 1997)

The number of accounts is similar to the number of employees in that the measure means little alone from an intellectual capital standpoint. This measure is a magnitude setting measure. It can be compared percentage wise with expenses, number of employees, experts, support staff, etc.

### Customer Base

*Days spent visiting customers* (Edvinsson 1997)

This measure shows the degree of direct personal interaction between customers and representatives of the company. An interesting complementary measure is *Customer Visits to the Company* (Edvinsson 1997). (Depending on the business, 'visit' might be defined as face to face to face contact, e-mail or other type of contact.) The two measures should show a correlation or interaction.

## **Efficiency**

### *Profitability per customer (Sveiby 1997)*

There is generally surprisingly little information in companies on the profitability of customers. This is often because the costs are not accrued to customers but to products or functions. Companies that make an effort to determine the profitability of their customer base, often find that as much as 80% of the customers are not profitable.

### *Sales per customer (Celemi)(Sveiby 1997)*

Sales per customer is the total sales divided by the total number of customers. Since selling more to the same customer is usually easier and less costly than finding a new customer, this ratio demonstrates the efficiency of a firm's existing network of customers.

## **Satisfaction**

### **Repeat Customers**

#### *Frequency of repeat orders (Sveiby 1997)*

A high repeat order frequency indicates that customers are satisfied with the company. Stable, loyal customers are profitable customers in the long term providing stable, long term earnings and profit. The frequency of repeat orders can be measured as the proportion of total billings attributable to old customers. The meaning of "old" naturally varies according to the type of business, but normally a customer who has given you at least one previous

order can be regarded as an old customer.

### **Longevity**

*Average duration of customer relationship* (Edvinsson 1997)

A growing duration can signify customer satisfaction. Too much of an increase might indicate that new customers are not being cultivated.

**Generic Intellectual Property Model.** Intellectual Property is divided into Growth, Efficiency, and Value. Each is further subdivided as illustrated below. Appendix D lists potential intellectual property measures.

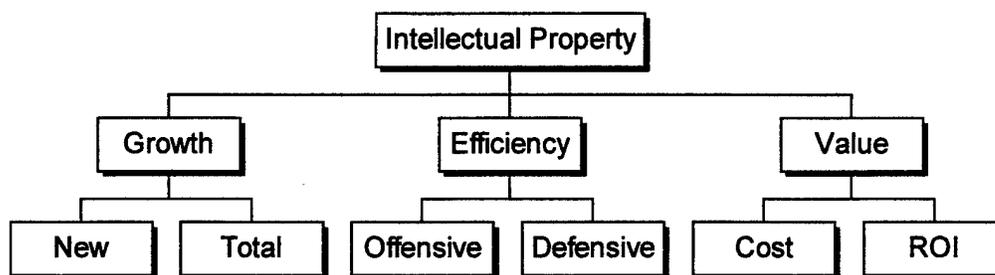


Figure 13. Generic Intellectual Capital Model – Intellectual Property

### **Growth**

#### **New**

*Number of new patents* (Stewart 1997)

The number of patents developed for products and services that will result in new sales one to five years into the future. This measure indicates whether the company is continuing to develop and create new ideas and products.

## **Total**

*Number of company patents (Edvinsson 1997)*

Number of total patents being utilized or the number of patents that may be utilized in the next 5 years.

## **Efficiency**

### **Offensive**

*Percentage of patent portfolio that is offensive (Smart Patents 1998)(Lucas 1998)(Rappaport 1998)*

Offensive patents are filed directly in the path of a competitor to stop the competitor from advancing a technology or force a cross-licensing position. This can be measured in the number of patents or the cost of obtaining and maintaining the identified group of offensive patents. It can also be measured as the percentage of patents licensed to third parties and/or deriving licensing revenues from these third parties.

### **Defensive**

*Percentage of patent portfolio that is defensive (Smart Patents 1997)  
(Rappaport 1998)*

The percentage of the company's patents that are used to protect the company's right to practice. These patents are not generating licensing income or royalties, but give protection in the event the firm is charged with patent infringement by competitors. This can be measured in the number of

patents or the cost of obtaining and maintaining the identified group of defensive patents.

## **Value**

### **Cost**

*Cost to maintain portfolio worldwide (Smart Patents 1997)(Rappaport 1998)*

This is the total of annuity, tax, and patent maintenance costs to keep the entire patent portfolio active on an annual basis.

### **ROI**

*ROI on patent portfolio (Smart Patents 1997)(Rappaport 1998)*

This measure is the maintenance, research and development costs subtracted from the revenue generated by the patent portfolio divided by the total costs. This is a relatively new, yet simple measure, since patents were thought of before primarily as expenses and not as revenue generators.

**Conclusion.** The model presented in this chapter provides any company a starting point for an intellectual capital audit. The measures presented are basic ones that could apply across a spectrum of different companies.

Appendixes A through D provide nearly two hundred and fifty measures in which a manager could choose from to suit his or her business.

## CHAPTER III

### METHODOLOGY

**Basic Model.** Current Air Force intellectual capital is reviewed in this chapter. The focus of this research is human intellectual capital in the Air Force during the recent draw-down. With the generic model as a basic foundation (Figure 14), we proceed to develop a model of human intellectual capital for the Air Force and identify measures developed specifically for the Air Force.

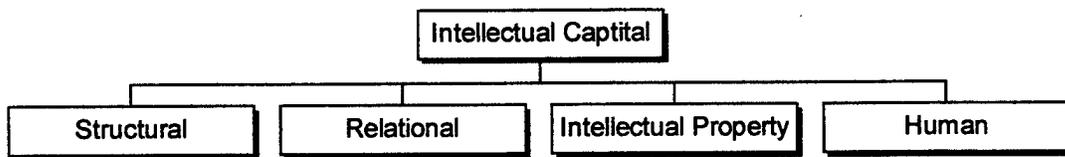


Figure 14. Generic Intellectual Capital Model

**Current Air Force Intellectual Capital.** The subdivisions of structural capital include efficiency, growth/renewal and information. The Air Force is already working in the area of structural capital. The Air Force Knowledge Concepts section of the Future Concepts Division at Randolph AFB is designing and developing an AF Best Practices Clearinghouse. This unit is exploring ways to improve the Air Force's structural processes. It will

contain: Best Practices Data Base, Contact Management Tools (Profiles- individuals and organizations) Data Bases, Knowledge Management Connections, Interactive Chat Rooms, Common Interest Groups Connections, Links to many key areas (internal and external to AF), and Training Connections. All of these areas can be considered part of the structural capital of the Air Force. The efficiency of the Air Force's information processing should improve with a coordinated central effort.

Relational capital is a new area to explore in the Air Force. Although the Air Force introduced the term 'customer' into its vocabulary with the advent of total quality management, its meaning and concept are still relatively new and undeveloped. The Air Force relationships include everyone from the makers of the Stealth Bomber to the food suppliers at the airmen's dining hall.

The Air Force currently maintains over 3,600 patents with approximately 130 new patents a year (Navarrete 1997, Anderson 1997). Since the Air Force might be considered a non-profit organization, the concept of offensive and defensive patent strategy may not be valid. The Air Force spent \$389,382 on patent prosecution and maintenance in fiscal year 1997 (Anderson 1997). The royalties the Air Force receives for its patents has been growing steadily, reaching \$140,000 in FY 1997 (Anderson 1997). When Dow Chemical began managing their intellectual capital they chose to begin with patents. Gordon Petrash stated, "It was decided to start in an area that was familiar to many within the corporation, had a high probability

of success, would be an obvious value contributor, and could be implemented quickly," (Petrash 1996). For Dow Chemical, patents met this criteria. They have been very successful, as they generated \$25 million in 1994 and expect that figure to increase to \$125 million by the year 2000 (Petrash. 1996).

The Air Force draw-down, by definition, is a reduction in the personnel of the Air Force. The loss or gain of intellectual capital during this draw-down is the focus of this research. All the data for the measurement of human capital is available at, and was provided by, the Air Force Personnel Center at Randolph Air Force Base. For the Air Force, the author chose human capital as the place to begin measurement of intellectual capital.

*"It is important to remember that what makes the Air Force successful will not change. Quality people define the Air Force."*  
Global Engagement: A Vision for the 21<sup>st</sup> Century Air Force

**Who to measure?** Experts drive the corporation and generate the revenue. Experts are those who work directly in the field of competence that constitutes the company's business idea. The mission of the Air Force is to defend the United States through control and exploitation of air and space. This does not specifically identify the experts, as all Air Force personnel can be said to support the mission. The Air Force has officers and enlisted personnel. For this research, enlisted personnel will be treated as support staff and, therefore, not part of an intellectual capital audit. The officers will be further reduced to consider only the line officers. Line officers include all officers not in the following career fields: chaplain, dental, judge advocate

general, medical, nurse, medical services and biomedical science (Hutfler 1998). Within the line officer corps, the decision on who to measure is more arbitrary. This research covers all line officers from lieutenant to lieutenant colonel. Managers are the decision-makers in an organization. They are concerned with developing the organization. For this research, colonels and generals will be considered the managers and not be measured in the intellectual capital audit.

Pilots are a subgroup of line officer experts. Their experience, expertise, and retention are keys to carrying out the mission of the Air Force. Pilots are excellent examples of human capital. Their skill comes from years of experience, they are not easily replaced, and they directly support the mission of the Air Force. Although every pilot costs \$5.19 million to train, Lieutenant General Michael McGinty, Air Force deputy chief of staff for personnel, said in relation to the pilot retention problem, “The biggest loss isn’t the money, but combat capability” (Petcoff 1997).

*It amazes me that we treat pilots as if they are just another commodity – readily available at the local hardware store – instead of a very expensive, hard to train and highly skilled national resource... You can pump up pilot production – there will always be someone who wants to fly – but you cannot pump up experience levels and proficiency. (Stevens 1997)*

If one considered the mission of the Air Force ‘to fly and fight’, then the pilots could be subdivided into fighter and bomber pilots and all other pilots. If the goal was to measure the ‘experts of the experts’, the fighter and bomber pilots could be further separated into Fighter Weapon School (FWS)

graduates and all other fighter and bomber pilots. In this research, FWS graduates are considered a distinct subgroup of experts.

**Human Intellectual Capital Measurement.** Sveiby (1997) compares the measurement of intellectual capital with Heisenberg's uncertainty principal, which states that it is impossible to know both the exact position and velocity of a particle at the same time. This suggests that exact measurement may not be as important as the vector or trend for some resources. Focusing on where a company is today in this exact moment may be far less important than understanding where the company is going and, indeed, how fast it is moving. The goal is not to produce a single dollar figure for intellectual capital, but rather to see whether a company's total body of knowledge is growing, declining or stagnating (Eiley 1996) and to validate the organization's ability to achieve its goals (Brooking 1996).

In this research, human capital in the Air Force is measured over a period of time. The fall of the Berlin wall in 1989 marked a significant turning point in the balance of power of the world. It also coincided with the beginning of the draw-down of US force levels in the military. For this reason, human intellectual capital will be measured from 1989 to the present to evaluate the trends or direction the Air Force has taken during the draw-down.

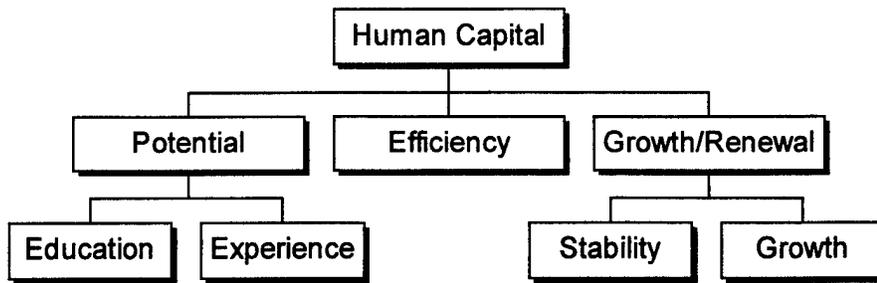


Figure 15. Air Force Intellectual Capital - Human Capital

**Potential.** The potential of a corporation’s human intellectual capital is a measure of abilities or skills that can be called into action or used in the future.

*The overall mission of education and training in the Air Force is to leverage the most powerful factor in the warfighting equation— **human potential**. As we move into the twenty-first century and the information age, it will continue to be people who must fight and win our nation’s wars, and the military must continue to prepare its warriors to accomplish this awesome task. The growing possibility of engagement in nontraditional military missions emphasizes the need for a competently trained and thoroughly educated force prepared to meet a variety of future challenges. It is for the purpose that the ASF of 2025 will continue to value, support, and invest in the education and training of its members. (Sikes 1996)*

The level of education of experts affects the quality of their competence and thus the company’s ability to achieve future success.

All officers have a minimum of at least an undergraduate degree and therefore this data is not included. Line officers do not include dentists, lawyers, or doctors; therefore, advanced degrees in these fields are not considered either. Masters degrees are included for all line officers and

pilots. Ph.D.'s represent a far higher level of potential skill for the Air Force and are measured for both line officers and pilots.

There are various levels of Professional Military Education (PME). Professional military education for Air Force officers begins with Squadron Officer School. Captains build the foundations for their careers in four curriculum areas: officership, air and space power, leadership tools, and applications. The academic curriculum is presented through readings, lectures and seminars. Classes are seven weeks long with an enrollment of more than 700, including 25 civilians in each class. Three courses each year include international officers. With six classes each year, more than 3,800 students attend this course annually (Air University 1997).

*Military education focuses on the art of war and on developing insights and intellectual constructs that ensure we fight our wars smartly; it enables the warrior to envision future threats, engage in creative ways to resolve conflict, select the right tools and methods, and achieve the desired effect. (Sikes 1996)*

Air Command and Staff College (ACSC) is the next level of officer PME. The college uses computer-based education and hyper-information systems to annually educate almost 600 resident and more than 7,000 nonresident mid-career officers and Department of Defense civilians. ACSC's 40-week curriculum focuses on educating students on the profession of arms, the requisites of command, the nature of war, and the application of air and space power at the theater warfare level (Air University 1997). ACSC in residence at Maxwell Air Force Base, Alabama, is highly competitive. Only

the top 15% of majors are selected to study in this manner. As this course is more in depth, and the Air Force has implicitly said that officers selected for in residence study are the anticipated future leaders, it is included as a measurement of future potential.

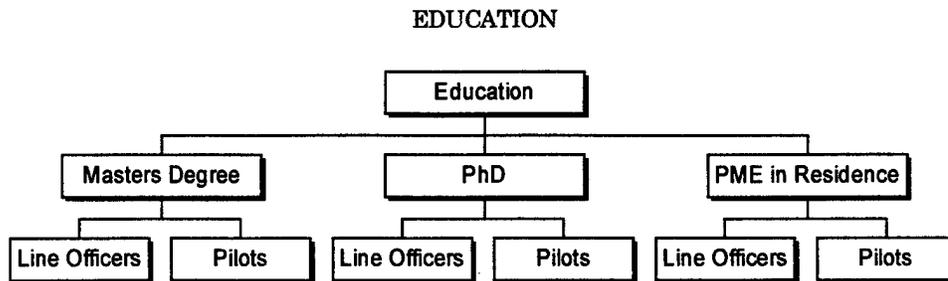


Figure 16. Air Force Intellectual Capital Model – Education

*Throughout my 35 years of commissioned service, I lived in a world where the good guys spoke English and the bad guys spoke Russian. Today, our world is a very different place. We live in a “global village” where information, commerce, and even CNN pay little attention to national borders...much to the chagrin of some nations who would try to keep those influences out. As technology brings our world closer, culture, tradition, and history remind us how we differ. Around the world today, we see regional, religious, and ethnic differences becoming more pronounced—and tensions mounting. We need to establish a presence throughout our force of officers proficient in foreign language and area studies—officers who can be effective in shaping events or responding to a contingency anywhere in the world with a moment’s notice.*

*Our vision for the Air Force of the 21<sup>st</sup> century is “Global Engagement.” Global Engagement mandates the capability to take immediate action—to deploy anywhere in the world—no matter how primitive the airstrip or how remote the location—in a few hours time. In our globally engaged Air Force, there’s no time for 18 months at the Defense Language Institute—we need people with language and cultural skills in place and ready... just as we need pilots and satellite controllers.*

General Henry Vicellio Jr. - AFMC Commander (Mueller 1997)

Experience in the Air Force may be measured in many ways. General Viccellio stated we must be prepared to act today in foreign countries. This implies we need personnel with both experience in those countries and the ability to communicate with the people in these foreign lands. A tour of duty in foreign country provides an airman with the opportunity to learn the culture, character and history of the land in which he or she is stationed. This experience might be invaluable should we have a conflict in the very same region in the future.

Colonel Gunther A. Mueller, USAF, professor and department head of foreign languages at the United States Air Force Academy, was appointed head of the Foreign Language Skills Action Team (PAT) in 1994 to examine enhanced language skills as improvements to USAF global operations. He said, "First and foremost: foreign language/foreign area skills are just that--skills required to do Air Force missions in the 21st century," (Mueller 1997).

The team was tasked with understanding how the existing system provides needed officer language skills, defining future language requirements for changing USAF roles and missions and improving the overall system that provides officer language skills. The findings of the report included recurring evidence that foreign language skills were not keeping pace with DOD requirements (Mueller 1995). One of the recommendations was to establish a USAF goal of 10% of officers qualified in a foreign language (Mueller 1995). Appendix G is an article submitted to Air University by Colonel Gunther concerning the language skills required for

global engagement.

Foreign country tours by officers are broken into regions:

Mexico/Central/South America, Africa, Europe, Central Europe, Australia, Mideast, Asia, Russia and the Caribbean. A measure was created that measured the number of officers who had a tour in a foreign country and speak that country's native language. The countries selected for this measure are Germany, Russia, China, France, Japan and Korea.

Foreign language skills are examined with two measures. The first includes all officers with a second language capability. The second looks at the percentage of officers who speak a key language. Colonel Mueller (1997) suggests the seven critical key foreign languages for the Air Force in the future are Arabic, Chinese, Russian, German, French, Spanish and Japanese.

*The Department of Defense's (DoD) ability to successfully employ the nation's Armed Forces is dependent on the integration of the war-fighting capabilities of the Military Services. To effectively integrate these capabilities, (the) Department of Defense must produce high quality officers experienced and educated in joint matters. A Senate Armed Services Committee (SASC) October 1985 report clearly stated that (the) Department of Defense was not succeeding in the production of such officers. The SASC defined quality in the following way: (1) the inherent skills and talents as professional military officers; (2) the necessary education and experience; and (3) a tour of sufficient length to become effective and to provide continuity... Title IV's objectives were clear—it sought to improve the quality of officers assigned to joint organizations, increase the experience and educational levels of such officers, and expand the exposure of officers to joint matters. (Boggs 1995)*

Joint duty data lists any officer with a joint duty tour. In 1986, Senators Goldwater and Nichols introduced a bill that clearly specified the importance of joint operations in the military. Appendix H lists the many provisions of the 1986 Goldwater-Nichols Act. The Act establishes an occupational category, referred to as the 'joint specialty' for the management of officers who are trained in, and oriented toward, joint matters. It specifies that each promotion board be given guidelines to ensure appropriate consideration is given to joint duty performance. It requires that an officer may not be promoted to general or flag rank unless he has served in a joint duty assignment (Boggs 1995).

Non-joint staff positions are also included in the experience measures of human capital. The percentage of officers with a staff tour at each of three different levels is analyzed. Air staff tours represent staff assignments at Headquarters AF, any Joint Command or NATO. A Command Staff tour is a staff assignment at Command Headquarters, a Field Operating Agency, or Direct Reporting Unit. The third staff category includes tours at a numbered Air Force.

Peter Keen, author of The Process Edge: Creating Value Where It Counts, said, "The intellectual capital movement is an effort to stop 'wasting people' – stop wasting experience," (Manasco 1997). The five components of experience in measuring intellectual capital in the Air Force in this research are: foreign country tours by region, foreign country tour and the ability to speak the native language for selected countries, joint duty tour, and level of

staff level tours for line officers and pilots.

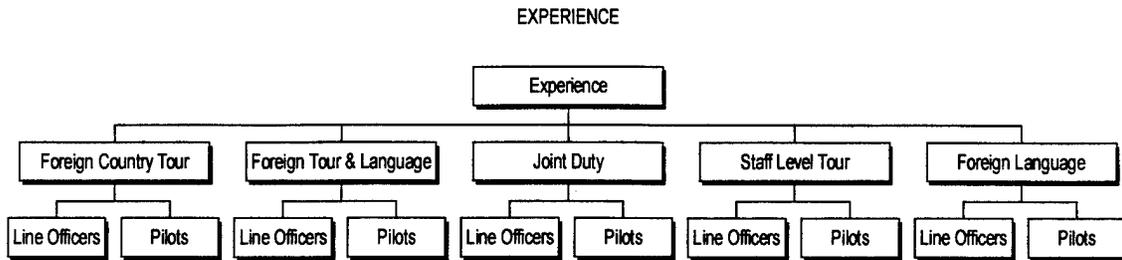


Figure 17. Air Force Intellectual Capital Model – Experience

**Growth/Renewal.** Stability in the Air Force is measured similarly to the generic corporation. Data is examined on the percentage of officers with less than two years of service. This ratio is known as the rookie ratio. Veterans in the Air Force, for this research, are officers with more than twenty years of service. The retention rate, average age of officers and average number of years of service are also measured.

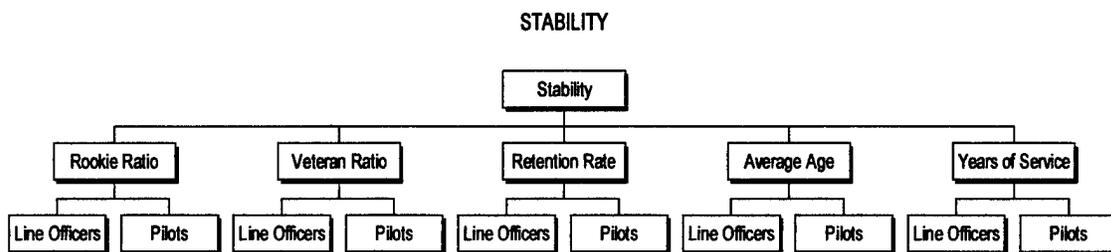


Figure 18. Air Force Intellectual Capital Model – Stability

The growth in human intellectual capital is measured with the total of all officers, line officers, pilots and fighter weapon school graduates. While

this would normally be used to measure the increase or growth of an organization, this measurement only highlights the reduction in forces due to the military draw-down.

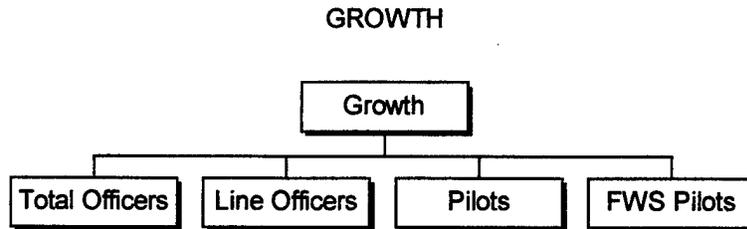


Figure 19. Air Force Intellectual Capital Model – Growth

**Efficiency.** The efficiency of the human capital in the Air Force is measured by the percentage of experts to total officers. The mission of the Air Force is to defend the United States through control and exploitation of air and space. The officers identified in this research as most closely supporting this mission are the line officers, pilots, and FWS graduates. The measures are line officers, pilots, and FWS graduates to total officers. This measure indicates how important the experts are to the Air Force.

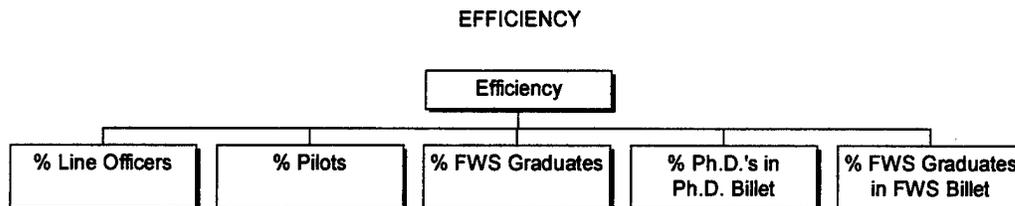


Figure 20. Air Force Intellectual Capital Model – Efficiency

The percentage of experts in designated expert positions measures how efficient the Air Force is using its experts. The number of Ph.D. officers in Ph.D. billets and FWS officers in FWS designated billets are used for this measure.

**Conclusion.** The generic intellectual capital model includes human capital, structural capital, relational capital and intellectual property. This work measures only human capital in the Air Force during the years of the draw-down from 1989 to 1997. The measures are primarily of line officers, and pilots, which are a subgroup of line officers. Most measures are further subdivided into the ranks of captains, majors and lieutenant colonels. Fighter weapon school graduates are included on several measures.

## CHAPTER IV

### RESULTS

**Introduction.** Four figures and one table illustrate the status of intellectual capital in the Air Force from 1989 through 1997. The number of officers in the Air Force shows the reduction in the number of officers, line officers, and pilots during the years of the draw-down. This figure demonstrates the futility of trying to judge the value of intellectual capital by a strict “count” value since nearly all totals decrease due to the draw-down in personnel. All measures of intellectual capital are evaluated on a percentage basis to account for the overall decrease in numbers of officers. The general subdivisions of human intellectual capital and the measures used in for each subdivision are illustrated. A general view of the increase or decrease in intellectual capital for these measures is presented. Finally, the actual value for all the line officer measures for each year in the study are presented.

The human intellectual capital model for the US Air Force is divided into three areas: Potential, Growth/Renewal, and Efficiency. Potential human capital is further subdivided by education, experience, and foreign language. Growth/Renewal is subdivided by stability and growth. The human capital measure results in this chapter are limited to line officers. Appendix E contains data for all officers on Air Force intellectual capital

measures. Data is provided for line officers and pilots for the years 1989 through 1997 with further breakouts for the ranks of captain, major and lieutenant colonel for many measures. For all potential, efficiency, and growth measures, a rising trend line indicates an improvement, or an increase in human intellectual capital. A downward trend line indicates a decrease in intellectual capital. A level line indicates no change, which, at this stage of human history, is unacceptable. The US Air Force, like a corporation, needs to continue increasing its capabilities if it wishes to remain the leader. The stability measures, however, should stay within a band and not continue unabated either in an upward or downward trend. For example, a continuously increasing rookie ratio would suggest that a company is not able to retain anyone with whatever experience gained in the first few years of employment being lost to other companies.

**Growth - Number of Officers.** Figure 21 displays the number of officers in the Air Force. The downward trend for total officers, line officers, and pilots illustrates how the draw-down has, indeed, reduced the officer corps in the last 10 years. The Air Force cut its total officer corps from 98,059 in 1989 to 69,892 in 1997, a 28.7% reduction. The reduction in line officers and pilots was 33.6% and 32.7%, respectively. Due to the overall reduction in officers, all subsequent data is presented as percentages of the total number of line officers.

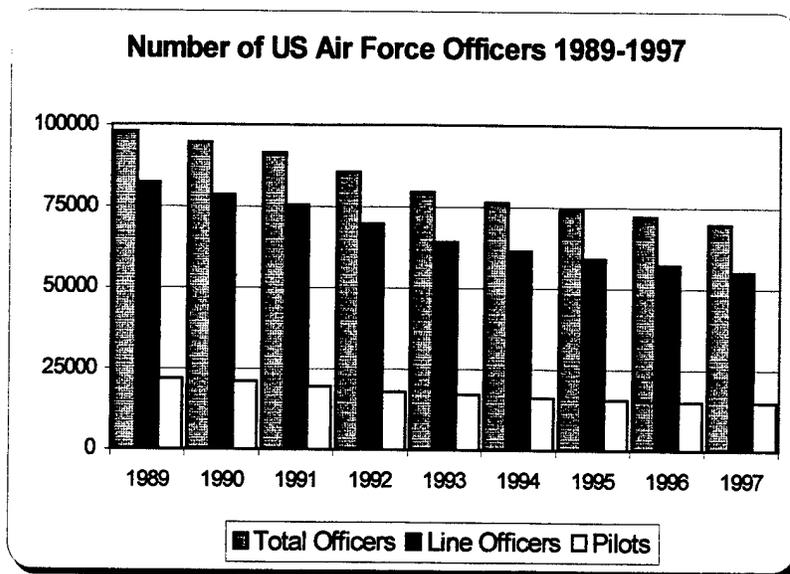


Figure 21. Number of Air Force Officers 1989-1997

**Air Force Intellectual Capital.** Figure 22 illustrates the basic subdivisions of intellectual capital. The measurements selected for the Air Force are shown under each subdivision.

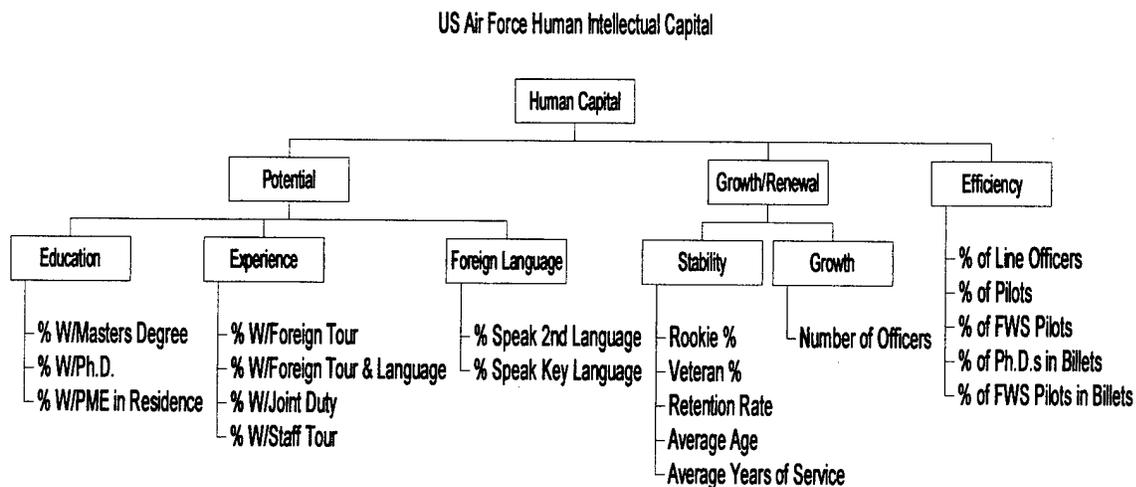


Figure 22. US Air Force Intellectual Capital

### Human Intellectual 1989-1997 (Line Officers)

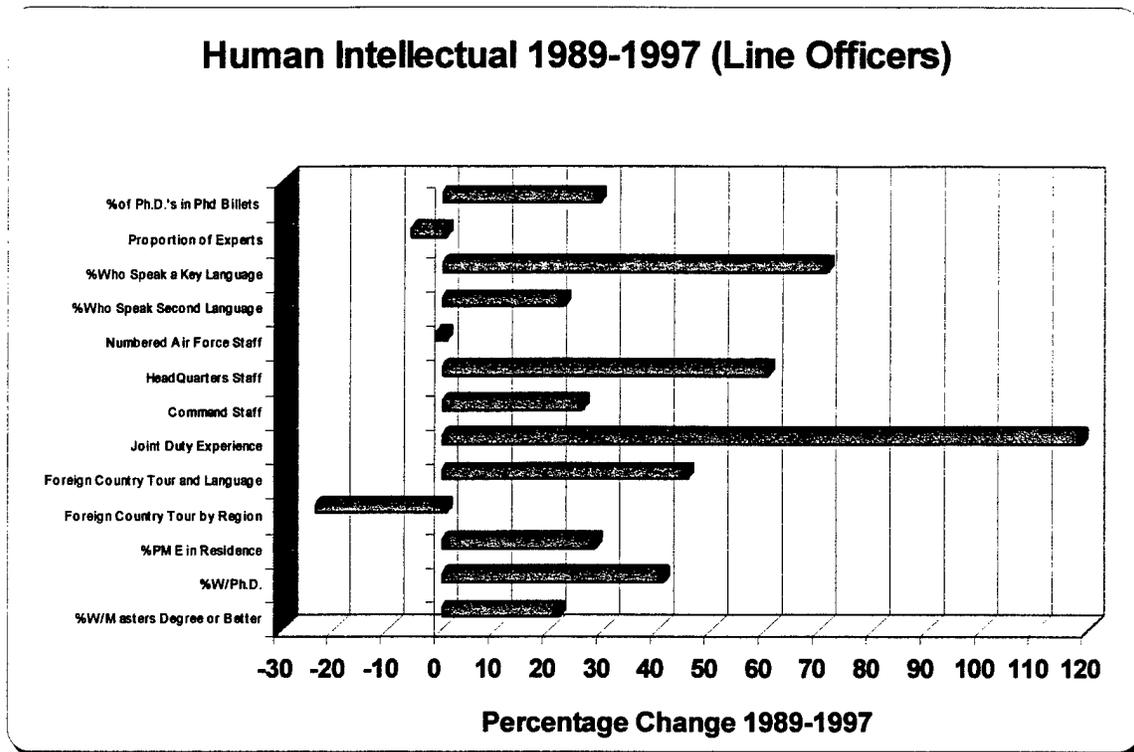


Figure 23. Human Intellectual Capital 1989-1997

**Education.** Education does not necessarily prepare an officer for a particular job or skill, but it is one assessment of competence. The primary skill gained by officers from education is the ability to process increased amounts of information and problem solving skills. Since 1989, the percentage of line officers with masters degrees increased from 40% to more than 48%. The percentage of officers with a Ph.D. increased from less than 1% to 1.16%.

*Education ... focuses on the intellectual or cognitive domain of learning. It is the process of preparing others to solve problems and deal with situations not yet known or defined. It is about learning how to learn and discovering what we do not know so that we may survive in the future (Sikes 1996).*

**Experience.** One predictable aspect of the Air Force draw-down is that fewer officers are now stationed overseas. While more officers are deployed from continental United States bases to foreign countries for temporary duty, there is a potential to lose the valuable experience gained by actually living and working in a foreign country. The percentage of officers with a foreign tour fell sharply from 1989 through 1990. However, since 1990 the percentage has slowly increased. The perhaps alarming data is shown in the graphs for individual regions in appendix F. The percentage of officers with a foreign tour in Africa, Central Europe, Australia, Russia or the Caribbean is less than one tenth of one percent each. For example, in 1989, the Air Force Personnel Center cites only thirteen line officers with a past tour of duty in Africa. By 1997 that number had reduced to only four. While we have many airlift pilots who have flown into various African nations on humanitarian missions, we have almost no officers with the experience that comes from living in a foreign country. This is an entire continent (apart from Egypt) where we have virtually no experience to call on should we require it in the future.

The Mexico, Central, and South America data is only slightly better. The average number of line officers with a tour in this region for the years

1989 through 1997 is over three hundred. However, Panama accounts for 84% of these tours. On average over this period, apart from Panama, the Air Force has had only fifty line officers with a foreign tour in one of the countries in these regions.

### **Foreign Language.**

*First and foremost: foreign language/foreign area skills are just that--skills required to do Air Force missions in the 21st century. (Mueller 1997)*

A goal of the Foreign Language Skills Process Action Team in 1995 was to establish an Air Force goal of 10% of all officers qualified in a foreign language at a usable level. The overall ability of line officers to speak a second language increased by over 20%; however, the total percentage is still well below the goal. Only 5.42% of line officers speak a second language. The percentage of officers who speak a key language, (Arabic, Chinese, Russian, German, French, Spanish and Japanese), also increased, although the total percentage is still only 1.3% of the total.

Lieutenant Colonels were at the Air Force goal of 10% in 1990 and 1991, however, their percentage steadily fell to below 8% in 1997. The data indicates that the percentage of captains, majors, and line officers overall with a foreign language skills are increasing though still well below the goal of 10%.

**Efficiency.** An important indicator of efficiency is the proportion of experts in the firm. In a corporation, the experts are the revenue generators. If their percentage is falling within a company it means the profit per total employees is probably also falling. A company must realize what its true mission is and who the essential personnel are to carry out that mission. The mission of the Air Force is not to make a profit, but to defend the United States through the control and exploitation of air and space. The experts in the Air Force are identified in this work as falling in three increasingly elite categories: the line officers, (i.e., all officers not in the following career fields: chaplain, dental, judge advocate general, medical, nurse, medical services and biomedical science), pilots, and Fighter Weapons School (FWS) graduates. The FWS graduates are included in several measures in appendices E and F.

The proportion of line officers decreased from 83.8% of all officers to 78.8%. This is a potential problem. This indicates that while the Air Force is drawing down its forces it is becoming less efficient as the percentage of support officers, (those not identified as experts), increases.

The proportion of pilots to all officers decreased from 22.1% to 20.9%. The decrease in the percentage of pilots is not necessarily surprising. The mission of the Air Force is NOT simply 'to fly and fight', but as noted before, to defend the United States through exploitation of air and space. This implies that while pilots are very essential to the Air Force, they are not the sole experts. As the ability of the Air Force to exploit space increases, one

would expect the percentage of experts in this field would increase, and the proportion of pilots might, therefore, decrease. While the proportion of pilots to all officers fell, the proportion of pilots to line officers actually increased slightly from 26.4% to 26.5%.

The Air Force, and indeed, the world, is becoming more technical every day. While the percentage of line officers with a Ph.D. increased by nearly 40%, the Air Force still had less than 900 officers with a Ph.D. degree in 1997. It is important for any corporation to keep experts in a position where they can use their expertise. Microsoft would not hire a computer programmer only to assign him a job sweeping floors. The percentage of Ph.D.'s in Ph.D. billets measures how effective we are using our educated officers. The percentage increased from 30.2% in 1989 to 38.7% in 1997.

**Stability.** Figure 24 illustrates the stability measurements for the Air Force. Stability measures include the rookie and veteran proportions, retention rate, average age, and average years of service. Rookies are the officers with less than two years service in the Air Force and veterans are those with more than 20 years. New officers are relatively less stable than old. They are also less efficient, because they have not yet socialized into the traditions of the Air Force, so they do not know the most efficient means to accomplish tasks. However, rookies also bring new competencies, fresh skills, and experience to the Air Force. Veterans have at least 20 years of experience the Air Force can tap if required. The Air Force, like a

corporation, cannot drive either ratio too high or too low for fear of losing too much experience or, on the other extreme, stagnating and not growing. The Air Force has managed to maintain both ratios between 8 and 10 percent for the last 8 years. (Note when the veteran population rises slightly there is a corresponding dip in the rookie proportion and vice versa.)

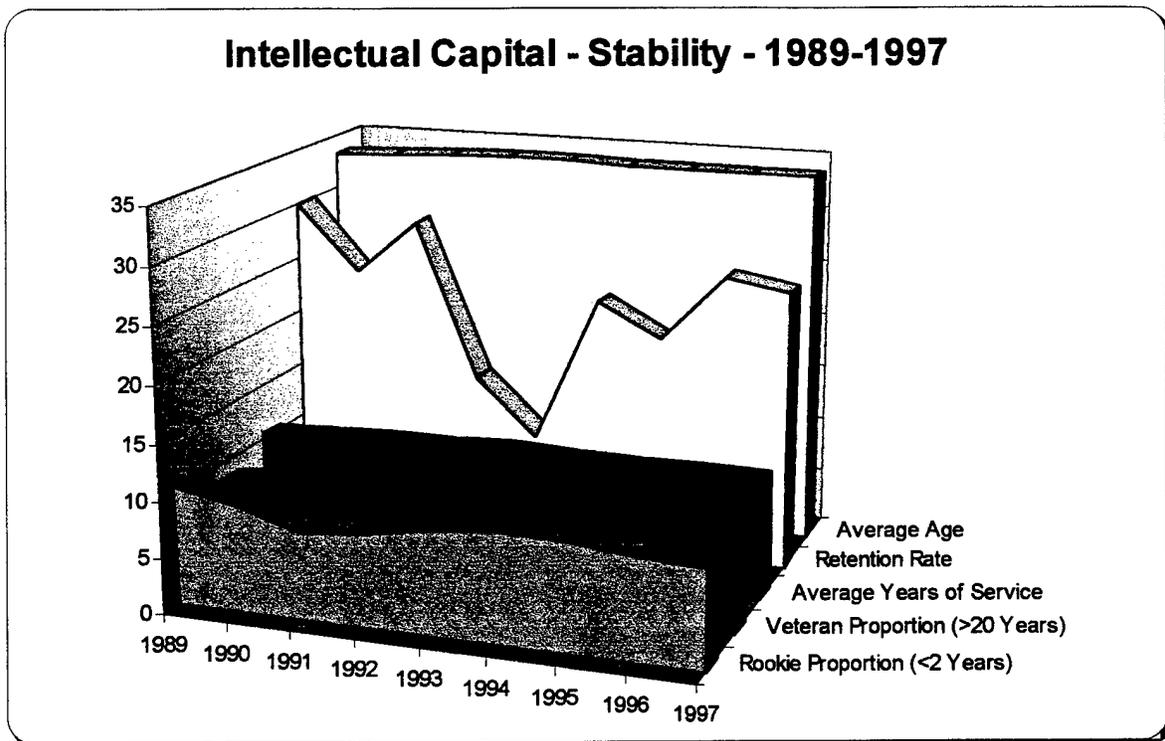


Figure 24. Intellectual Capital – Stability

The average age has hovered around thirty-three and a half with the average years of service approximately ten and a half. A sudden rise or fall in either of these measures should be considered a warning sign. Rising

continuously suggests an increase in years of experience and competence, but a balance in age and experience is necessary.

The stability measure that has varied significantly during the years 1989 through 1997 is the retention rate. The Air Force Personnel Center retention rate data measures the percentage of officers in each year group that make it to the twenty year point. The rate varied from ten to thirty percent over this period and has not returned to its highs of 1989-1991.

Table 4. Intellectual Capital Measurements – Summary of Data

<b>Intellectual Capital Measurements - Line Officers - Human Capital</b>									
<b>Potential</b>	1989	1990	1991	1992	1993	1994	1995	1996	1997
<i>Masters Degree or Better</i>	40.15	41.83	43.02	42.38	45.20	45.85	46.60	47.87	48.51
<i>Ph.D.</i>	0.83	0.85	0.88	0.85	0.96	0.99	1.03	1.11	1.16
<i>ACSC PME in Residence</i>	17.94	18.86	18.97	19.55	20.78	20.67	21.88	21.65	22.91
<b>Experience</b>									
<i>Foreign Country Tour</i>	13.78	12.53	12.09	10.67	9.98	10.33	10.25	10.45	10.55
<i>Foreign Country Tour &amp; Language</i>	0.44	0.50	0.57	0.54	0.60	0.63	0.62	0.62	0.64
<i>Joint Duty Experience</i>	4.11	4.81	5.49	5.99	6.87	7.32	7.48	8.37	8.97
<i>Command Staff Level Tour</i>	14.96	14.85	16.28	17.64	18.30	18.85	18.74	18.73	18.74
<i>Headquarters Staff Level Tour</i>	9.62	10.18	10.77	11.75	12.74	13.08	13.94	14.87	15.37
<i>Numbered Air Force Staff Level Tour</i>	1.72	1.68	1.71	1.77	1.96	1.89	1.74	1.74	1.70
<i>Speak Second Language</i>	4.45	4.82	5.20	4.91	5.01	5.10	5.14	5.28	5.42
<i>Speak a Key Language</i>	0.75	0.81	0.87	0.87	0.97	1.06	1.10	1.18	1.28
<b>Growth/Renewal</b>	1989	1990	1991	1992	1993	1994	1995	1996	1997
<i>Rookie Proportion</i>	10.60	9.50	7.80	8.30	9.20	9.80	9.60	9.00	8.70
<i>Veteran Proportion</i>	8.50	9.20	9.90	9.70	10.10	8.80	9.30	9.70	9.80
<i>Retention Rate</i>	30.00	24.00	29.00	15.00	10.00	23.00	20.00	26.00	25.00
<i>Average Age</i>	33.32	33.58	33.79	33.92	33.99	33.76	33.68	33.69	33.73
<i>Average Years of Service</i>	10.33	10.60	10.83	10.91	11.00	10.67	10.58	10.63	10.69
<i>Number of Line Officers</i>	82130	78531	75350	69707	64051	61160	58948	57129	55097
<b>Efficiency</b>	1989	1990	1991	1992	1993	1994	1995	1996	1997
<i>Proportion of Experts</i>	83.76	82.97	82.44	81.55	80.64	80.07	79.65	79.25	78.83
<i>% of Ph.D.'s in Phd Billets</i>	29.79	32.02	34.02	31.29	37.30	36.62	37.95	37.56	38.24

## **CHAPTER V**

### **CONCLUSION AND RECOMMENDATIONS**

**Background.** For hundreds of years, managers, analysts and investors used relatively the same techniques to measure and evaluate a firm or entire industries. The information age and the knowledge worker drove the development of a new concept, the measurement and management of intellectual capital. The purpose of this paper was fourfold. 1) Review the literature on intellectual capital. 2) Find or create measures for the United States Air Force. 3) Apply the measures to the Air Force for the period of the recent military draw-down. 4) Evaluate the results.

The study of intellectual capital is a new field of interest. Definitions are still being developed to attempt to explain just exactly what intellectual capital is. Figure 25 is a simple graphic showing the dates of the sources for this work illustrating just how recent intellectual capital is.

The literature review revealed there is no consensus on how to define intellectual capital, nor how to subdivide it. Intellectual capital is the knowledge, experience, skills, technology, and relationships not currently valued on a balance sheet. Intellectual capital can be subdivided into human capital, structural capital, relational capital and intellectual property. Human capital is the employees' capability and potential to provide value for

the company. Structural capital is the capability and potential to provide value for the company through the sum of the firm's processes. Relational capital is knowledge of, and relationship with, the firm's network of associates and customers, which leads to loyalty and potential profitability. Intellectual property is an intellectual asset protected by law.

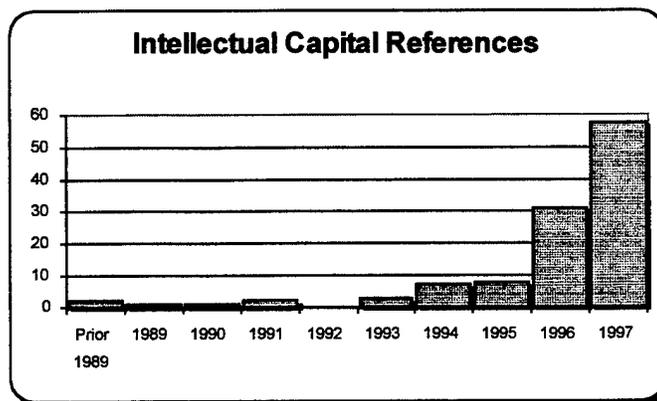


Figure 25. Intellectual Capital References

Numerous models exist with different hierarchies and terminology. The author created a basic hierarchy that can be applied to a variety of companies. Measures from authors, researchers, lecturers, and businesses are organized into the basic intellectual capital model. A company manager could begin with the basic model and use the measures provided or choose from the two hundred and fifty measures listed in appendices A through D. These measures are divided by the basic components of intellectual capital: human capital, structural capital, relational capital, and intellectual property.

A basic problem encountered in trying to apply business measures to the Air Force is the conflicting mission or goal of the Air Force versus that of a corporation. The Air Force does not exist to make money. As such, many of the measures incorporating profits are not relevant. However, measures were developed to more easily coincide with the mission of the Air Force.

**Intellectual Capital Measurement.** The human intellectual capital model for the Air Force measures education, experience, foreign language ability, stability, growth, and efficiency. The experts identified for this analysis include line officers, pilots, and FWS graduates. The results for the period 1989 to 1997 reveal:

- **Education:** The percentage of officers with a masters degree increased from two out of five to nearly half of all officers.

*“The personnel of the Air Force in the year 2025 will be quite unlike the personnel of the Air Force today...100% of the officers will have masters degrees...”* (Air Force 2025).

- **Experience:** There is a potential for problems due to a lack of officers with experience in several regions of the world.

*"You need a core of experience. You can get a million people to volunteer to be aviators"* (Pulley 1998)

- **Foreign Language:** The Air Force is improving, but it is still well below the goal of 10% of all officers with a second language capability.

- **Stability:** All the stability measurements are constant except retention.
- **Efficiency:** The percentage of experts (line officers) is increasing.

Human intellectual capital increased on nearly every measure in the Air Force throughout the draw-down. Except for retention, the stability measures are remaining 'stable'. This indicates the Air Force Military Personnel Center 'managed' its intellectual capital well during the draw-down.

### **How to Increase Human Intellectual Capital in the Air Force.**

The measures in this work subdivided human capital into potential, growth/renewal and efficiency. There are general ways to increase the intellectual capital for each subdivision of human capital.

Potential human intellectual capital in the Air Force can be increased in three ways: hire experts with more intellectual capital, increase the intellectual capital of current experts, and retain the current experts longer. Potential human capital was divided in this work into education and experience. The Air Force can raise the education standards for new officers and seek more recruits from graduate schools. Experience includes foreign tours and foreign language skills. Here again, the Air Force can emphasize these or other skills defined later as important human intellectual capital

components, in its hiring practices. The intellectual capital of the Air Force's current experts can be increased by more emphasis on advanced education and foreign languages. Retaining the experts with the human intellectual qualities the Air Force needs is another method to increase the overall intellectual capital in the Air Force. Retention can be increased through a combination of incentives to remain on active duty, transition to the guard or reserve, and increasing commitments restricting people from leaving.

The growth/renewal portion of human capital is divided into stability and growth. The Air Force has reduced its manpower during the draw-down and conceivably will continue to reduce the forces in the near future. Given this, the Air Force must continue to correctly manage the stability of the Air Force. With the exception of retention, all the stability measures remained relatively constant as they should.

**Future Research.** This research explores the area of human intellectual capital in the Air Force. The Air Force structural capital, relational capital and intellectual property have yet to be measured and evaluated.

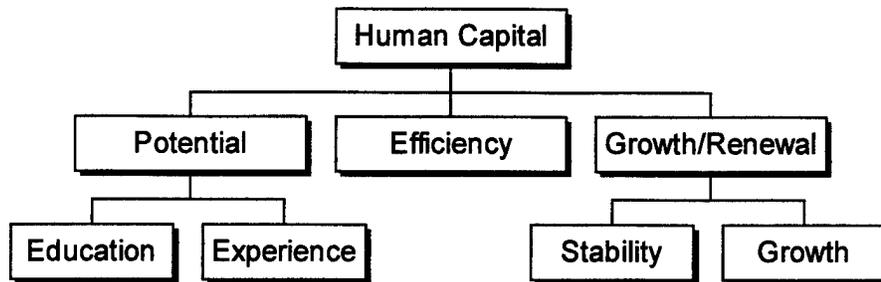
Future research on intellectual capital in the Air Force might begin with different methods for deciding exactly what is strategically important to the Air Force, and, therefore, what exactly should be measured. A decision-maker could be identified to explicitly define the goals of the Air Force and identify which qualities are important for Air Force personnel. A

multivariate examination or step-wise regression of promotion board results would identify what the Air Force implicitly considers important by analyzing exactly which factors and qualities in officers are rewarded with a promotion and which factors are not. For example, this research showed that the Air Force has a potential problem due to a lack of experience in two of the continents of the world. A stepwise regression on selected data maintained by the Air Force Personnel Center between colonels and deferred lieutenant colonels would be useful. The results would show what characteristics and skills the Air Force implicitly considers important to be an Air Force leader. An intellectual capital audit of the Air Force could then focus on these identified characteristics. This type of data was not available for this thesis.

A similar analysis would be useful to highlight what skills and characteristics are present in officers not chosen for promotion. Are officers with the skills the Air Force has explicitly said are important not being promoted? This data also was not available for this thesis.

## APPENDIX A

### **Human Intellectual Capital Measurements and Selected Definitions**



#### ***Potential***

##### ***Education***

##### **Average educational level (Celemi 1997)(Sveiby 1989)**

Education level can be measured in various ways according to the structure of the company. Celemi measures employees at year-end with primary education calculated as = 1, secondary education = 2, and tertiary education (university) = 3.

##### **Change in company information technology (IT) literacy (Skandia 1996)**

##### **Information technology (IT) literacy of staff (Edvinsson 1997)**

The employees' competency in using information technologies. These can be assessed individually on a scale of 1-5. An average is then compiled for all the employees.

**Level of education (Sveiby 1997).**

The level of education of experts affects the assessment of the quality of their competence and thus the knowledge company's ability to achieve future success. The reason why formal education is of interest is that the main competence gained by students at academic levels is how to process vast amounts of information. Three general classes can be distinguished: Primary, Secondary and Tertiary. An average can be calculated and the change in the average indicates whether the company is improving its ability to process information.

**Number of days devoted to education per expert (Sveiby 1997)**

**Per capita annual cost of training and support programs for full-time employees (Edvinsson 1997)**

**Per capita annual cost of training, communication and support programs for temporary employees (Malone 1997)(Edvinsson 1997)**

**Per capita annual cost of training, communication, and support programs for part-time employees and non-full time contractors (Edvinsson 1997)**

**Percentage of company experts with advanced degrees (Edvinsson 1997)**

**Percentage of experts with masters degrees or higher (Wagner 1998)**

**Percentage of experts with Ph.D. degrees (Wagner 1998)**

**Share of employees with secondary education or higher (Skandia 1996)**

**Share of training hours (Edvinsson 1997)**

**Time in training (Edvinsson 1997)(Malone 1997)(Skandia 1996)**

**Training and education costs (Sveiby 1997)**

In knowledge companies, which depend heavily on the knowledge and competence of their employees, competence development is an important investment item. This fact is not normally apparent from the company's financial statements, for most acquisition of knowledge takes place not in formal courses but through regular work on assignments for customers and R&D projects.

**Training expense per employee (Edvinsson 1997)(Skandia 1996)**

Annual training expenses divided by the number of employees.

**Training expense/administrative expense (Skandia 1996)(Edvinsson 1997)**

The annual training expenses divided by the administrative expenses.

Training expenses are an investment in the employees' intellectual capital.

### ***Experience***

**Average number of employees per country (Skandia 1996)**

For companies involved in worldwide operations this measure indicates the level of potential experience the company has to draw on when required.

**Average number of years in the profession (Sveiby 1989)(Stewart 1997)**

A simple and useful measure of competence is the total number of years that experts have worked in their profession. Although the man-years of individual experts are not strictly speaking addable, in large groups the discrepancies are smoothed out enough to make changes in the figure worth recording. The total number of years in the profession is a measure of the skill and experience of a company's whole body of experts, whereas professional experience per expert is a measure of the average skill and experience of each of them. If you divide the sum total by the average number of experts in the company, you get a control figure for competence per expert.

**Average number of years of experience employees have in their professions (Stewart 1997)**

**Average years of service with company (Edvinsson 1997)(Skandia 1996)**

**Average years with company of temporary employees (Edvinsson 1997)**

**Competence turnover (WM-Data 1997)**

By comparing the competence of people who have left the company with those of new recruits, one can derive a quotient showing how personnel turnover affects the company's competence as a whole. The turnover figure can be calculated as the competencies of those who have joined the company divided by the competencies of those who have left it. "Competence" may be any indicator, like education, marks or years of experience.

**Percentage of company experts of different nationality than the company register (Edvinsson 1997)**

**Percentage of experts with foreign country experience (by region) (Wagner 1998)**

**Percentage of experts with foreign country experience and foreign language ability (by region) (Wagner 1998)**

**Percentage of experts who speak a foreign language (Wagner 1998)**

**Percentage of experts who speak a key foreign language (Wagner 1998)**

**Seniority (Sveiby 1997)**

Seniority is defined as the number of years employed in the same organization. The seniority of experts can be used as an indicator of stability of competence.

**Seniority among experts (Stewart 1997)**

The average number of years with the company of the experts.

**Total competence of experts (Celemi 1997)**

**Years of experience gained with growth (Sveiby 1997)**

**Years of experience gained with replacements (Sveiby 1997)**

**Years of experience lost with people who leave (Sveiby 1997)**

## *Growth/Renewal*

### *Stability*

**Age structure (Sveiby 1997)**

**Annual turnover of full-time permanent employees (Edvinsson 1997)**

**Average age of employees (Edvinsson 1997)(Sveiby 1989)(Sveiby 1997)**

Older people are more "stable" than younger, that is, they tend to stay and not leave the company. An organization with on average older experts is likely to be more stable than a younger organization in the same industry.

The average age is a good indicator of stability. It is also, just like turnover and seniority, an indicator of dynamics. A very high average age indicates a stable company with more wisdom than drive. The average age has a habit of creeping upwards, unless management is alert, so a steadily increasing average age over a long period is a warning sign. With the aid of a deliberate recruitment policy, it is possible to maintain a stable age structure, but keeping the age and the experience of the staff in balance is not easy.

**Average age of full-time/permanent employees (Edvinsson 1997)**

**Average employee years of service with company (Malone 1997)**

**Employee attitude (Stewart 1997)**

**Employee surveys (Stewart 1997)**

**Employee turnover (Edvinsson 1997)(Malone 1997)(Skandia 1996)**

**Expert seniority (Celemi 1997)(Sveiby 1997)**

Seniority is defined as the number of years employed in the same

organization. The seniority of experts, can be used as an indicator of stability of competence. If computed for the category of administrators it can also be used as an indicator of the stability of the internal structure.

**Expert turnover (Celemi 1997)(Sveiby 1997)**

The competence of experts who have joined the company is divided by the competence of those who have left it. The quotient shows how personnel turnover affects the company's competence.

**Expert turnover rate (Sveiby 1997)**

Staff turnover is generally regarded as an indicator of stability. It is easy to calculate and to compare with other companies. A very low turnover (below 5%) often suggests a stable but not dynamic situation. A very high turnover rate (above 20%) usually suggests that people are dissatisfied. Turnover should be kept in a "band" and sudden changes in the turnover rate is usually an indication that something has changed internally in the company. The turnover rate is usually calculated as the number of people who leave during a year divided by the number of people employed at beginning of the year. The turnover rate for experts is an indicator of stability in the important group of revenue creating people. Companies can actively use the turnover rate as a management tool to sustain a sufficient level of dynamics. The turnover rate can be made more or less sophisticated. It can be divided into external (people leaving the company) and internal turnover (job-rotation) or into the turnover rate for experts and administrative staff.

**Expert employee turnover rate** (Stewart 1997)

**Median age** (WM-Data 1997)(Celemi 1997)

**Motivation index** (Edvinsson 1997)(Malone 1997)

**Number of years employed** (Sveiby 1989)

**Number of years in the profession** (Sveiby 1997)

The total number of years that the company's experts have worked in their profession. This is a measure of the skill and experience of a company's professional body.

**Relative pay position** (Sveiby 1997)

Many companies already maintain statistics on pay levels and the relative positions of individual companies. Relative pay position is usually expressed in index form such as 97 or 103. This measures relative cost levels compared with the competition. This measure can also indicate if employees are likely to look elsewhere for employment.

**Rookie ratio** (Stewart 1997)(Sveiby 1997)(WM-Data 1995)

The number of people with less than 2 years employment. Recently employed people are less stable than old. They are also less efficient, because they have not yet socialized into the tradition of the organization, so they do not know the most efficient way around. There is usually a higher personnel turnover among people with less than two years of seniority in organizations.

**Satisfied employee index** (Edvinsson 1997)

**Share of employees under age 40** (Edvinsson 1997)

**Share of employees with 3 or more years of service** (Skandia 1996)

### **Staff turnover (Sveiby 1989)(WM-Data 1995)**

Staff turnover is calculated by taking all those who have left during the year as a percentage of the total number of employees at the beginning of the year. Very high turnover indicates dissatisfaction and very low turnover is a sign of rigidity. An intermediate level indicates a dynamic situation.

### **Support staff turnover (Sveiby 1997)**

The support staff and experts are the backbone of the internal structure. It is vital for the survival and efficiency that they function well and a low turnover rate indicates this. The turnover should be kept in a band, just like the turnover rate for experts. Because the objective of support staff is to maintain the internal structure a lower turnover than for experts is preferable.

### **Turnover (Sveiby 1997)(WM-Data 1996)**

The competence of experts who have joined the company is divided by the competence of those who have left it. The quotient shows how personnel turnover affects the company's competence.

### **Turnover among experts (Stewart 1997)**

### **Values and attitude measurements (Sveiby 1997)**

## ***Growth***

### **Actual competence level vs ideal (Saint-Onge 1997)**

This measure is based on competency model with a scale for each

competency. Actual competence is the level of competency reached by the individual and ideal is what position he or she requires. The cumulation of these measurements indicates the level of competence of the organization as a whole in terms of the work assigned to them.

**Average number of employees (Skandia 1996)**

**Average number of employees per country (Skandia 1996)**

**Number of experts (Malone 1997)(Sveiby 1997)(Edvinsson 1997)(Skandia 1996)**

**Number of employees (Edvinsson 1997)(Malone 1997)(Skandia 1996)  
(Sveiby 1989)**

**Number of employees full time (Skandia 1996)(Malone 1997)(Edvinsson 1997)**

**Number of part-time employees/non-full time contractors (Edvinsson 1997)**

**Number of women experts (Edvinsson 1997)(Skandia 1996)**

### ***Efficiency***

**Adjusted equity/employee (Sveiby 1989)**

**Administrative expense/employee (Skandia 1996)**

**Capability for team work (Saint-Onge 1997)**

This is based on competencies related to working as a team.

Questionnaires can be used in team building that may provide a clear view of

these capabilities.

**Capability to develop/maintain relationships internal/customer**

(Saint-Onge 1997)

This measure is based on the Hall-Tona methodology that identifies values placed on a developmental spectrum. The capability to build relationships is based on the extent relationship values are selected and the level at which these values are placed on a development spectrum. The Hall-Tona questionnaire (distributed by Values Technology in Santa Clara, California) becomes a very powerful measurement tool.

**Completed development plans (Saint-Onge 1997)**

**Costs as a percentage of turnover (Sveiby 1997)**

**Empowerment index (Malone 1997)(Edvinsson 1997)**

**Expert competence (Celemi 1997)**

A simple and useful measure of competence is the total number of years that experts have worked in their profession. The total number of years in the profession is a measure of the skill and experience of a company's whole body of experts.

**Full-time permanent employees who spend less than 50 percent of work hours at a corporate facility (Edvinsson 1997)**

**Grading (Sveiby 1997)**

The company grades the experts. A three or five point scale may be used. After grades are given, they can be analyzed with statistical methods.

The results can show changes with time, how it affects personnel turnover, etc.

**Information technology expense/employee (Skandia 1996)**

**Leadership index (Edvinsson 1997)**

**Managers assigned to full-time permanent employees (Edvinsson 1997)**

**Market value/employee (Sveiby 1989)**

**Net profit (WM-Data 1996)**

**New ideas and percent implemented (Saint-Onge 1997)**

This is the number of ideas formally submitted in a "suggestion" and the number of those that are acted on and implemented.

**Percentage of full time permanent employees (Malone 1997)**

**Profit per employee (Sveiby 1989)**

Profit per employee is a useful term if you can correct for excess salaries, etc. It can be used to make comparisons between stock market-quoted knowledge companies because they are required to report profits more honestly. The advantage is that the figures are easily available. In the long term, it is first and foremost the ability of the experts to generate profits that determines the market value of knowledge companies.

**Profit per expert (Sveiby 1997)**

The profit-generating ability of experts depends on the state of the market, on how efficiently the company is managed, and on how much of the value added is paid out direct to employees as salaries and benefits.

**Proportion of challenging assignments (Sveiby 1989)**

**Proportion of consultants (Sveiby 1989)**

**Proportion of experts in the company (Sveiby 1997)**

An important indicator of efficiency is the proportion of experts in the firm; the number of experts, divided by the total number of employees. This measures how important the experts are to the firm. It is useful in making comparisons between companies in the same business, if the number of experts is calculated in the same way for all the companies compared. Note that the proportion of experts varies from one type of business to another, and thus can be used only for comparisons within the same area of operations.

**Proportion of new employees (Sveiby 1989)**

The proportion of new employees is the number of employees with one year's employment or less, as a percentage of the total number of employees.

**Proportion of support staff (Sveiby 1997)**

Proportion of support staff of the total number of employed indicates efficiency of the internal structure. A change in the proportion indicates whether the efficiency is improving or not. The inverse of this ratio is the proportion of experts.

**Proportion of veterans (Sveiby 1989)**

The proportion of veterans is the number of revenue people with at least three years' employment (over 20 years employment in this research of the Air Force), as a percentage of the total number of revenue staff. High

figures indicate high stability, but also the risk of rigidity and a lack of new development.

**Return on capital employed return on equity (WM-Data1995)**

**Sales per support person (Sveiby 1997)**

Sales per support person can be used as an indicator of how large a volume the organization's internal structure can cope with. A change in the proportion indicates whether the efficiency is improving or not.

**Succession planning ratios (Saint-Onge 1997)**

**Value added per employee (Celemi 1997)(Sveiby 1997)**

Value added per employee is a better measure of ability to produce than turnover or profit per employee because turnover may be heavily influenced by commissions or by goods and services that go straight through the company. It is also better than profit for purposes of comparison because profit figures are relatively easy to manipulate, at least in private limited companies. Profits can be taken out as salaries, fringe benefits, pension insurance premiums, etc.

**Value added per expert (Celemi 1997)(Sveiby 1997)(Stewart 1997)**

Value added per expert measures how much value a company's experts produce. The experts in a company, by definition, bring in the revenue. These revenues must cover all the costs incurred in keeping the experts in the field, their salaries, pensions and other costs. The residual is the profit to be distributed as dividends to shareholders or used by the company for investment. Value added per expert indicates the importance of the experts

to the company.

**What percentage of all employees' time is spent in activity of low**

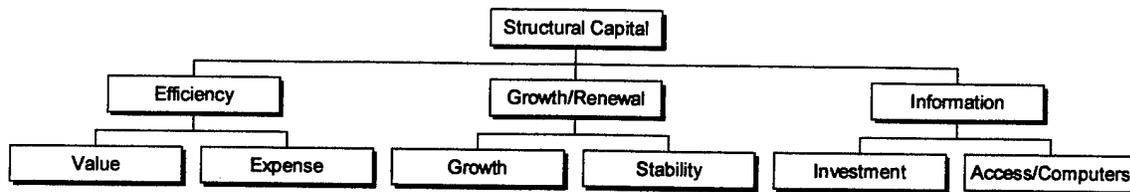
**value to customers? (Stewart 1997)**

**What percentage of expert employees' time is spent in activity of low**

**value to customers? (Stewart 1997)**

## APPENDIX B

### Structural Intellectual Capital and Selected Definitions



#### *Efficiency*

##### *Value*

**Administrative expense/employee (Edvinsson 1997)**

**Administrative expense/gross premium (Edvinsson 1997)(Skandia 1996)**

**Administrative expense/managed assets (Edvinsson 1997)**

**Administrative expense/total revenues (Edvinsson 1997)**

**Applications filed without error (Edvinsson 1997)**

**Change in proportion of administrative staff (Celemi 1997)**

**Common training programs of company and partners (Edvinsson 1997)**

**Company historic rate of new products reaching market (Edvinsson 1997)**

**Contracts/employee (Edvinsson 1997)**

**Cost for administrative error/management revenues (Edvinsson 1997)**

**Cost per transaction (Saint-Onge 1997)**

This is the cost of a "transaction" in the system.

**Cycle time/cost improvement on main business processes (Saint-Onge 1997)**

The trend line for the improvement of cycle time and cost associated with processes.

**Historic life expectancy of new products (Edvinsson 1997)**

**Information technology expense/administrative expense (Edvinsson 1997)(Skandia 1996)**

**Information technology expense/employee (Edvinsson 1997)**

**Percent cost reduction (Saint-Onge 1997)**

Level of overall reduction of costs in the operations of the firm.

**Percent of sales attributable to new products or services (Stewart 1997)**

**Percentage of customer training, service, and support provided by partners (Edvinsson 1997)**

**Processing time of out payments (Edvinsson 1997)**

**Rate of process improvement index (Saint-Onge 1997)**

An index of improvement of many aspects of the operation of the firm including costs, cycle time and any other indicator of effectiveness and efficiency.

**Ratio of sales to sales, general, & admin costs (Stewart 1997)**

**Revenue per employee (Saint-Onge 1997)**

Total revenue divided by the number of employees.

**Share of “Method and Technology” hours (Edvinsson 1997)**

***Expense***

**Change in information technology inventory (Edvinsson 1997)**

**Contribution of engineering design system (Edvinsson 1997)**

**Contribution of process control system to corporate revenues  
(Edvinsson 1997)**

**Contribution of sales information system to corporate revenues  
(Edvinsson 1997)**

**Gross rental income/employee (Edvinsson 1997)**

**Function points/employee-month (Edvinsson 1997)**

**Product R&D in percent of value added (Celemi 1996)**

**Total yield compared with index (Edvinsson 1997)**

**Value of company management information system (Edvinsson 1997)**

**Value of corporate communications networks (Edvinsson 1997)**

**Value of corporate sales information system (Edvinsson 1997)**

**Value of process control system (Edvinsson 1997)**

**Value of the company’s engineering design system (Edvinsson 1997)**

**Values and attitude measurements (Sveiby 1997)**

The attitude of employees toward the workplace, customers, and superiors. The employees' attitudes to their place of work can be measured through polls and surveys. If the attitudes are favorable, they contribute consciously or unconsciously to enhancing the company's image among its customers. If unfavorable, those attitudes will unconsciously influence customers.

**Marketing expense/product line (Edvinsson 1997)**

**R&D expense/administrative expense (Skandia 1996)**

## ***Growth/Renewal***

### ***Growth***

**Average contacts by customer/year (Edvinsson 1997)**

**Average customer purchases/year (Edvinsson 1997)**

**Company products or components designed by partners (Edvinsson 1997)**

**Contracts/employee (Edvinsson 1997)**

**Customers contributing to internal structure (Sveiby 1997)**

The proportion of assignments devoted to customers that improve the internal structure of the company adds to the growth of the asset. Examples of projects that improve the internal structure are large projects where competence is passed on by tradition to several experts at once. Innovative projects involving new materials, new methods of calculation, new software,

etc. come under the heading of R&D and should be classed as such.

**Growth in sales per administrative staff (Celemi 1997)**

Total revenues divided by average number of administrative staff.

**Investment in the internal structure (Sveiby 1997)(Celemi 1997)(WM-Data 1996)**

Investments in new subsidiaries or new methods and systems are cash outlays that are often accounted for as costs. These investments indicate a buildup of the internal structure. The indicator can be calculated as a proportion of sales or a percentage of value added.

**New products currently in development (Edvinsson 1997)**

**Number of new products/year (Saint-Onge 1997)**

The level of innovation is indicated by the number of new products put in the market place by the organization.

**Organization enhancing customers (Celemi 1996)**

***Stability***

**Administration staff turnover level (Celemi 1995)**

**Administrative staff seniority (Celemi 1995)**

**Administrative staff seniority change (Celemi 1997)**

**Age of the organization (Sveiby 1997)**

An old organization is generally more stable than a new one. Signs like "Est. 1887" are often used by retailers to indicate the shop can be trusted. The age is easy to compare with competitors.

**Employees working at home/total employees (Edvinsson 1997)**

## ***Information***

### ***Investment***

**Investment in competitive intelligence programs (Edvinsson 1997)**

**Investment in information processing systems (Sveiby 1997)**

Investment in information technology influences the internal structure. In many industries, it is also regarded as a measure of progress in accomplishing the corporate mission. An insurance company with more advanced information technology systems can solve its customers' problems more efficiently. An airline with a sophisticated ticket booking system may enjoy a competitive advantage over other airlines. Companies with systems for information retrieval and distribution have a powerful structure that supports the organization. Thus information technology investments, expressed as percentages of turnover or in absolute figures, can provide valuable clues to how the internal structure is developing.

**Investment in new customer service/support/training programs (Edvinsson 1997)**

**Investment in strategic partner development (Edvinsson 1997)**

**Investment in the internal structure (Sveiby 1997)**

**Information technology investment in % of value added (Celemi 1995)**

**Total investment in organization, % of value added (Celemi 1995)**

### ***Access/Computers***

**Databases of estimated replacement cost (Stewart 1997)**

**Information technology capacity (Edvinsson 1997)**

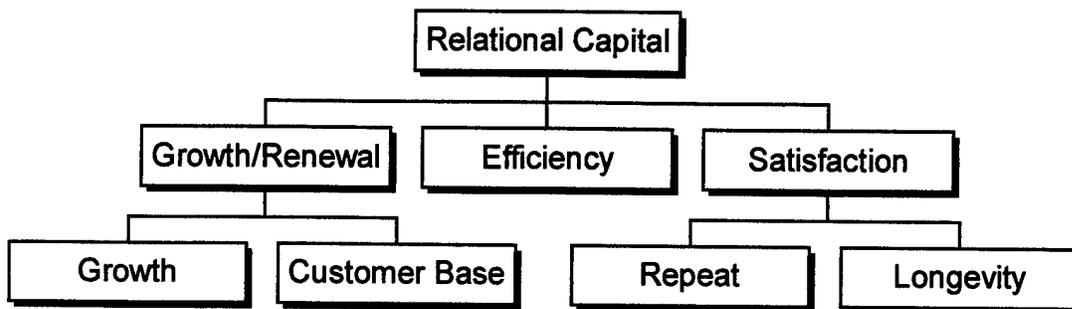
**Laptops/employee (Edvinsson 1997)(Skandia 1996)**

**Percentage of experts connected to web server (Deckro 1998)**

**Personal computers/employee (Skandia 1996)(Edvinsson 1997)**

## APPENDIX C

### **Relational Capital Intellectual Capital Measurements and Selected Definitions**



#### ***Growth/Renewal***

##### ***Growth***

**Average customer size (Edvinsson 1997)**

**Average lease (Skandia 1996)**

**Five largest customers (Celemi 1997)**

Share of revenues from five largest customers.

**Market coverage (Edvinsson 1997)**

**Market share (Edvinsson 1997)**

**Number of accounts (Edvinsson 1997)**

**Number of competence enhancing customers (Celemi 1997)(Sveiby 1997)**

Since experts spend most of their time working for customers, and

since customers are the most important source of competence development, valuable information is obtained by measuring the proportion of customer assignments that contribute to competence development.

**Number of contracts** (Skandia 1996)

**Number of contracts/information technology-employees** (Edvinsson 1997)

**Number of customer relationships** (Skandia 1996)

**Number of customers** (Edvinsson 1997)(Skandia 1996)

**Number of depositors** (Skandia 1996)

**Number of external information technology customers** (Edvinsson 1997)

**Number of funds** (Edvinsson 1997)

**Number of internal information technology customers** (Edvinsson 1997)

**Organic growth** (Sveiby 1997)

Increase in billings with income from acquisitions deducted is a measure of how well a business concept is received by the market.

**Revenue Growth** (Celemi 1997)

### ***Customer Base***

**Age structure** (Sveiby 1997)

This is a measure of customer longevity. The longer customers have been with a firm, the better its relations with them are likely to be and the easier it ought to be to retain them.

**Brand equity (Stewart 1997)**

**Customer information technology literacy (Edvinsson 1997)**

**Customer rating (Edvinsson 1997)**

**Customer visits to the company (Edvinsson 1997)**

**Customers contributing to internal structure (Sveiby 1997)**

The proportion of assignments devoted to customers that improve the internal structure of the company adds to the growth of the asset. Examples of projects that improve the internal structure are large projects where competence is passed on by tradition to several experts at once.

**Days spent visiting customers (Edvinsson 1997)**

**Financial well being of long term customers (Saint-Onge 1997)**

Value added over the length of the relationship and contribution to the financial viability of the customer.

**Image enhancing customers (Celemi 1996)**

**Proportion of big customers (Sveiby 1997)**

The percentage of billings attributable to the five biggest customers or number of customers accounting for 50 percent of billings. The proportion of big customers shows how dependent the company is on a few major customers.

**Telephone accessibility (Edvinsson 1997)**

**Telephone electronic accessibility (Edvinsson 1997)**

***Efficiency***

**Annual sales/customer (Edvinsson 1997)**

**Average time from customer contact to sales response (Edvinsson 1997)**

**Contracts/employee (Skandia 1996)**

**Customers/employees (Edvinsson 1997)**

**Information technology investment/salesperson (Edvinsson 1997)**

**Information technology investment/service and support employee (Edvinsson 1997)**

**Percent penetration and coverage (Saint-Onge 1997)**

Combination of share of market and share of wallet.

**Percentage of customers who are “competence-enhancing” (Stewart 1997)**

Since experts spend most of their time working for customers, and since customers are the most important source of competence development, valuable information is obtained by measuring the proportion of customer assignments that contribute to competence development.

**Points of sale (Edvinsson 1997)(Skandia 1996)**

**Policies without surrender (Edvinsson 1997)**

**Price Sensitivity (Saint-Onge 1997)**

The extent to which the customer will remain loyal (maintain the relationship despite rate increases).

**Profitability by customer (Saint-Onge 1997)**

The profitability of the relationship over time.

**Profitability per customer (Sveiby 1997)**

Companies that make an effort to find out the profitability of their customer base, often find that up to 80% of the customer sales are not profitable. There is generally surprisingly little information in companies on the profitability of customers. This is because the costs are not accrued to customers but to products or functions.

**Ratio of sales contacts to sales closed (Edvinsson 1997)**

**Reduction with complaint resolution time (Saint-Onge 1997)**

Monitoring of the complaint resolution process will yield a measure on how long it takes to resolve the complaint and restore the satisfaction level.

**Revenue generating staff (Edvinsson 1997)**

**Sales per customer (Celemi 1997)(Sveiby 1997)**

Sales per customer is total sales divided by the total number of customers. Since selling more to the same customer is usually easier and less costly than finding a new customer this ratio shows how efficient your company's existing network of customers is.

**Savings/contracts (Edvinsson 1997)**

**Service expense/contact (Edvinsson 1997)**

**Support expense/customer (Edvinsson 1997)**

**Surrender rate (Skandia 1996)**

**Vacancy rate (Edvinsson 1997)**

**Win/loss index (Sveiby 1997)**

Number of successful bids with number of unsuccessful. Companies that make a lot of their business from tenders can calculate a simple index by comparing how many of their quotations were successful with how many that they lost. Compared over time this gives a good indication of how their customers regard them. The index can also be used for comparisons when trying out different pricing strategies.

## ***Satisfaction***

### ***Repeat***

**Customer retention rate (Stewart 1997)**

**Customer satisfaction (Stewart 1997)**

**Customers lost (Edvinsson 1997)**

**Devoted customers ratio (Sveiby 1997)**

Proportion of sales from companies that have been customers for longer than five years. This measure indicates how devoted the customers are and therefor is a sign of stability.

**Frequency of repeat orders (Sveiby 1997)**

A high frequency indicates that customers are satisfied with the company. Stable, loyal customers are profitable customers in the long term.

Customer utility is high and so are earnings. The frequency of repeat orders can be measured as the proportion of total billings attributable to old customers. The meaning of "old" naturally varies according to the type of business, but normally a customer who has given you at least one previous assignment can be regarded as an old customer.

**Rate of repeat customers (Edvinsson 1997)**

**Ratio of repeat customers to total customers (Edvinsson 1997)**

**Repeat orders (Celemi 1997)**

Customers who also existed the prior year.

**Satisfaction index (Saint-Onge 1997)**

Measurements related to the level of satisfaction experienced by the customer as measured through survey methods.

**Satisfied customer index (Edvinsson 1997)(Skandia 1996)(Sveiby 1997)**

Measuring the degree of customer satisfaction is perhaps the best way to get an early indication of whether results are about to improve or deteriorate. Many companies now make a systematic effort to acquire information about their customers' perceptions of quality and other attitudes to the company. The results of these polls are used primarily in marketing, and not in financial forecasting, but it is feasible to append an index of customers' quality perceptions and attitudes to the financial statements.

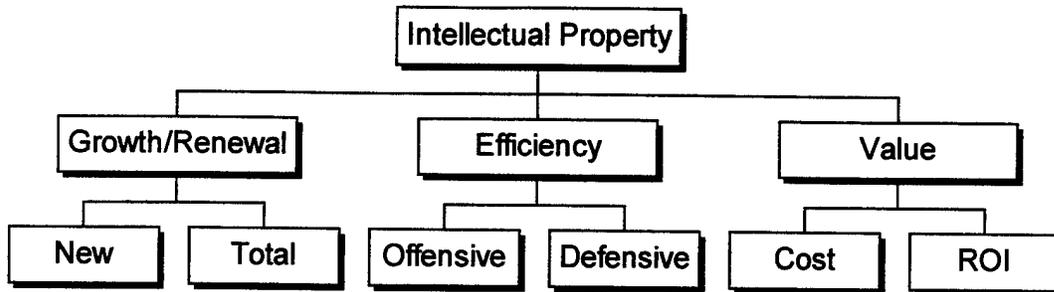
## *Longevity*

**Average duration of contract (Edvinsson 1997)**

**Average duration of customer relationship (Edvinsson 1997)**

## APPENDIX D

### Intellectual Property Measurements and Selected Definitions



#### *Growth/Renewal*

##### *New*

**Number of new patents (Stewart 1997)**

The number of patents developed for products and services that will result in new sales one to five years into the future. This measure indicates whether the company is continuing to develop and create new ideas and products.

##### *Total*

**Number of company patents (Edvinsson 1997)**

Number of total patents being utilized or the number of patents that may be utilized in the next 5 years.

## *Efficiency*

### *Offensive*

**Percentage of patent portfolio that is offensive (Smart Patents 1997)(Lucas 1998)(Rappaport 1998)**

Offensive patents are filed directly in the path of a competitor to stop the competitor from advancing a technology or force a cross-licensing position. This can be measured in the number of patents or the cost of obtaining and maintaining the identified group of offensive patents. It can also be measured as the percentage of patents licensed to third parties and/or deriving licensing revenues from these third parties.

**Percentage of sales protected by intellectual assets (Petrash 1996)**

The percentage of products sold that are protected by at least one product. This can be a simple measure or can include a weighted value assessment.

### *Defensive*

**Percentage of competitive samples analyzed that initiate business actions by purpose (Petrash 1996)**

**Percentage of new business initiatives protected by intellectual assets (Petrash 1996)**

**Percentage of patent portfolio that is defensive (Smart Patents 1997)(Rappaport 1998)**

The percentage of the company's patents that are used to protect the company's right to practice and, in some cases, to block competitors from practicing. The percentage of the company's patents that are used to protect the company's right to practice and, in some cases, to block competitors from practicing. These patents are not generating licensing income or royalties, but give protection in the event the firm is charged with patent infringement by competitors. This can be measured in the number of patents or the cost of obtaining and maintaining the identified group of defensive patents.

#### **Impact of competitive patent activity (Lucas 1998)**

The number of significant patents by competitors the company is forced to react to (opinions, oppose, license-in, invent around, etc.) This measure can signal if the business is sliding into competitive technology disadvantage.

### ***Value***

#### ***Cost***

**Cost to maintain portfolio worldwide (Smart Patents 1997)(Rappaport 1998)**

This is the total of annuity, tax and patent maintenance costs to keep the entire patent portfolio active on an annual basis.

**Percentage of technically relevant, competitive intellectual assets that require business response (Petrash 1996)**

## **ROI**

**Number of patents generated per R&D dollar (Smart Patents 1997)**  
(Rappaport 1998)

The number of patent applications filed that year or the number of patents issued that year divided by the total R&D dollars spent. This is an approximation because there is a several year lag from the year a patent application is filed and the year when it is issued. Nonetheless over a period of years the average number of patents obtained per R&D dollar spent is a very useful measure of the potential protection that the organization is obtaining per R&D dollar spent.

**Number of patents that are cross licensed (Smart Patents 1997)**  
(Rappaport 1998)

This indicates how leveraged the portfolio of patents is. The number of your patents which are cross-licensed with third parties, i.e., these patents are licensed in return for a license of some or all of the patents owned by the third party. Cross licensing historically has not had large sums of money flow from one party to the other and tend to be more defensive in nature than straight unilateral licensing of one party's patent or group of patents for which the licensee is paying substantial royalties.

**ROI on patent portfolio (Smart Patents 1997)(Rappaport 1998)**

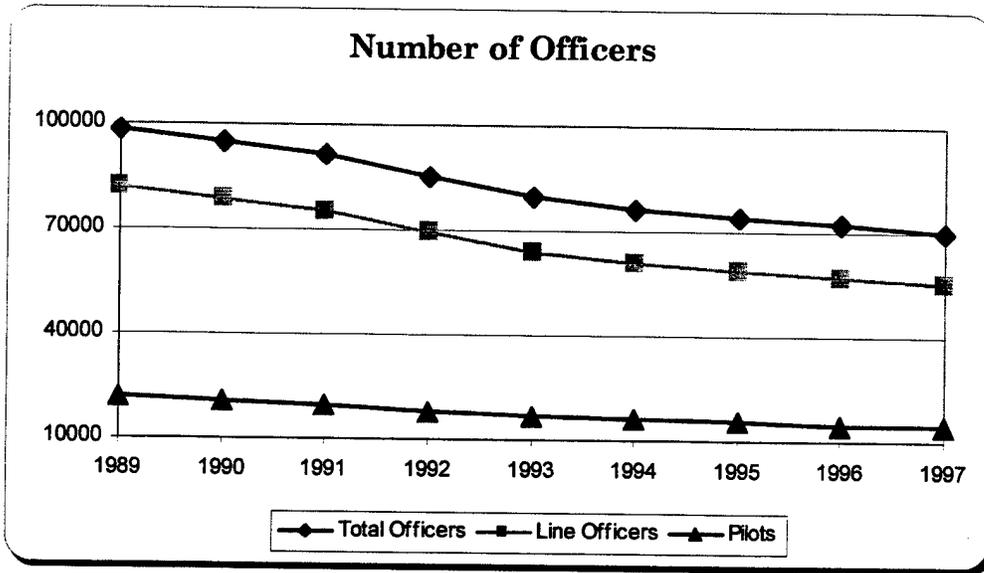
This measure is the maintenance, research and development costs subtracted from the revenue generated by the patent portfolio divided by the total costs. This is a relatively new, yet simple measure, since patents were thought of before primarily as expenses and not as revenue generators.

**Value contributed to the business by significant/extraordinary intellectual asset management actions (Petrash 1996)**

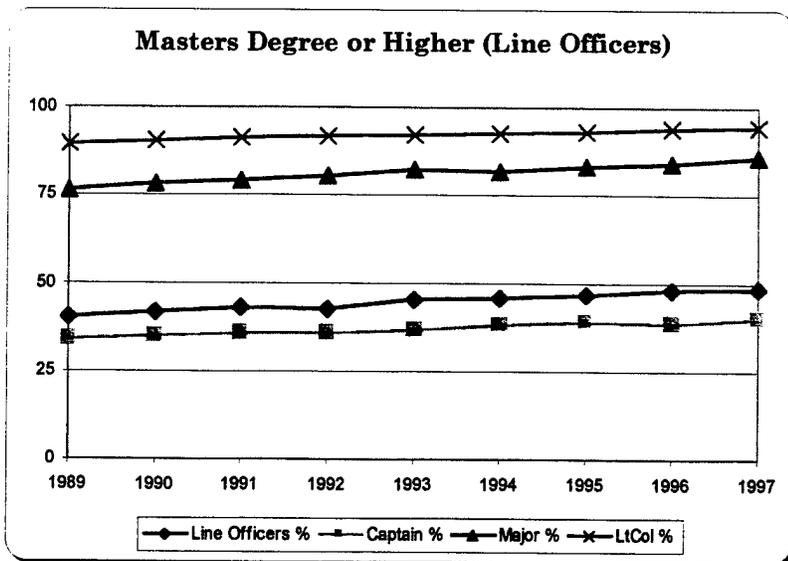
A joint venture where one party contributes intellectual assets and the other party contributes hard assets.

**APPENDIX E**

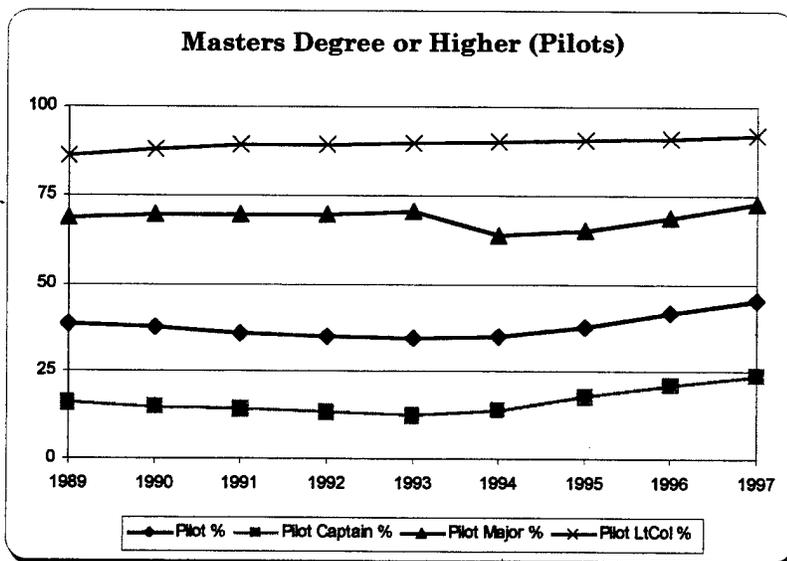
**Human Intellectual Capital in the Air Force**



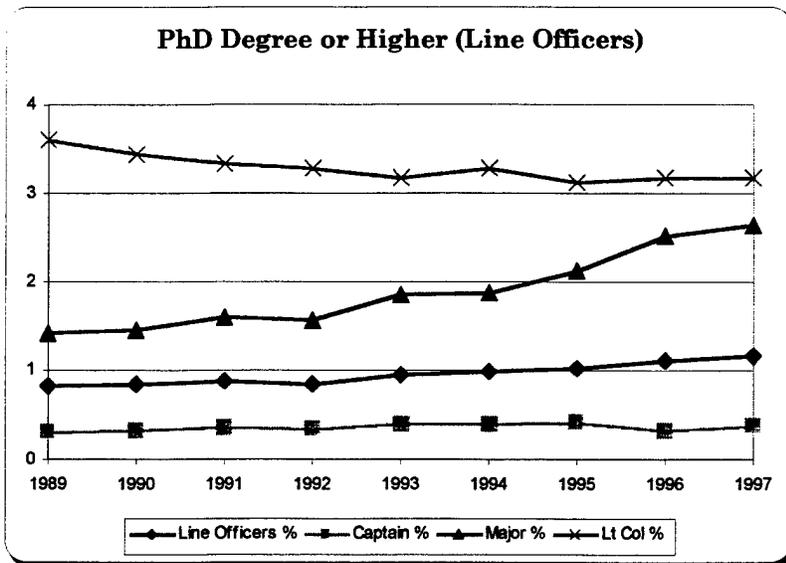
	<b>Number of Officers</b>								
	<b>1989</b>	<b>1990</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>
<b>Total Officers</b>	98059	94649	91402	85480	79425	76386	74012	72091	69892
<b>Line Officers</b>	82130	78531	75350	69707	64051	61160	58948	57129	55097
<b>Pilots</b>	21680	20819	19534	17848	17036	16045	15396	14806	14602



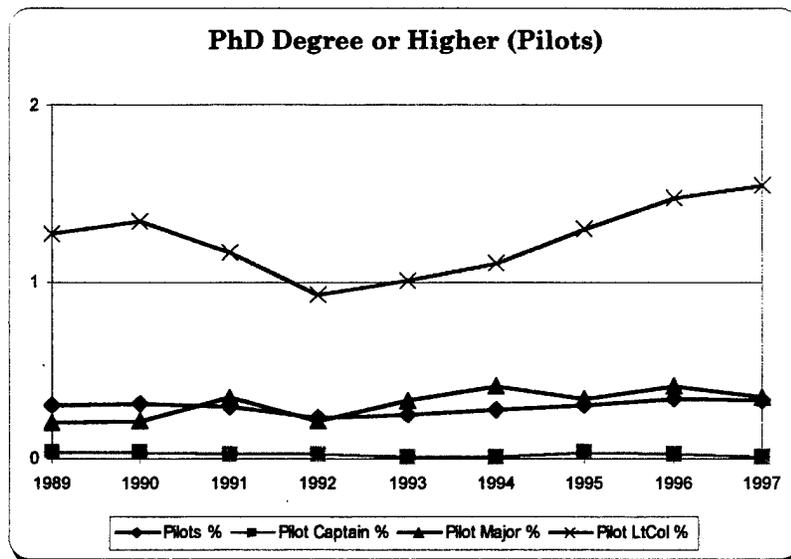
	% With Masters Degree or Better								
	1989	1990	1991	1992	1993	1994	1995	1996	1997
Line Officers %	40.15	41.83	43.02	42.38	45.20	45.85	46.60	47.87	48.51
Captain %	34.09	34.79	35.95	35.74	36.80	37.80	38.77	38.55	39.76
Major %	76.67	78.13	79.00	80.56	82.52	82.07	83.08	84.30	85.86
LtCol %	89.52	90.56	91.54	91.97	92.38	92.86	93.32	94.01	94.69



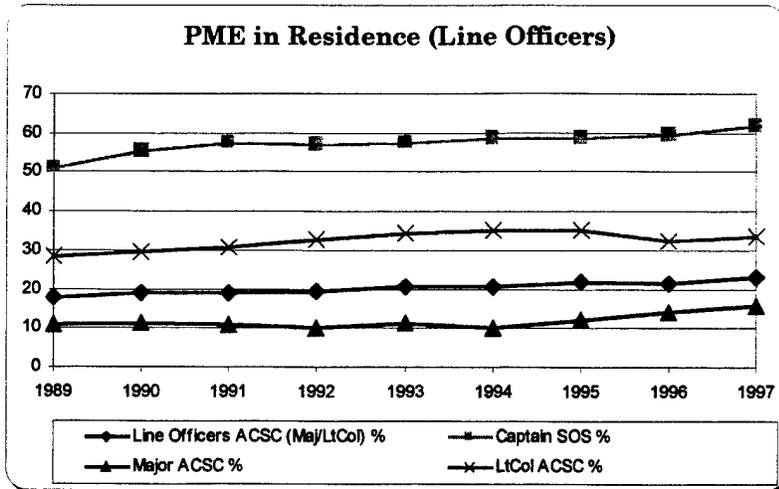
	% With Masters Degree or Better								
	1989	1990	1991	1992	1993	1994	1995	1996	1997
Pilot %	38.39	37.55	35.96	34.91	34.72	34.97	37.71	41.74	45.08
Pilot Captain %	15.94	14.73	14.49	13.27	12.47	13.95	18.14	20.90	23.69
Pilot Major %	68.82	69.45	69.50	69.59	70.57	63.89	65.24	68.63	72.71
Pilot LtCol %	86.08	87.80	89.15	89.39	89.86	90.14	90.64	91.19	91.95



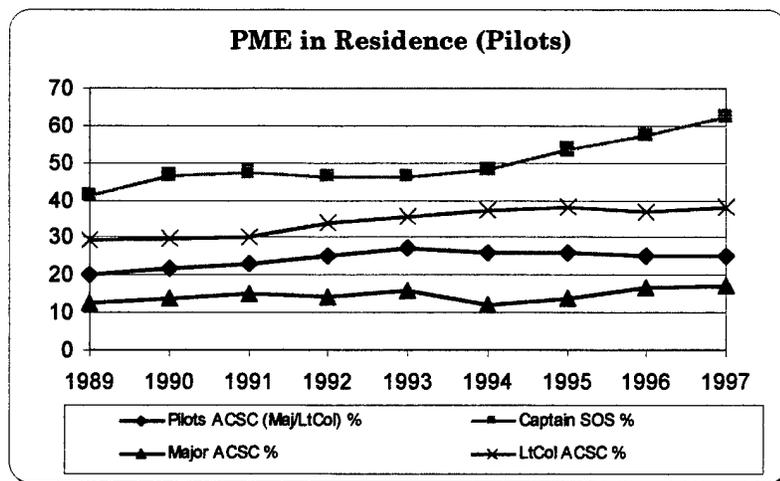
	% With Ph.D.									
	1989	1990	1991	1992	1993	1994	1995	1996	1997	
Line Officers %	0.83	0.85	0.88	0.85	0.96	0.99	1.03	1.11	1.16	
Captain %	0.30	0.33	0.35	0.33	0.39	0.40	0.41	0.32	0.38	
Major %	1.42	1.45	1.60	1.57	1.85	1.86	2.11	2.52	2.64	
Lt Col %	3.60	3.44	3.33	3.28	3.18	3.28	3.12	3.18	3.17	



	% With Ph.D.									
	1989	1990	1991	1992	1993	1994	1995	1996	1997	
Pilots %	0.30	0.32	0.30	0.23	0.24	0.28	0.30	0.34	0.32	
Pilot Captain %	0.03	0.03	0.02	0.02	0.01	0.01	0.03	0.02	0.01	
Pilot Major %	0.21	0.21	0.34	0.21	0.33	0.41	0.34	0.41	0.35	
Pilot LtCol %	1.27	1.34	1.16	0.92	1.01	1.10	1.29	1.48	1.54	

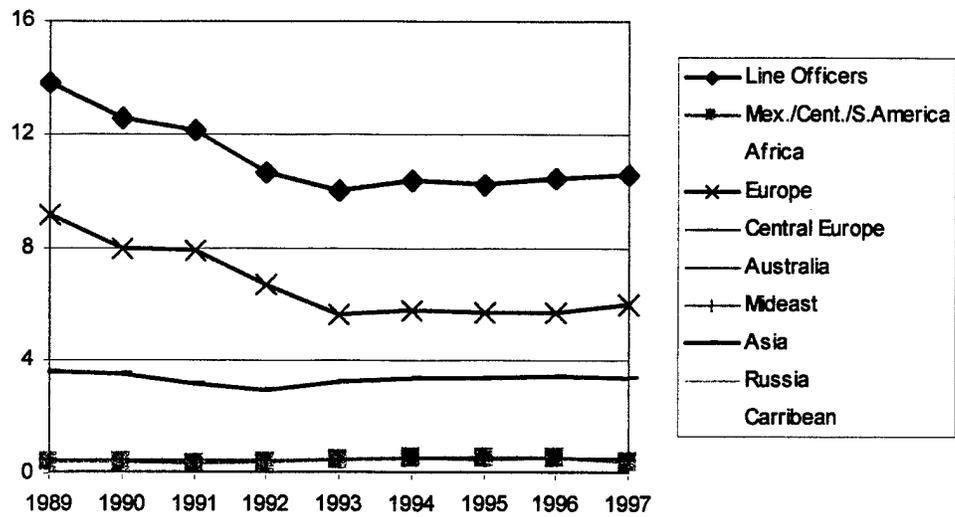


	% PME in Residence								
	1989	1990	1991	1992	1993	1994	1995	1996	1997
<b>Line Officers</b>	17.94	18.86	18.97	19.55	20.78	20.67	21.88	21.65	22.91
<b>Captain SOS %</b>	50.89	55.42	57.49	56.97	57.56	58.69	58.85	59.31	61.73
<b>Major ACSC %</b>	10.93	11.27	10.74	10.24	11.13	9.99	12.24	14.20	15.86
<b>LtCol ACSC %</b>	28.14	29.61	30.63	32.78	34.32	35.15	35.11	32.55	33.40



	% PME in Residence								
	1989	1990	1991	1992	1993	1994	1995	1996	1997
<b>Pilots ACSC</b>	20.28	21.67	22.86	25.02	27.04	25.84	26.01	25.34	25.18
<b>Captain SOS %</b>	41.19	46.50	47.27	46.28	46.13	48.13	53.66	57.62	62.53
<b>Major ACSC %</b>	12.69	13.92	15.09	14.12	15.75	12.00	14.00	16.87	17.19
<b>LtCol ACSC %</b>	29.18	29.85	30.23	33.85	35.78	37.19	38.01	36.78	38.06

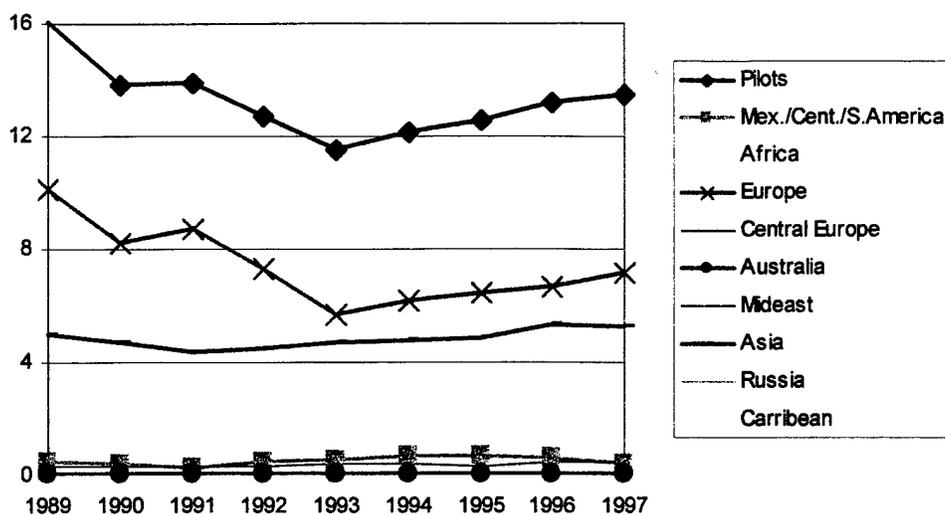
### Foreign Country Tour (% Line Officers)



### Foreign Country Tour by Region

	1989	1990	1991	1992	1993	1994	1995	1996	1997
<b>Line Officers</b>	13.781	12.533	12.090	10.668	9.980	10.332	10.255	10.452	10.548
Mex./Cent./S.America	0.423	0.396	0.387	0.420	0.470	0.531	0.558	0.539	0.415
Africa	0.015	0.013	0.013	0.009	0.021	0.008	0.008	0.005	0.007
Europe	9.190	7.989	7.906	6.677	5.630	5.752	5.684	5.733	6.016
Central Europe	0.001	0.001	0.000	0.001	0.003	0.003	0.008	0.005	0.005
Australia	0.059	0.065	0.065	0.065	0.073	0.074	0.074	0.080	0.082
Mideast	0.477	0.508	0.525	0.486	0.524	0.563	0.519	0.564	0.576
Asia	3.598	3.542	3.170	2.988	3.234	3.373	3.371	3.483	3.411
Russia	0.003	0.004	0.005	0.005	0.006	0.009	0.010	0.014	0.012
Caribbean	0.015	0.015	0.019	0.016	0.019	0.019	0.023	0.029	0.023

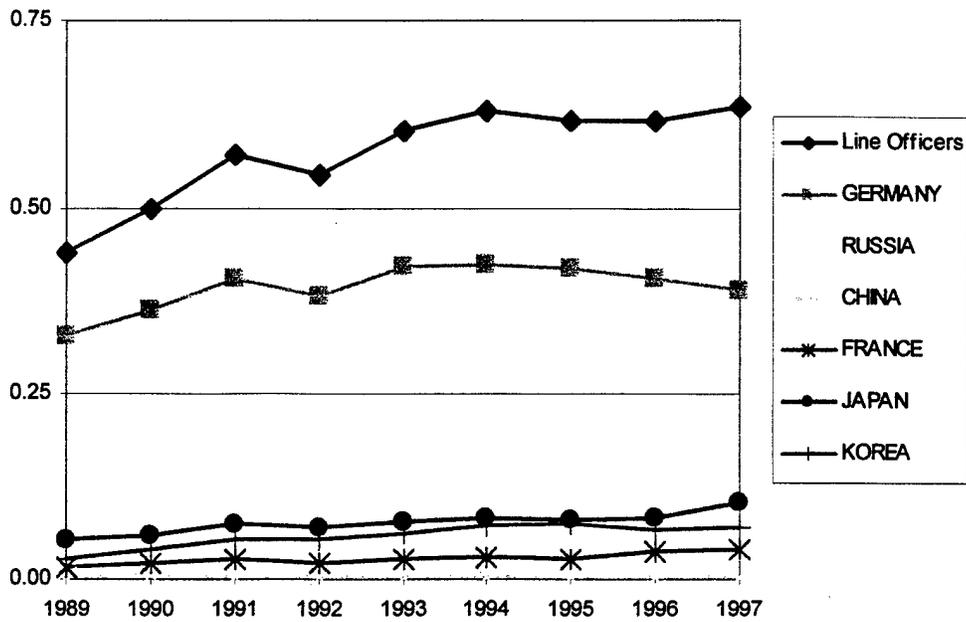
### Foreign Country Tour (% Pilots)



### Foreign Country Tour by Region

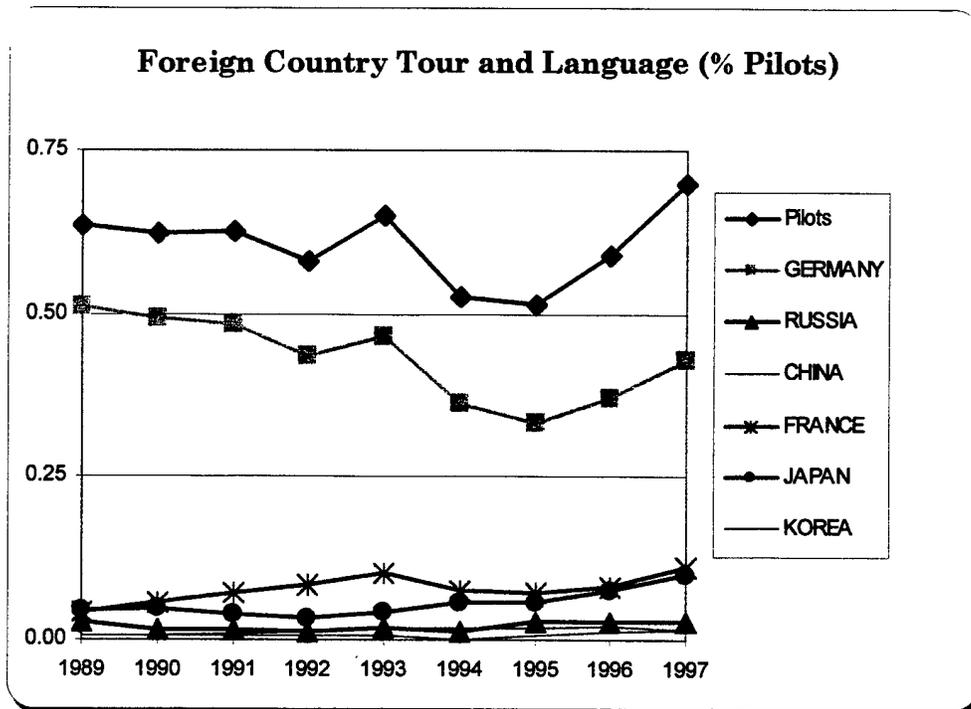
	1989	1990	1991	1992	1993	1994	1995	1996	1997
<b>Pilots</b>	16.078	13.836	13.871	12.677	11.507	12.122	12.551	13.206	13.505
Mex./Cent./S.America	0.510	0.449	0.311	0.470	0.591	0.677	0.716	0.602	0.445
Africa	0.037	0.024	0.025	0.022	0.030	0.013	0.007	0.007	0.021
Europe	10.110	8.228	8.712	7.267	5.694	6.177	6.458	6.654	7.173
Central Europe	0.000	0.000	0.000	0.000	0.000	0.006	0.026	0.014	0.014
Australia	0.055	0.062	0.061	0.061	0.066	0.069	0.065	0.074	0.078
Mideast	0.382	0.378	0.377	0.386	0.412	0.395	0.384	0.501	0.494
Asia	4.979	4.690	4.369	4.461	4.684	4.755	4.863	5.320	5.267
Russia	0.000	0.000	0.000	0.000	0.006	0.013	0.013	0.014	0.007
Carribean	0.005	0.005	0.015	0.011	0.024	0.019	0.020	0.020	0.007

**Foreign Country Tour and Language (% Line Officers)**

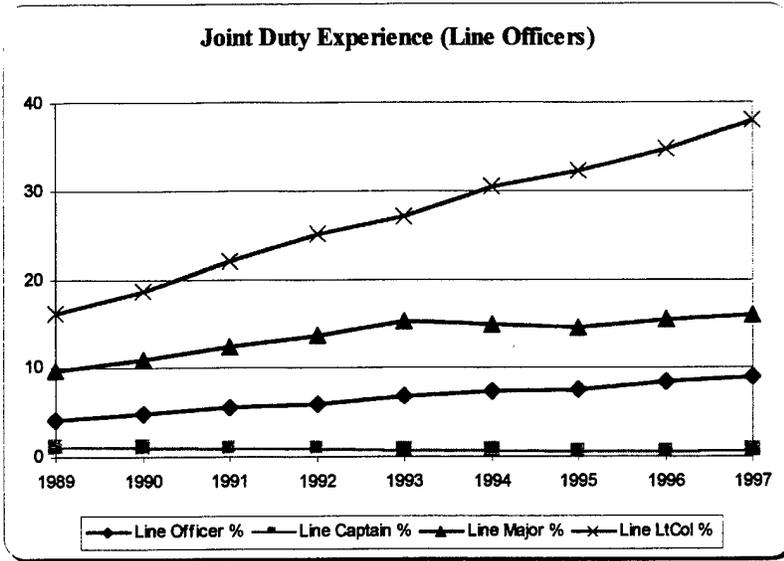


**Foreign Country Tour and Language**

	1989	1990	1991	1992	1993	1994	1995	1996	1997
<b>Line Officers</b>	0.439	0.499	0.571	0.545	0.603	0.629	0.617	0.617	0.636
GERMANY	0.328	0.362	0.405	0.383	0.421	0.424	0.419	0.405	0.391
RUSSIA	0.010	0.012	0.009	0.012	0.013	0.016	0.016	0.022	0.026
CHINA	0.003	0.005	0.004	0.004	0.003	0.003	0.002	0.003	0.004
FRANCE	0.015	0.021	0.026	0.021	0.025	0.030	0.028	0.037	0.040
JAPAN	0.055	0.060	0.075	0.070	0.078	0.084	0.079	0.082	0.105
KOREA	0.028	0.039	0.052	0.054	0.063	0.073	0.074	0.068	0.070

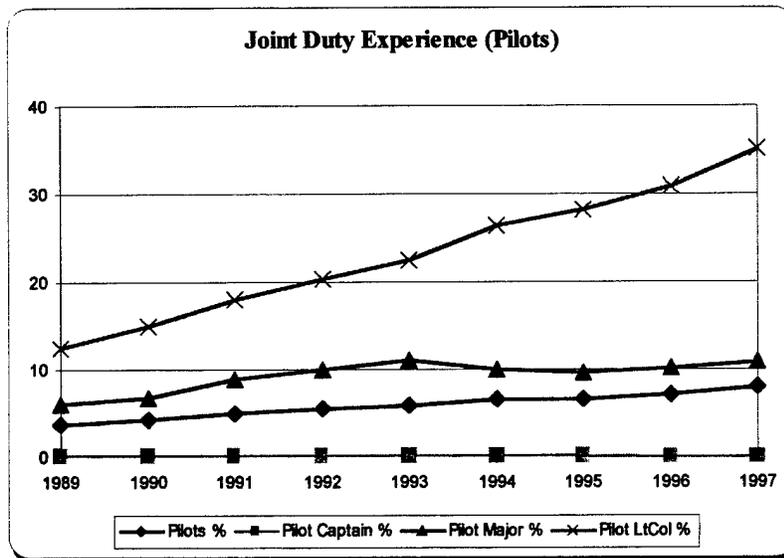


Foreign Country Tour and Language									
	1989	1990	1991	1992	1993	1994	1995	1996	1997
Pilots	0.634	0.622	0.627	0.581	0.651	0.526	0.514	0.589	0.699
GERMANY	0.510	0.492	0.484	0.436	0.466	0.363	0.332	0.372	0.431
RUSSIA	0.028	0.014	0.015	0.011	0.018	0.013	0.026	0.027	0.028
CHINA	0.005	0.005	0.010	0.011	0.018	0.019	0.020	0.020	0.014
FRANCE	0.041	0.057	0.071	0.084	0.102	0.075	0.072	0.081	0.113
JAPAN	0.046	0.048	0.041	0.034	0.042	0.056	0.059	0.074	0.099
KOREA	0.005	0.005	0.005	0.006	0.006	0.000	0.007	0.014	0.014



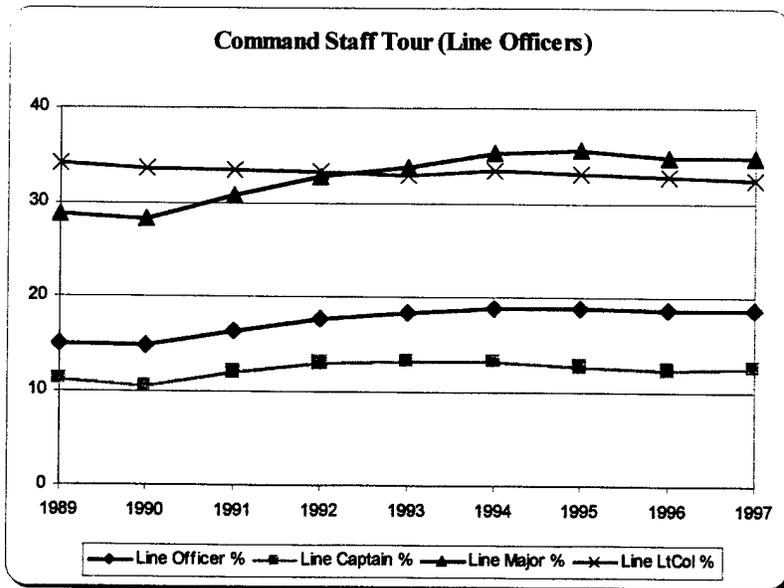
### Joint Duty Experience

	1989	1990	1991	1992	1993	1994	1995	1996	1997
Line Officer %	4.11	4.81	5.49	5.99	6.87	7.32	7.48	8.37	8.97
Line Captain %	1.03	1.02	0.96	0.85	0.81	0.73	0.56	0.62	0.70
Line Major %	9.61	10.88	12.44	13.70	15.24	14.83	14.53	15.50	15.90
Line LtCol %	16.07	18.71	22.03	25.12	27.04	30.42	32.32	34.83	38.09



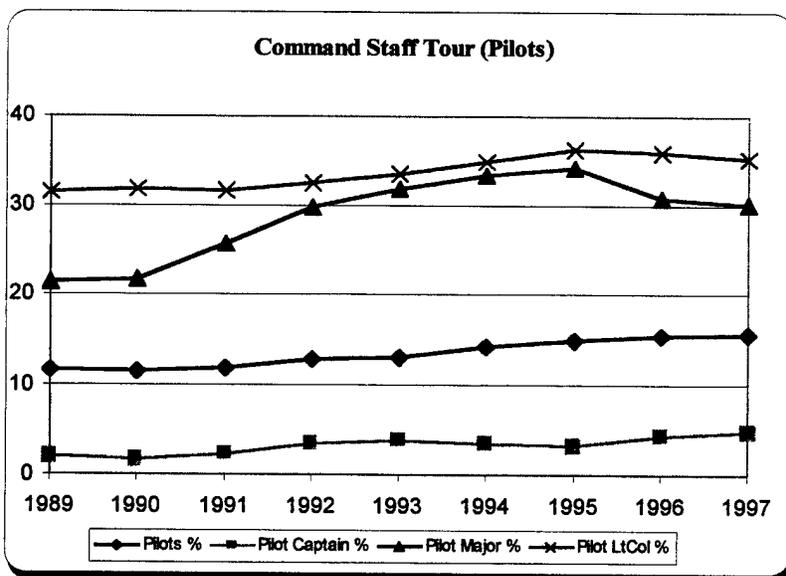
### Joint Duty Experience

	1989	1990	1991	1992	1993	1994	1995	1996	1997
Pilots %	3.75	4.35	5.04	5.57	5.97	6.61	6.55	7.20	7.98
Pilot Captain %	0.11	0.12	0.15	0.12	0.17	0.17	0.11	0.06	0.06
Pilot Major %	6.14	6.86	8.84	9.96	10.99	9.96	9.63	10.25	10.92
Pilot LtCol %	12.52	15.08	18.00	20.39	22.52	26.49	28.16	30.83	35.11



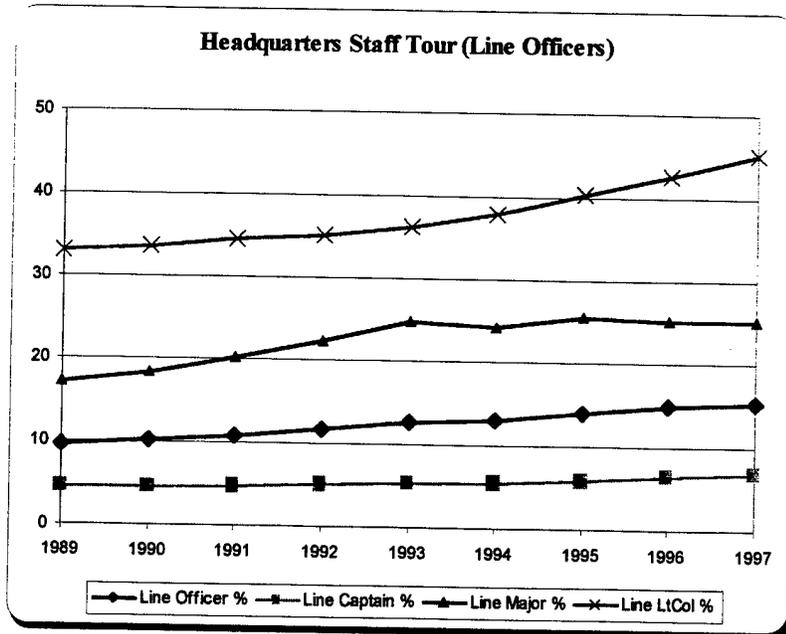
### Command Staff Level Tour

	1989	1990	1991	1992	1993	1994	1995	1996	1997
Line Officer %	14.96	14.85	16.28	17.64	18.30	18.85	18.74	18.73	18.74
Line Captain %	11.04	10.34	11.87	13.01	13.17	13.11	12.60	12.19	12.49
Line Major %	28.66	28.25	30.69	32.84	33.82	35.33	35.71	34.82	34.75
Line LtCol %	34.09	33.53	33.51	33.21	32.90	33.36	33.16	32.76	32.49



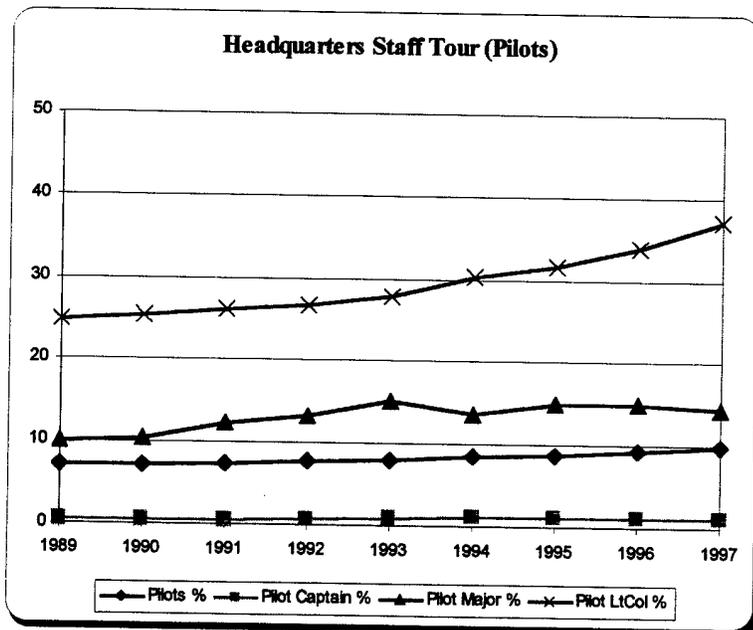
### Command Staff Level Tour

	1989	1990	1991	1992	1993	1994	1995	1996	1997
Pilots %	11.62	11.42	11.71	12.81	13.08	14.14	14.87	15.30	15.50
Pilot Captain %	2.02	1.77	2.19	3.47	3.74	3.44	3.16	4.19	4.72
Pilot Major %	21.45	21.73	25.65	29.66	31.83	33.27	34.23	30.74	30.02
Pilot LtCol %	31.50	31.86	31.66	32.55	33.45	34.79	36.23	35.98	35.13



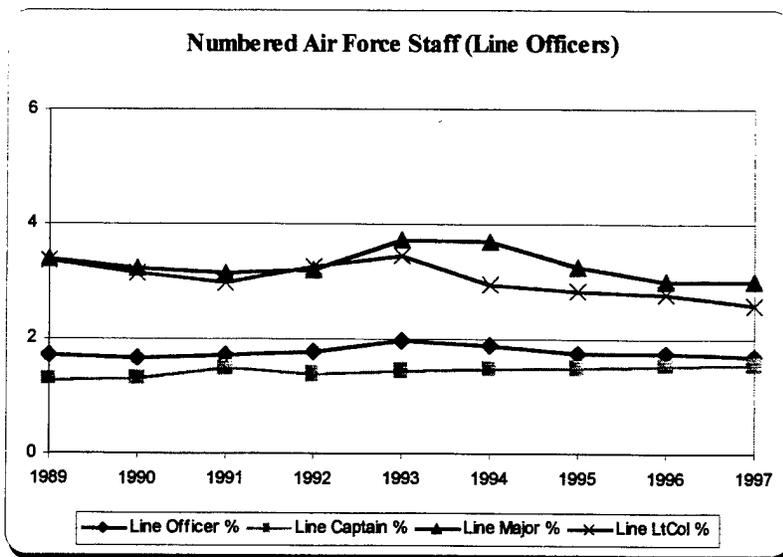
### Headquarters Staff Level Tour

	1989	1990	1991	1992	1993	1994	1995	1996	1997
Line Officer %	9.62	10.18	10.77	11.75	12.74	13.08	13.94	14.87	15.37
Line Captain %	4.57	4.60	4.80	5.15	5.38	5.50	5.93	6.35	6.81
Line Major %	17.24	18.34	20.32	22.31	24.75	24.29	25.61	25.27	25.10
Line LtCol %	32.98	33.56	34.55	35.04	36.10	37.91	40.39	42.62	45.20



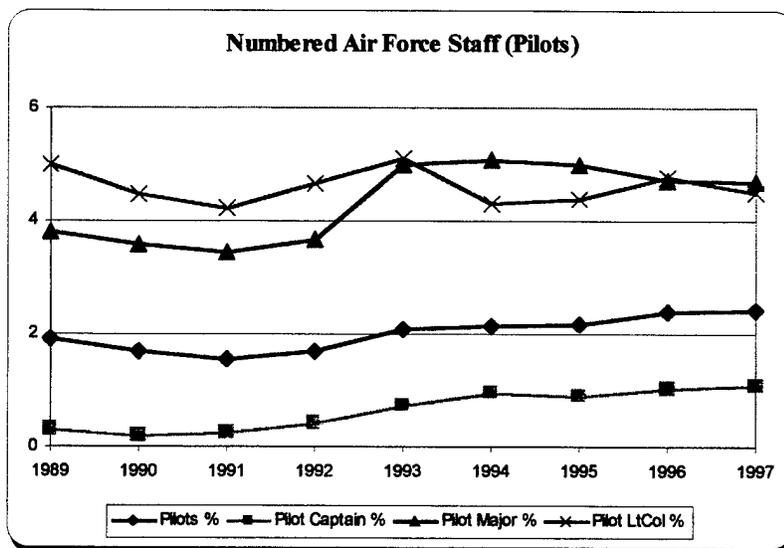
### Headquarters Staff Level Tour

	1989	1990	1991	1992	1993	1994	1995	1996	1997
Pilots %	7.11	7.28	7.43	7.69	7.96	8.43	8.73	9.34	9.79
Pilot Captain %	0.56	0.58	0.64	0.74	0.86	1.07	1.16	1.07	1.14
Pilot Major %	9.97	10.45	12.24	13.30	15.10	13.54	14.90	14.93	14.31
Pilot LtCol %	24.75	25.37	26.09	26.61	27.84	30.32	31.66	33.91	37.19



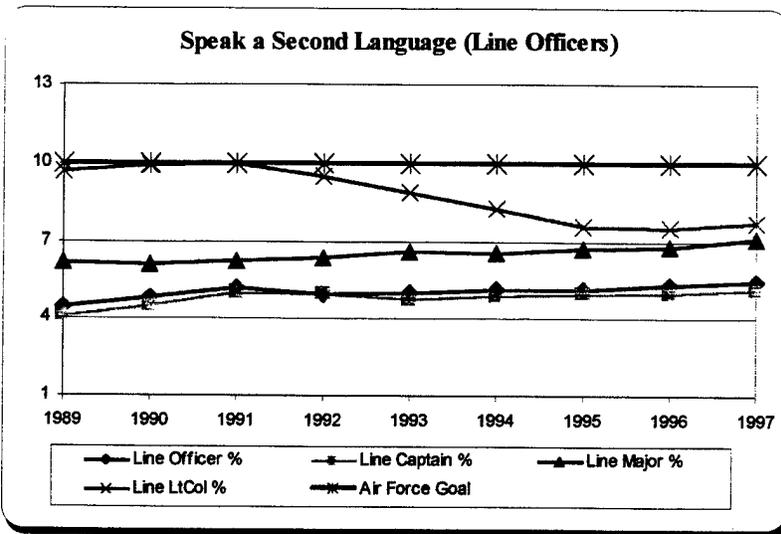
### Numbered Air Force Staff Level Tour

	1989	1990	1991	1992	1993	1994	1995	1996	1997
Line Officer %	1.72	1.68	1.71	1.77	1.96	1.89	1.74	1.74	1.70
Line Captain %	1.27	1.30	1.49	1.38	1.46	1.48	1.50	1.54	1.56
Line Major %	3.40	3.22	3.14	3.20	3.72	3.70	3.24	3.01	2.99
Line LtCol %	3.35	3.13	2.97	3.25	3.44	2.93	2.83	2.77	2.58



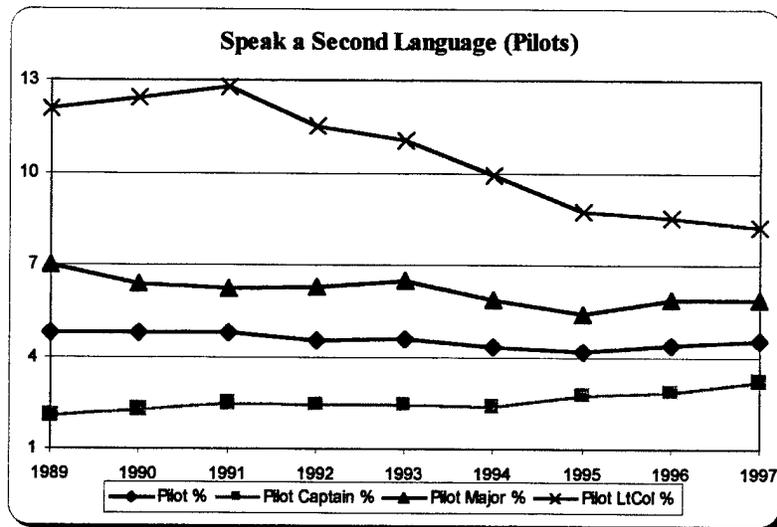
### Numbered Air Force Staff Level Tour

	1989	1990	1991	1992	1993	1994	1995	1996	1997
Pilots %	1.92	1.68	1.55	1.70	2.07	2.14	2.16	2.39	2.43
Pilot Captain %	0.29	0.20	0.26	0.42	0.72	0.93	0.89	1.03	1.09
Pilot Major %	3.82	3.59	3.45	3.66	5.01	5.08	4.99	4.72	4.70
Pilot LtCol %	5.01	4.47	4.22	4.67	5.10	4.30	4.38	4.77	4.50



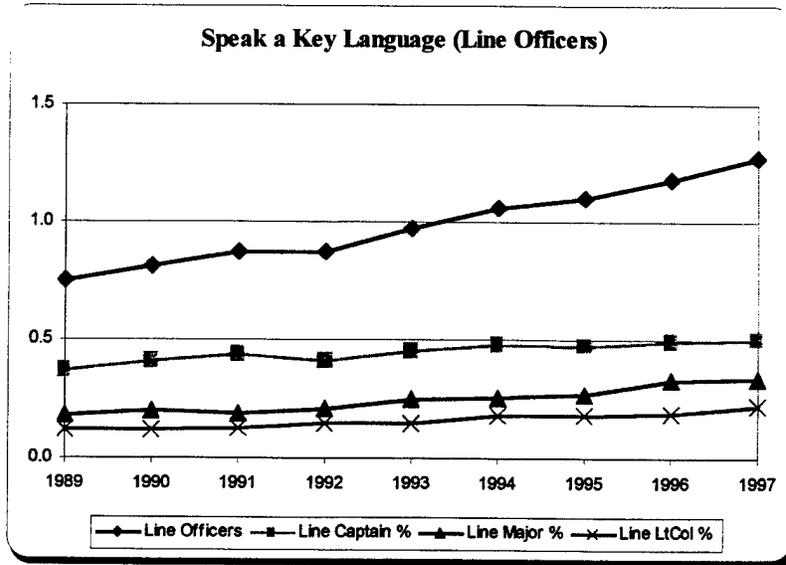
### % Who Speak a Second Language

	1989	1990	1991	1992	1993	1994	1995	1996	1997
Line Officer %	4.45	4.82	5.20	4.91	5.01	5.10	5.14	5.28	5.42
Line Captain %	4.06	4.53	5.01	4.95	4.74	4.90	4.92	5.00	5.11
Line Major %	6.19	6.10	6.22	6.38	6.60	6.57	6.71	6.76	7.09
Line LtCol %	9.69	9.94	10.02	9.48	8.87	8.25	7.58	7.53	7.73
Air Force Goal	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00



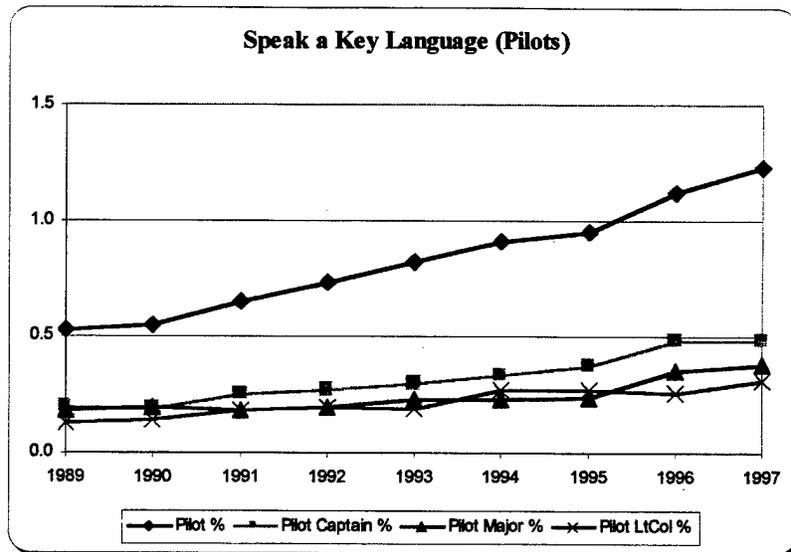
### % Who Speak a Second Language

	1989	1990	1991	1992	1993	1994	1995	1996	1997
Pilot %	4.78	4.79	4.81	4.53	4.61	4.34	4.18	4.37	4.56
Pilot Captain %	2.09	2.26	2.51	2.43	2.42	2.41	2.72	2.87	3.18
Pilot Major %	7.01	6.39	6.22	6.26	6.47	5.86	5.42	5.87	5.87
Pilot LtCol %	12.06	12.45	12.77	11.51	11.06	9.93	8.75	8.52	8.24



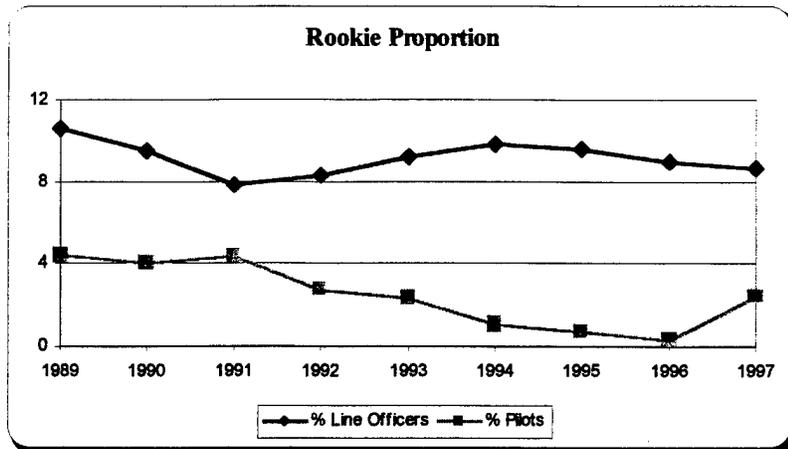
### % Who Speak a Key Language

	1989	1990	1991	1992	1993	1994	1995	1996	1997
<b>Line Officers</b>	0.75	0.81	0.87	0.87	0.97	1.06	1.1	1.18	1.28
<b>Line Captain %</b>	0.37	0.41	0.44	0.41	0.45	0.48	0.47	0.49	0.5
<b>Line Major %</b>	0.18	0.2	0.19	0.21	0.25	0.26	0.27	0.33	0.34
<b>Line LtCol %</b>	0.12	0.12	0.13	0.15	0.15	0.18	0.18	0.19	0.22



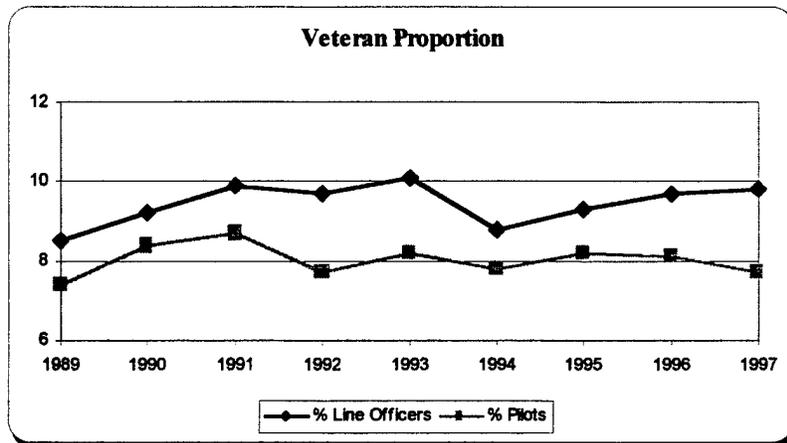
### % Who Speak a Key Language

	1989	1990	1991	1992	1993	1994	1995	1996	1997
<b>Pilot %</b>	0.53	0.55	0.65	0.73	0.82	0.91	0.95	1.12	1.23
<b>Pilot Captain %</b>	0.2	0.19	0.25	0.27	0.3	0.33	0.37	0.48	0.48
<b>Pilot Major %</b>	0.18	0.20	0.18	0.20	0.23	0.23	0.24	0.35	0.38
<b>Pilot LtCol %</b>	0.13	0.14	0.18	0.2	0.19	0.27	0.27	0.26	0.31



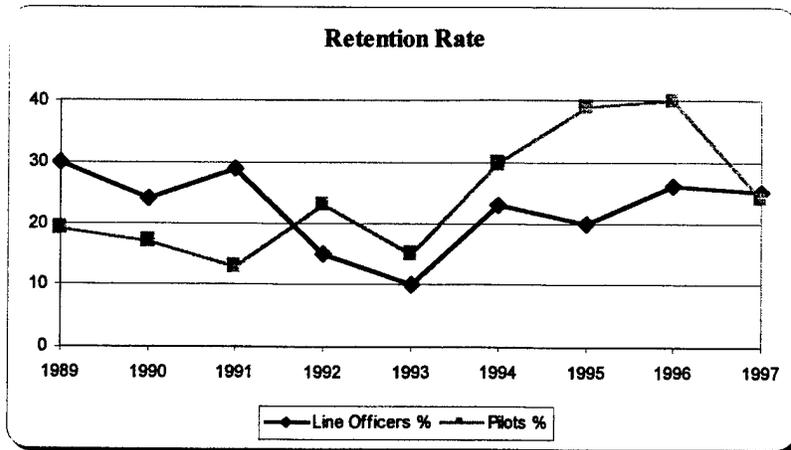
### Rookie Proportion

	1989	1990	1991	1992	1993	1994	1995	1996	1997
<b>% Line Officers</b>	10.6	9.5	7.8	8.3	9.2	9.8	9.6	9	8.7
<b>% Pilots</b>	4.4	4	4.3	2.7	2.3	1.1	0.7	0.3	2.4



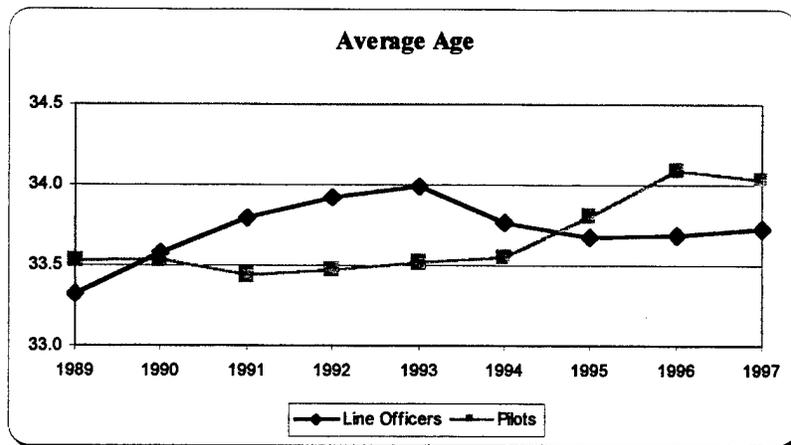
### Veteran Proportion

	1989	1990	1991	1992	1993	1994	1995	1996	1997
<b>% Line Officers</b>	8.5	9.2	9.9	9.7	10.1	8.8	9.3	9.7	9.8
<b>% Pilots</b>	7.4	8.4	8.7	7.7	8.2	7.8	8.2	8.1	7.7



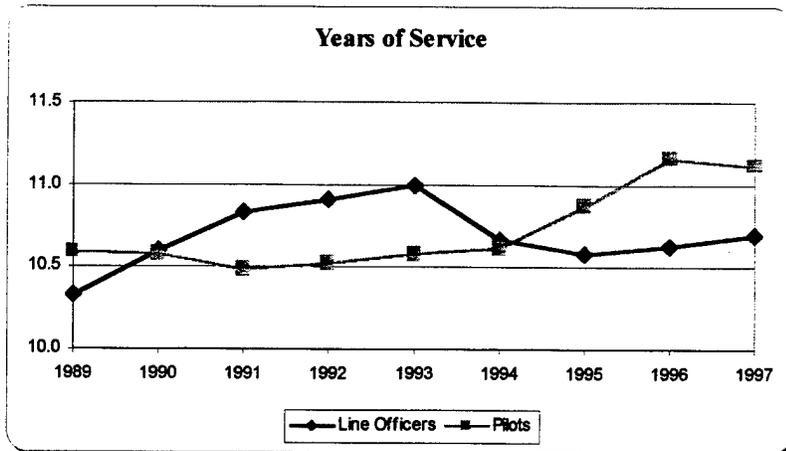
### Retention Rate

	1989	1990	1991	1992	1993	1994	1995	1996	1997
Line Officers %	30	24	29	15	10	23	20	26	25
Pilots %	19	17	13	23	15	30	39	40	24



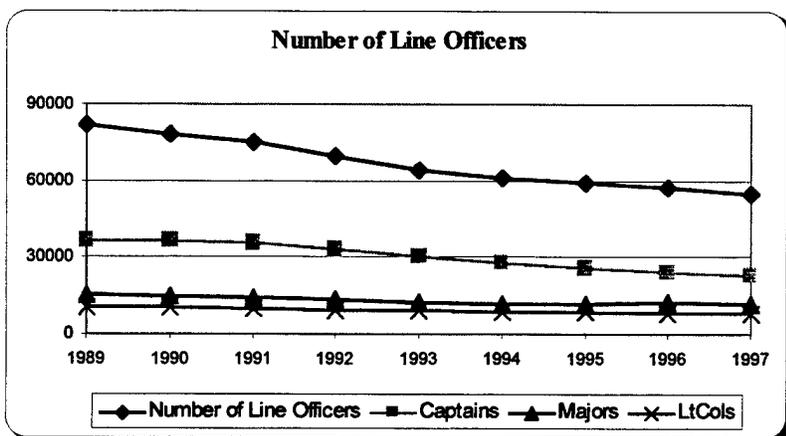
### Average Age

	1989	1990	1991	1992	1993	1994	1995	1996	1997
Line Officers	33.32	33.58	33.79	33.92	33.99	33.76	33.68	33.69	33.73
Pilots	33.53	33.54	33.44	33.47	33.52	33.55	33.8	34.09	34.03



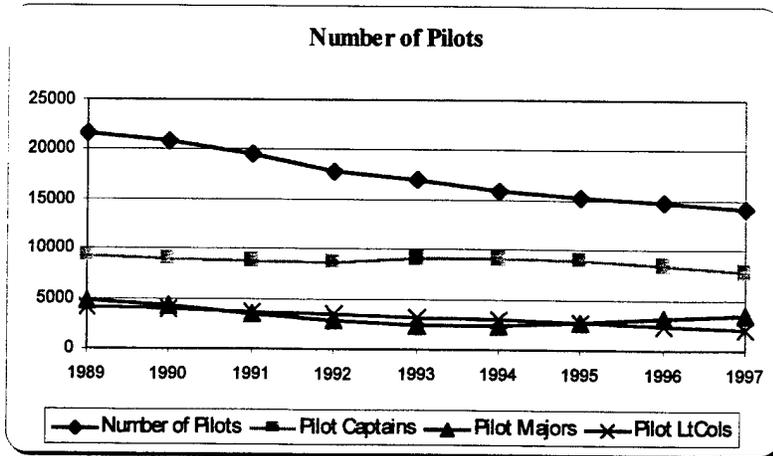
### Average Years of Service

	1989	1990	1991	1992	1993	1994	1995	1996	1997
<b>Line Officers</b>	10.33	10.60	10.83	10.91	11.00	10.67	10.58	10.63	10.69
<b>Pilots</b>	10.59	10.58	10.49	10.52	10.58	10.62	10.87	11.16	11.11

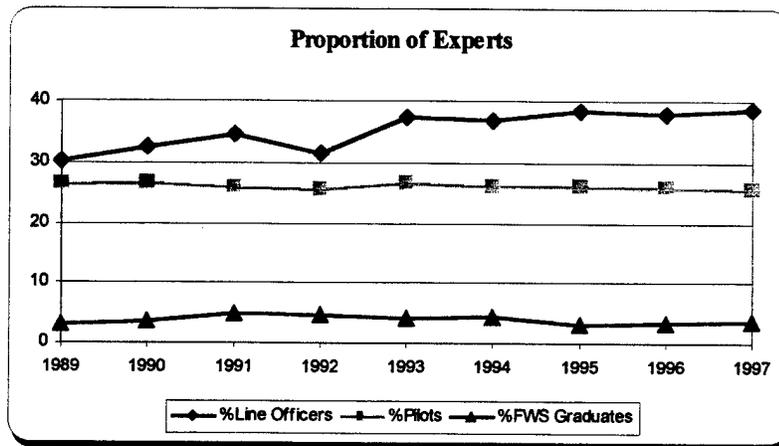


### Number of Line Officers

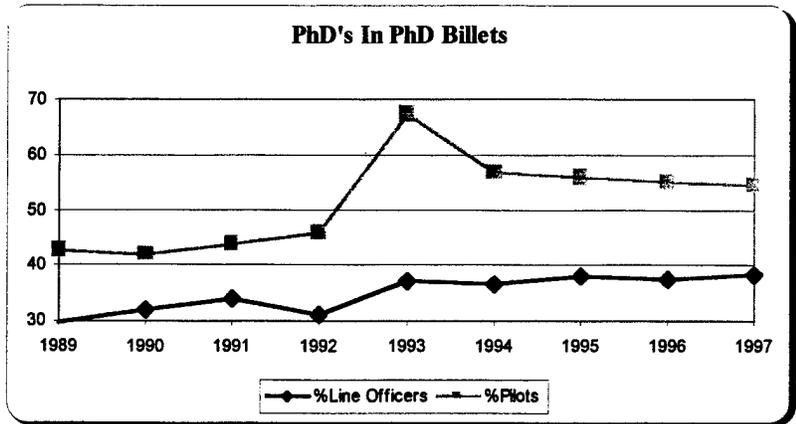
	1989	1990	1991	1992	1993	1994	1995	1996	1997
<b>Captains</b>	36677	36440	35945	33060	30018	27826	26138	24336	22929
<b>Majors</b>	15310	14847	14143	13479	12628	11926	11584	12151	11948
<b>LtCols</b>	10499	10479	9975	9488	9000	8791	8438	8301	8037



	Number of Pilots								
	1989	1990	1991	1992	1993	1994	1995	1996	1997
Pilot Captains	9220	8950	8762	8528	9064	9001	8917	8439	7832
Pilot Majors	4792	4239	3505	2812	2457	2459	2685	3201	3444
Pilot LtCols	4089	4024	3695	3468	3175	3001	2628	2371	2135

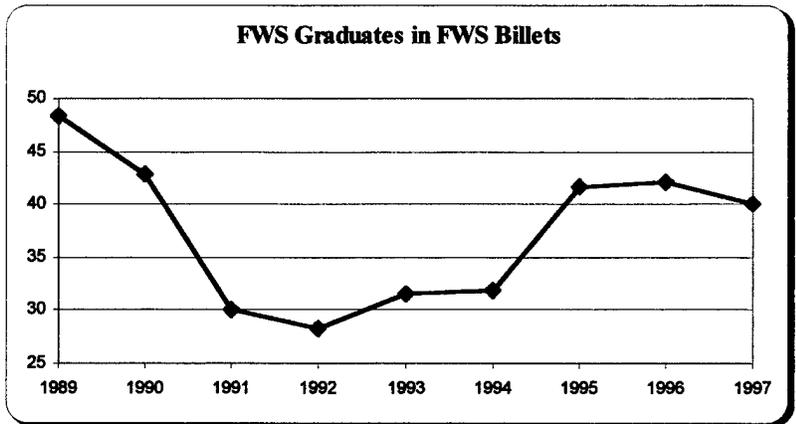


	Proportion of Experts								
	1989	1990	1991	1992	1993	1994	1995	1996	1997
%Line Officers	30.20	32.40	34.50	31.50	37.40	36.90	38.40	37.90	38.70
%Pilots	26.39	26.51	25.92	25.60	26.59	26.06	26.01	25.81	25.65
%FWS Graduates	3.04	3.51	5.00	4.77	4.22	4.34	3.19	3.40	3.66



### % of Ph.D.'s in Phd Billets

	1989	1990	1991	1992	1993	1994	1995	1996	1997
<b>%Line Officers</b>	29.79	32.02	34.02	31.29	37.30	36.62	37.95	37.56	38.24
<b>%Pilots</b>	42.62	41.67	43.86	45.95	67.50	56.82	55.81	55.10	54.55



### % FWS Graduates in FWS Billets

1989	1990	1991	1992	1993	1994	1995	1996	1997
48.30	42.80	30.10	28.20	31.60	31.80	41.70	42.10	40.00

## APPENDIX F

### Air Force Human Intellectual Capital

<i><b>Potential Education</b></i>	1989	1990	1991	1992	1993	1994	1995	1996	1997
<i>% W/Masters Degree or Better</i>									
<b>Line Officers %</b>	40.15	41.83	43.02	42.38	45.20	45.85	46.60	47.87	48.51
<b>Captain %</b>	34.09	34.79	35.95	35.74	36.80	37.80	38.77	38.55	39.76
<b>Major %</b>	76.67	78.13	79.00	80.56	82.52	82.07	83.08	84.30	85.86
<b>LtCol %</b>	89.52	90.56	91.54	91.97	92.38	92.86	93.32	94.01	94.69
<b>Pilot %</b>	38.39	37.55	35.96	34.91	34.72	34.97	37.71	41.74	45.08
<b>Pilot Captain %</b>	15.94	14.73	14.49	13.27	12.47	13.95	18.14	20.90	23.69
<b>Pilot Major %</b>	68.82	69.45	69.50	69.59	70.57	63.89	65.24	68.63	72.71
<b>Pilot LtCol %</b>	86.08	87.80	89.15	89.39	89.86	90.14	90.64	91.19	91.95
<i>% W/Ph.D.</i>									
<b>Line Officers %</b>	0.83	0.85	0.88	0.85	0.96	0.99	1.03	1.11	1.16
<b>Captain %</b>	0.30	0.33	0.35	0.33	0.39	0.40	0.41	0.32	0.38
<b>Major %</b>	1.42	1.45	1.60	1.57	1.85	1.86	2.11	2.52	2.64
<b>Lt Col %</b>	3.60	3.44	3.33	3.28	3.18	3.28	3.12	3.18	3.17
<b>Pilots %</b>	0.30	0.32	0.30	0.23	0.24	0.28	0.30	0.34	0.32
<b>Pilot Captain %</b>	0.03	0.03	0.02	0.02	0.01	0.01	0.03	0.02	0.01
<b>Pilot Major %</b>	0.21	0.21	0.34	0.21	0.33	0.41	0.34	0.41	0.35
<b>Pilot LtCol %</b>	1.27	1.34	1.16	0.92	1.01	1.10	1.29	1.48	1.54
<i>% PME in Residence</i>									
<b>Line Officers ACSC (Maj/LtCol) %</b>	17.94	18.86	18.97	19.55	20.78	20.67	21.88	21.65	22.91
<b>Captain SOS %</b>	50.89	55.42	57.49	56.97	57.56	58.69	58.85	59.31	61.73
<b>Major ACSC %</b>	10.93	11.27	10.74	10.24	11.13	9.99	12.24	14.20	15.86
<b>LtCol ACSC %</b>	28.14	29.61	30.63	32.78	34.32	35.15	35.11	32.55	33.40
<b>Pilots ACSC (Maj/LtCol) %</b>	20.28	21.67	22.86	25.02	27.04	25.84	26.01	25.34	25.18
<b>Captain SOS %</b>	41.19	46.50	47.27	46.28	46.13	48.13	53.66	57.62	62.53
<b>Major ACSC %</b>	12.69	13.92	15.09	14.12	15.75	12.00	14.00	16.87	17.19
<b>LtCol ACSC %</b>	29.18	29.85	30.23	33.85	35.78	37.19	38.01	36.78	38.06

<i>Experience</i>	1989	1990	1991	1992	1993	1994	1995	1996	1997
Foreign Country Tour by Region									
<b>Line Officers</b>	13.781	12.533	12.090	10.668	9.980	10.332	10.255	10.452	10.548
Mexico/Cent./S.America	0.423	0.396	0.387	0.420	0.470	0.531	0.558	0.539	0.415
Africa	0.015	0.013	0.013	0.009	0.021	0.008	0.008	0.005	0.007
Europe	9.190	7.989	7.906	6.677	5.630	5.752	5.684	5.733	6.016
Central Europe	0.001	0.001	0.000	0.001	0.003	0.003	0.008	0.005	0.005
Australia	0.059	0.065	0.065	0.065	0.073	0.074	0.074	0.080	0.082
Mideast	0.477	0.508	0.525	0.486	0.524	0.563	0.519	0.564	0.576
Asia	3.598	3.542	3.170	2.988	3.234	3.373	3.371	3.483	3.411
Russia	0.003	0.004	0.005	0.005	0.006	0.009	0.010	0.014	0.012
Caribbean	0.015	0.015	0.019	0.016	0.019	0.019	0.023	0.029	0.023
	<b>1989</b>	<b>1990</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>
<b>Pilots</b>	16.078	13.836	13.871	12.677	11.507	12.122	12.551	13.206	13.505
Mexico/Cent./S.America	0.510	0.449	0.311	0.470	0.591	0.677	0.716	0.602	0.445
Africa	0.037	0.024	0.025	0.022	0.030	0.013	0.007	0.007	0.021
Europe	10.110	8.228	8.712	7.267	5.694	6.177	6.458	6.654	7.173
Central Europe	0.000	0.000	0.000	0.000	0.000	0.006	0.026	0.014	0.014
Australia	0.055	0.062	0.061	0.061	0.066	0.069	0.065	0.074	0.078
Mideast	0.382	0.378	0.377	0.386	0.412	0.395	0.384	0.501	0.494
Asia	4.979	4.690	4.369	4.461	4.684	4.755	4.863	5.320	5.267
Russia	0.000	0.000	0.000	0.000	0.006	0.013	0.013	0.014	0.007
Caribbean	0.005	0.005	0.015	0.011	0.024	0.019	0.020	0.020	0.007
Foreign Country & Language	<b>1989</b>	<b>1990</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>
<b>Line Officers</b>	0.439	0.499	0.571	0.545	0.603	0.629	0.617	0.617	0.636
GERMANY	0.328	0.362	0.405	0.383	0.421	0.424	0.419	0.405	0.391
RUSSIA	0.010	0.012	0.009	0.012	0.013	0.016	0.016	0.022	0.026
CHINA	0.003	0.005	0.004	0.004	0.003	0.003	0.002	0.003	0.004
FRANCE	0.015	0.021	0.026	0.021	0.025	0.030	0.028	0.037	0.040
JAPAN	0.055	0.060	0.075	0.070	0.078	0.084	0.079	0.082	0.105
KOREA	0.028	0.039	0.052	0.054	0.063	0.073	0.074	0.068	0.070
<b>Pilots</b>	0.634	0.622	0.627	0.581	0.651	0.526	0.514	0.589	0.699
GERMANY	0.510	0.492	0.484	0.436	0.466	0.363	0.332	0.372	0.431
RUSSIA	0.028	0.014	0.015	0.011	0.018	0.013	0.026	0.027	0.028
CHINA	0.005	0.005	0.010	0.011	0.018	0.019	0.020	0.020	0.014
FRANCE	0.041	0.057	0.071	0.084	0.102	0.075	0.072	0.081	0.113
JAPAN	0.046	0.048	0.041	0.034	0.042	0.056	0.059	0.074	0.099
KOREA	0.005	0.005	0.005	0.006	0.006	0.000	0.007	0.014	0.014

<b>Joint Duty Experience</b>	<b>1989</b>	<b>1990</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>
<b>Line Officer %</b>	4.11	4.81	5.49	5.99	6.87	7.32	7.48	8.37	8.97
Line Captain %	1.03	1.02	0.96	0.85	0.81	0.73	0.56	0.62	0.70
Line Major %	9.61	10.88	12.44	13.70	15.24	14.83	14.53	15.50	15.90
Line LtCol %	16.07	18.71	22.03	25.12	27.04	30.42	32.32	34.83	38.09
<b>Pilots %</b>	3.75	4.35	5.04	5.57	5.97	6.61	6.55	7.20	7.98
Pilot Captain %	0.11	0.12	0.15	0.12	0.17	0.17	0.11	0.06	0.06
Pilot Major %	6.14	6.86	8.84	9.96	10.99	9.96	9.63	10.25	10.92
Pilot LtCol %	12.52	15.08	18.00	20.39	22.52	26.49	28.16	30.83	35.11
<b>% W/Staff Level Tour</b>									
<b>Command Staff</b>									
<b>Line Officer %</b>	14.96	14.85	16.28	17.64	18.30	18.85	18.74	18.73	18.74
Line Captain	11.04	10.34	11.87	13.01	13.17	13.11	12.60	12.19	12.49
Line Major	28.66	28.25	30.69	32.84	33.82	35.33	35.71	34.82	34.75
Line LtCol	34.09	33.53	33.51	33.21	32.90	33.36	33.16	32.76	32.49
<b>Pilots %</b>	11.62	11.42	11.71	12.81	13.08	14.14	14.87	15.30	15.50
Pilot Captain	2.02	1.77	2.19	3.47	3.74	3.44	3.16	4.19	4.72
Pilot Major	21.45	21.73	25.65	29.66	31.83	33.27	34.23	30.74	30.02
Pilot LtCol	31.50	31.86	31.66	32.55	33.45	34.79	36.23	35.98	35.13
<b>HdQtrs Staff</b>	<b>1989</b>	<b>1990</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>
<b>Line Officer %</b>	9.62	10.18	10.77	11.75	12.74	13.08	13.94	14.87	15.37
Line Captain	4.57	4.60	4.80	5.15	5.38	5.50	5.93	6.35	6.81
Line Major	17.24	18.34	20.32	22.31	24.75	24.29	25.61	25.27	25.10
Line LtCol	32.98	33.56	34.55	35.04	36.10	37.91	40.39	42.62	45.20
<b>Pilots %</b>	7.11	7.28	7.43	7.69	7.96	8.43	8.73	9.34	9.79
Pilot Captain	0.56	0.58	0.64	0.74	0.86	1.07	1.16	1.07	1.14
Pilot Major	9.97	10.45	12.24	13.30	15.10	13.54	14.90	14.93	14.31
Pilot LtCol	24.75	25.37	26.09	26.61	27.84	30.32	31.66	33.91	37.19
<b>Numbered Air Force Staff</b>									
<b>Line Officer %</b>	1.72	1.68	1.71	1.77	1.96	1.89	1.74	1.74	1.70
Line Captain	1.27	1.30	1.49	1.38	1.46	1.48	1.50	1.54	1.56
Line Major	3.40	3.22	3.14	3.20	3.72	3.70	3.24	3.01	2.99
Line LtCol	3.35	3.13	2.97	3.25	3.44	2.93	2.83	2.77	2.58
<b>Pilots %</b>	1.92	1.68	1.55	1.70	2.07	2.14	2.16	2.39	2.43
Pilot Captain	0.29	0.20	0.26	0.42	0.72	0.93	0.89	1.03	1.09
Pilot Major	3.82	3.59	3.45	3.66	5.01	5.08	4.99	4.72	4.70
Pilot LtCol	5.01	4.47	4.22	4.67	5.10	4.30	4.38	4.77	4.50

<i>Foreign Language</i>	1989	1990	1991	1992	1993	1994	1995	1996	1997
<b>% Who Speak Second Language</b>									
<b>Line Officer %</b>	4.45	4.82	5.20	4.91	5.01	5.10	5.14	5.28	5.42
Line Captain %	4.06	4.53	5.01	4.95	4.74	4.90	4.92	5.00	5.11
Line Major %	6.19	6.10	6.22	6.38	6.60	6.57	6.71	6.76	7.09
Line LtCol %	9.69	9.94	10.02	9.48	8.87	8.25	7.58	7.53	7.73
<b>Pilot %</b>	4.78	4.79	4.81	4.53	4.61	4.34	4.18	4.37	4.56
Pilot Captain %	2.09	2.26	2.51	2.43	2.42	2.41	2.72	2.87	3.18
Pilot Major %	7.01	6.39	6.22	6.26	6.47	5.86	5.42	5.87	5.87
Pilot LtCol %	12.06	12.45	12.77	11.51	11.06	9.93	8.75	8.52	8.24
<b>% Who Speak a Key Language</b>									
<b>Line Officers</b>	0.75	0.81	0.87	0.87	0.97	1.06	1.1	1.18	1.28
Line Captain %	0.37	0.41	0.44	0.41	0.45	0.48	0.47	0.49	0.5
Line Major %	0.18	0.2	0.19	0.21	0.25	0.26	0.27	0.33	0.34
Line LtCol %	0.12	0.12	0.13	0.15	0.15	0.18	0.18	0.19	0.22
<b>Pilot %</b>	0.53	0.55	0.65	0.73	0.82	0.91	0.95	1.12	1.23
Pilot Captain %	0.2	0.19	0.25	0.27	0.3	0.33	0.37	0.48	0.48
Pilot Major %	0.18	0.20	0.18	0.20	0.23	0.23	0.24	0.35	0.38
Pilot LtCol %	0.13	0.14	0.18	0.2	0.19	0.27	0.27	0.26	0.31
<b>Growth/Renewal</b>									
<b>Stability</b>									
<b>Rookie Proportion</b>									
<b>Line Officers</b>	10.6	9.5	7.8	8.3	9.2	9.8	9.6	9	8.7
<b>Pilots</b>	4.4	4	4.3	2.7	2.3	1.1	0.7	0.3	2.4
<b>Veteran Proportion</b>									
<b>Line Officers</b>	8.5	9.2	9.9	9.7	10.1	8.8	9.3	9.7	9.8
<b>Pilots</b>	7.4	8.4	8.7	7.7	8.2	7.8	8.2	8.1	7.7
<b>Retention Rate</b>									
<b>Line Officers %</b>	30	24	29	15	10	23	20	26	25
<b>Pilots %</b>	19	17	13	23	15	30	39	40	24
<b>Average Age</b>									
<b>Line Officers</b>	33.32	33.58	33.79	33.92	33.99	33.76	33.68	33.69	33.73
<b>Pilots</b>	33.53	33.54	33.44	33.47	33.52	33.55	33.8	34.09	34.03
<b>Average Years of Service</b>									
<b>Line Officers</b>	10.33	10.60	10.83	10.91	11.00	10.67	10.58	10.63	10.69
<b>Pilots</b>	10.59	10.58	10.49	10.52	10.58	10.62	10.87	11.16	11.11
<b>Growth</b>									
<b>Number of Officers</b>									
<b>Total Officers</b>	98059	94649	91402	85480	79425	76386	74012	72091	69892
<b>Number of Line Officers</b>	82130	78531	75350	69707	64051	61160	58948	57129	55097
<b>Number of Pilots</b>	21680	20819	19534	17848	17036	16045	15396	14806	14602
Captains	36677	36440	35945	33060	30018	27826	26138	24336	22929
Majors	15310	14847	14143	13479	12628	11926	11584	12151	11948
LtCols	10499	10479	9975	9488	9000	8791	8438	8301	8037
<b>Number of Pilots</b>	21675	20816	19529	17844	17032	15937	15331	14745	14133
Pilot Captains	9220	8950	8762	8528	9064	9001	8917	8439	7832
Pilot Majors	4792	4239	3505	2812	2457	2459	2685	3201	3444
Pilot LtCols	4089	4024	3695	3468	3175	3001	2628	2371	2135
<b>Number of FWS Pilots</b>	658	731	976	851	718	692	489	501	517

<b><i>Efficiency</i></b>	<b>1989</b>	<b>1990</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>
Proportion of Experts									
<b>%Line Officers</b>	83.76	82.97	82.44	81.55	80.64	80.07	79.65	79.25	78.83
<b>%Pilots of Total Officers</b>	22.11	22.00	21.37	20.88	21.45	21.01	20.80	20.54	20.89
<b>%Pilots of Line Officers</b>	26.40	26.51	25.92	25.60	26.60	26.23	26.12	25.92	26.50
<b>%FWS Grads of Total Officers</b>	0.67	0.77	1.07	1.00	0.90	0.91	0.66	0.69	0.74
<b>%FWS Grads of Line Officers</b>	0.80	0.93	1.30	1.22	1.12	1.13	0.83	0.88	0.94
<b>% FWS Grads of Pilots</b>	3.04	3.51	5.00	4.77	4.21	4.31	3.18	3.38	3.54
<b><i>Utility</i></b>									
% of Ph.D.'s in Phd Billets									
<b>Line Officers</b>	29.79	32.02	34.02	31.29	37.30	36.62	37.95	37.56	38.24
<b>Pilots</b>	42.62	41.67	43.86	45.95	67.50	56.82	55.81	55.10	54.55
% of FWS Graduates in FWS Billets	48.30	42.80	30.10	28.20	31.60	31.80	41.70	42.10	40.00

## Appendix G

### **Global Skills: Vital Components of Global Engagement**

COL Gunther Mueller, USAF Academy

#### INTRODUCTION

*Throughout my 35 years of commissioned service, I lived in a world where the good guys spoke English and the bad guys spoke Russian. Today, our world is a very different place. We live in a “global village” where information, commerce, and even CNN pay little attention to national borders...much to the chagrin of some nations who would try to keep those influences out. As technology brings our world closer, culture, tradition, and history remind us how we differ. Around the world today, we see regional, religious, and ethnic differences becoming more pronounced—and tensions mounting. We need to establish a presence throughout our force of officers proficient in foreign language and area studies—officers who can be effective in shaping events or responding to a contingency anywhere in the world with a moment’s notice.*

*Our vision for the Air Force of the 21<sup>st</sup> century is “Global Engagement.” Global Engagement mandates the capability to take immediate action—to deploy anywhere in the world—no matter how primitive the airstrip or how remote the location—in a few hours time. In our globally engaged Air Force, there’s no time for 18 months at the Defense Language Institute—we need people with language and cultural skills in place and ready... just as we need pilots and satellite controllers. I highly commend Col Mueller and Lt Col Daubach for the work they’ve done to show why we need this cadre of foreign language experts and how we plan to acquire, train, and retain them.*

General Henry Viccellio Jr.  
AFMC Commander

**“Global Skills:” Vital Components of Global Engagement**  
Just as we were ill-equipped to deal with the technological threats of the Cold War era, today we lack the linguistic and cultural skills and resources fundamental to competing in the new international environment. Sen David Boren, Chairman, Senate Intelligence Committee

## Introduction:

The United States still lacks adequate foreign language capabilities despite the best intentions (and many dollars) of the National Defense Education Act of 1958 and the similar National Security Education Act of 1991. The 1979 “wake-up call” from the Presidential Commission on Foreign Language and International Studies, calling this situation “scandalous” went unheard. According to former Congressman Leon Panetta: “The situation is no longer scandalous, as it was described, our current national situation with regard to international skills and understanding is merely appalling.”<sup>2</sup> Consistent with national trends, DOD’s foreign language and area expertise capabilities are equally appalling.

*In every war in its history, the US Army has turned to native speakers of one kind or another to meet its language needs. Each time, it was a last-minute expedient. Desert Storm was no different.<sup>3</sup>*

*In Desert Storm, all four services met their linguistic requirements in one fashion or another, yet all faced potentially crippling shortages.<sup>4</sup>*

*We had to put 500,000 American men and women in our armed services in harm’s way because our intelligence community failed to anticipate an impending military crisis ... . The lesson is clear. We need policy-makers, diplomats and intelligence analysts expert in cultures and languages that encompass all regions of the world.<sup>5</sup>*

DOD, Air Force, and other Governmental agency studies, audits, inspections, and reports have consistently criticized the dearth of foreign language and foreign area skills in the military services. A 1988 Defense Intelligence Agency assessment found that military attachés “lacked

functional language skills." A 1990 Government Accounting Office (GAO) report determined that defense language programs "did not adequately accomplish their objective in training participants to be proficient in languages." A Defense Language Institute Foreign Language Center's (DLIFLC) 1992 study found that "short courses for contingencies were of limited value for students to reach proficiency." A TIG (USAF/IG) 1991 Functional Management Inspection found that "personnel with regional knowledge or foreign language proficiency were not identified or effectively utilized," and that "language training and proficiency maintenance methods were not satisfying Air Force requirements for language capability." The DOD IG found in 1993 "incomplete and unclear plans, policies, roles, and responsibilities for managing and executing the Defense Foreign Language Program." And, a 1994 GAO report cited that "Air Force does not have a Command Language Program."<sup>6</sup>

These well-documented deficiencies during more predictable challenges bode poorly for the less predictable and far more diverse challenges of a new engagement and enlargement strategy. The USAF's "Global Engagement" vision, implementing air and space power in support of that strategy, makes a discussion of global skills relevant, timely, and necessary. For purposes of this discussion, we define "global skills" as language proficiency within a cultural and regional context.

## Former Security Environment—Old Paradigm for Language Skills

DOD Cold War era language training efforts mirrored the prevailing containment strategy and focused on potential adversaries' language.

*Our unfortunate experience has been that foreign language capability in the American armed forces has been restricted primarily to only one sphere of military activity. The military significance of foreign language competence is pigeonholed into the category of military intelligence - strategic and tactical.<sup>7</sup>*

Military language programs reflect the American mindset on language skills, which accounts, in large measure, for our national failure in the language and area studies arena. Unlike most other nations, we Americans have traditionally attributed a “short-term, mechanical value to foreign languages” and we neither understand nor appreciate, and therefore do not accept, the language and culture relationship. A 1989 survey of 32 American international business leaders, for example, found that these leaders believed that:

- language is divorced from its cultural context
- cross cultural understanding is important for doing business in the global economy, but few considered foreign language as a key element in this understanding
- foreign language was not a problem since it could be “managed” - when needs arose, appropriate skills would be located<sup>8</sup>

Relying on the “managed” model, the military has scrambled in contingencies to “locate” the necessary skills in groups as diverse as Kuwaiti exchange

students and New York City and Washington DC cab drivers. Because military leaders have accepted this “short-term, mechanical” view of language skills, and because we have been able to “manage” this problem, we largely ignore language maintenance programs.

*While it takes longer to acquire minimal competence in a language than to train for most military occupations, there is less opportunity for and less emphasis placed on, the maintenance of the more expensive skill.<sup>9</sup>*

The misguided American mindset on foreign language skills also drove us to the prevailing “just-in-time” language training model used throughout government. While we successfully “managed” our way through the Cold War and through recent contingency operations, this model is destined to fail in a long-term engagement-oriented National Security Strategy.

### **New Security Challenges, New Missions, New Strategy, New Skills**

In Global Engagement: A Vision for the 21st Century Air Force, the USAF leadership profoundly and directly redefines the AF mission in light of a new international security arena and states that “the ability of the Air Force to engage globally, using both lethal and non-lethal means is vital to today’s national security of engagement and enlargement. At present almost a quarter of USAF personnel are deployed overseas at any one time.”<sup>10</sup> Humanitarian/peacekeeping/peace enforcement missions, security assistance,

coalition building and maintenance, treaty enforcement, and drug interdiction account for many of these deployments. Rooted in the political, economic and military realities of emerging global security concerns, the Air Force's new strategic vision is cogent and compelling.

Moreover, implied, but not stated in the vision is an unprecedented need for "global skills" to enhance the engagement process and to support the shift from Cold War to "Global Engagement" strategies. Purely mechanical language skills that served - albeit poorly - strategic and tactical intelligence purposes, for example, will not serve the broader requirements of emerging "engagement" strategies. As Samuel P. Huntington has most recently pointed out: "In the post-Cold War world, the most important distinctions between peoples are no longer ideological, political, or economic. The distinctions are cultural."<sup>11</sup> Future Air Force leaders must recognize the importance of these cultural distinctions in order to implement effective engagement strategies, especially at lower levels. In a bygone era, Air Force people raining down fire and steel had few motives for cross-cultural understanding. In the future, a lack of cross-cultural perspective will, at best, create obstacles to "Global Engagement" and, at worst, lead to disengagement and isolation fostering the kind of regional instability we seek to combat.

As the only true super power in today's multi-polar world, the United States is the only power with a national identity, clearly defined in political and economic values, capable of exercising international primacy and

influence.<sup>12</sup> For the Air Force, in the late 1980s and early 1990s, building U.S. influence meant controlling and policing former Soviet client-protectorates turned regional renegade. A National Security Strategy paradigm shift began for the USAF with "forward presence," "global reach," and "global power projection" supplanting age-old Cold War, forward-based nuclear readiness posturing.<sup>13</sup>

DOD's 1993 Bottom-Up Review (BUR) framed the baseline for the further evolution of our National Security Strategy paradigm.<sup>14</sup> It remains today the doctrinal underpinning of the JCS's Joint Vision 2010 and the Air Force's new strategic vision. The BUR is clear on DOD's core values: the promotion of democratic governments and human rights, the peaceful resolution of regional conflicts, and the maintenance of open international economic markets stand at the heart of Defense Guidance. Moreover, the U.S.'s National Security Strategy hinges on expanded political, economic, and military engagement around the world. And, according to the BUR, our "Global Engagement" must be conducted within a two-fold goal: reducing dangers to our national interests (threat prevention) and enlarging international cooperation (partnership) for freedom and peace.<sup>15</sup>

DOD's commitment to "Global Engagement" as a National Security Strategy acknowledges that U.S. military forces will increasingly be called upon for operations short of war such as peacekeeping and peace enforcement.<sup>16</sup> Furthermore, OSD posits that "defense by other means," namely targeted economic aid, cooperative military education and training,

and robust military-to-military contact programs, fosters mutual understanding and cooperation through engagement. Finally, the BUR establishes several "Global Cooperative Initiatives." In addition to cooperative international threat reductions and counterproliferation programs, the U.S. military is seen as having an increased role in providing humanitarian assistance and disaster relief to counter the rise of regional instabilities which could lead to armed conflicts.<sup>17</sup> In short, our National Security Strategy employs U.S. military forces in an unprecedented global way to which this decade's military deployment record and operations tempo bear witness.

Flowing from our "new National Security Strategy," Global Engagement: A Vision for the 21st Century Air Force, recognizes the changing global security environment, with CONUS-based force projections, unpredictable missions, and constabulary-humanitarian roles becoming the operational norm. Moreover, the strategy mandates that the Air Force's future lies in a capability for "immediate action, operations in non-traditional environments" and the capacity to operate "as partners in regional (coalition) operations."<sup>18</sup> Clearly, many of these operations will be in non-English speaking regions and with non-English speaking coalition partners making a level of global skills mission essential.

### Implementing A New Plan

Recognizing the need to review the Air Force's foreign language

capabilities, the Air Education and Training Command Commander and Air Force's Deputy Chief of Staff for Personnel commissioned a 13-agency Total Force Process Action Team (PAT) in 1994. The PAT's report was completed in December 1995 and many of the team's recommendations were endorsed by the Air Force leadership in early 1996. Some of the recommendations have already been implemented, others are currently in Air Staff coordination. According to a 4 November 1996 Air Force Times article,

*“Increased deployments overseas, whether for war or peacekeeping, have the Air Force taking new stock in the foreign language capabilities of its members.”<sup>19</sup>*

The Foreign Language Skills PAT suggested one over-arching consideration and thirty-one specific recommendations falling into four broad categories. First and foremost: foreign language/foreign area skills are just that--skills required to do Air Force missions in the 21st century. No new Air Force specialist--enlisted or officer--career field should be created from which linguists could be plugged into contingencies. That's not the nature of "Global Engagement." And, everybody doesn't need to be a linguist--that's overkill for many Air Force people with a growing myriad of technical and professional responsibilities. Instead, a fresh look at the missions of engagement and a commensurate change in the Air Force attitude regarding these skills will best serve our needs.

Specifically, foreign language/area skills must be developed--over the long haul, not overnight--as necessary tools for the Total Force. It is difficult

to incorporate a “skills development” model in a “requirements-based” training system wherein the requirements cannot be predicted accurately. The “create ‘em overnight” tactic is no solution and contributes to the problem. To meet the long-term needs of our engagement strategy, the PAT proposed building a pool of resources across all USAF specialties in the Total Force. Moreover, by carefully tracking and managing language-skilled Air Force people, we can reduce unnecessary training costs. Again, new missions = new thinking. Within expected funding constraints, a “pool-building” model would likely serve us better than the traditional requirements-based model.<sup>20</sup>

To that end, the PAT also made specific recommendations in four general areas:

- **Identify and Track** the skills we already have and those coming through the accession door. Currently, the system only tracks those members who have taken the Defense Language Proficiency Test (DLPT): personnel who demanded to be tested, those who fill a language designated position and those who graduated from the Defense Language Institute. From the PAT-recommended Foreign Language Self Assessment (FLSA) survey, completed in November 1996, of all Active, Guard and Reserve members, AFPC identified over 72,000 people with skills in 207 languages or dialects. Conclusion: The FLSA identified new language resources enabling rapid identification of individuals with language capabilities to respond to mission needs. Clearly, this new data base will help to identify personnel for special

training, assignments, and contingencies.<sup>21</sup>

- Our foreign language "just-in-time" training model is all wrong. Language proficiency comes with time. We simply cannot train people quickly to be proficient in a foreign language--for hard languages we cannot even do it in two, three, or more years. "Just-in-time" language training follows a "requirements-based planning" model that just does not fit. For example, AFPC has a "requirement" for somebody with foreign language skills for a normal assignment rotation and reviews the force for verified DLPT scores. In rare cases, a person with the skills (except few are known) volunteers and the mission is complete--warm space, warm face. More often, a volunteer or non-volunteer is sent to "just-in-time" training, then reports to the assignment unable (non-proficient) to speak the language. Mission complete--warm space, wrong face. It's even worse in a contingency--hot space, no face--there's no such thing as "just-in-the-nick-of-time" language training. Instead we must change the model to **Find Them if We Can, Train Them Only if We Must**. That means homegrown foreign language skills from the accession points. We must consider these skills as part of the accessions decisions and create incentives for those members who have the skills. It is far more sensible, effective and efficient to identify language proficient people at the door than to train them years later.<sup>22</sup>

- But homegrowing is useless if we don't homegroom. We must **Maintain and Use** the foreign language skills of Air Force people. We need robust Base Education Office foreign language maintenance resources and

undergraduate and graduate academic degree programs in foreign languages and foreign area studies. We need Command-sponsored foreign language immersion programs, and a flexible and responsible personnel assignment system where in-every-other-way-qualified people, who have language skills, get priority for foreign language related assignments.<sup>23</sup>

- Finally, we must **Create and Support Institutional Incentives** for Air Force people to identify, acquire, and maintain foreign language/area skills. We must explore monetary increases in Foreign Language Proficiency Pay, with parity in pay for ARC personnel, and bonuses for successive years of higher DLPT scores. We need to give assignment priorities to language-qualified people for foreign locations. And,--this is an emotional one--we should look at factoring language proficiency into the promotion process.<sup>24</sup>

Taken at face value, Global Engagement: A Vision for the 21st Century Air Force guarantees a future for more and more Air Force people acting as USAF ambassadors, interfacing with other nations for the good of our country's national objectives. This means change is in the air for the Air Force. Of course there will be resistance to this change, and some of it will come from the top. With 11 serving General Officers (out of 300 in the active Air Force) and 185 Colonels (out of 4000) operationally fluent in a foreign language,<sup>25</sup> the importance of the yet another capability and demand on our Air Force people is bound to be questioned. But Global Engagement: A Vision for the 21st Century Air Force is exactly about change, and, by 2025, a new Air Force crew, highly capable of dealing in a new Air Force culture, will

never doubt that "Global Engagement" requires "Global Skills."

#### Endnotes

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## **Appendix H**

### **The Goldwater-Nichols Department of Defense Reorganization Act of 1986**

Excerpt from Chapter 2: Title IV Synopsis from a research paper presented to the Directorate of Research Air Command and Staff College by Major Kevin G. Boggs, Major Dale A. Bourque, Major Kathleen M. Grabowski, Major Harold K. James, and Major Julie K. Stanley in May 1995.

#### **THE GOLDWATER-NICHOLS DEPARTMENT OF DEFENSE REORGANIZATION ACT OF 1986: AN ANALYSIS OF AIR FORCE IMPLEMENTATION OF TITLE IV AND ITS IMPACT ON THE AIR FORCE OFFICER CORPS**

Title IV provisions follow:

- Establishes an occupational category, referred to as the 'joint specialty' for the management of officers who are trained in and oriented toward joint matters
- Provides that joint specialty officers (JSO) shall be selected by the Secretary of Defense (SecDef) from nominees submitted by the Secretaries of the Military Departments
- Requires that an officer may not be selected for the joint specialty until a program of joint education and a full joint tour are completed
- Requires 50 percent of joint duty positions in grades above captain/Navy lieutenant be filled by officers who have been nominated or selected for the joint specialty
- Directed the SecDef to designate at least 1,000 critical joint duty

assignments (JDA) that must always be filled by JSOs

- Requires the SecDef to establish career guidelines for JSOs
- Requires, subject to a waiver by the SecDef, that all officers promoted to general or flag rank must attend an education course (CAPSTONE).
- Requires all JSOs and a high proportion of other officers who graduate from a joint school to be assigned immediately to a joint duty position
- Prescribes, subject to a waiver by SecDef, that joint duty tours shall be at least 3 years in length for general and flag officers and at least 3 1/2 years in length for other grades
- Requires the SecDef to exclude joint training assignments and assignments within the Military Departments in the definition of 'joint duty assignments'
- Specifies that each promotion board, subject to a waiver for the Marine Corps, that will consider officers who have served in JDAs shall include at least one joint duty officer designated by the Chairman, Joint Chiefs of Staff (CJCS)
- Establishes the following review process for promotion boards considering officers: requires the SecDef to furnish to the Secretaries of the Military Departments guidelines to ensure that promotion boards give appropriate consideration to joint duty performance
- Directs the CJCS to review promotion board reports before they are submitted to the SecDef;

- Authorizes the Secretary of a Military Department, if the CJCS determines that the promotion board acted contrary to SecDef guidelines, to return the report to the promotion board for further proceedings, convene a special promotion board, or take other appropriate actions
- Directs the SecDef to take appropriate action to resolve any remaining disagreement between the Secretary of a Military Department and the CJCS
- Requires the SecDef to ensure the qualifications of officers assigned to JDAs (to include JSOs not serving-in JDAs) are such that certain promotion rates will be achieved
- Requires, subject to SecDef waiver, that an officer may not be promoted to general or flag rank unless he has served in a JDA
- Requires the CJCS to evaluate the joint duty performance of officers recommended for three- and four-star rank
- Requires the SecDef to advise the President on the qualifications needed by officers to serve in three- and four-star positions

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## Vita

Major Thomas J. Wagner was born on 13 February 1957 in San Marino, California. He graduated with a Bachelor of Science degree in Operations Research from the United States Air Force Academy in 1981. His first assignment was pilot training at Vance AFB in Oklahoma followed by a tour at Sembach Air Base, Germany, as an OV-10 Bronco pilot where he also maintained airborne jump status as an air liaison officer for the Army. His next assignment was at George AFB, California, as an OV-10 instructor pilot. In 1986, he moved to Kadena Air Base, Japan, where he flew as an F-15 instructor and Standardization and Evaluation (SEFE) pilot. His next assignment was at Holloman AFB, New Mexico, as an AT-38 instructor pilot, flight commander in three squadrons, and wing executive officer. Next, he studied Spanish at the Defense Language Institute in Monterey, California, before moving to Mendoza, Argentina, as an exchange officer with the Argentinean Air Force. From 1993 to 1996 he flew the Argentinean IA-63 Pampa jet as an instructor pilot and SEFE. In August 1996, he entered the School of Science and Engineering, Air Force Institute of Technology. Major Wagner is married to the former Leslie Ann Clary and together they have two sons, Tommy and Hunter.

Permanent Address: 1910 Sycamore Dr.  
San Marino, CA 91108

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13. ABSTRACT (Maximum 200 words) <p>For centuries, companies used basically the same accounting system developed in the fifteenth century to measure economic performance. Through much of this period the tangible value of a firm, its plants, property and equipment, was closely related to the market value of the firm. With the dawning of the information age, America has evolved from a manufacturing based economy to a service oriented economy. Closely related to this change from a blue collar to white collar workplace has been the widening gap between the market value of a company and its tangible assets. Roughly equal before, now the tangible assets may represent as little as ten percent of the market value of a company. This difference in value between the tangible assets and the market value represents the value of the intangible assets. Many people define the intangible assets of a company as its intellectual capital. Since the intangible assets might represent ninety percent of the value of the firm, investors and managers alike are seeking ways to define and measure these assets.</p> <p>The Air Force, in many ways, is similar to a large corporation. It deals with budgets, rapidly changing world environments, performance expectations, retention, training and similar concerns. The Air Force reduced the officers in the active duty force from 98,059 in 1989 to 69,892 in 1997. This research addresses the affect of the draw-down on the USAF's intellectual capital. The uniqueness of the military is discussed and measures are developed specifically for the Air Force. The measures developed for the Air Force are evaluated for the years of the military draw down and conclusions are made based upon the results.</p>				
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