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THESIS

BRINGING COST-WISE READINESS TO THE DECKPLATES OF A STRIKE FIGHTER SQUADRON USING THE BALANCED SCORECARD

by

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December 2013

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Budgetary pressures make it difficult for Naval aviation leaders to balance operations, procurement, and personnel to maintain appropriate levels of readiness to meet the demands of combatant commanders. The Naval Aviation Enterprise has had success in reducing the cost of Naval aviation, but operational squadrons are not systematically included in those efforts. This thesis explores how Naval aviation stakeholders define success for Navy strike fighter squadrons and develops a balanced scorecard that can align squadron success factors with the Commander, Naval Air Force's mission of "…delivering the right force with the right readiness at the right time with a reduced cost...." Providing objectives, performance measures, and targets in a balanced scorecard framework will enable squadrons to reduce operating costs without sacrificing effectiveness or readiness.

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Budgetary pressures make it difficult for Naval aviation leaders to balance operations, procurement, and personnel to maintain appropriate levels of readiness to meet the demands of combatant commanders. The Naval Aviation Enterprise has had success in reducing the cost of Naval aviation, but operational squadrons are not systematically included in those efforts. This thesis explores how Naval aviation stakeholders define success for Navy strike fighter squadrons and develops a balanced scorecard that can align squadron success factors with the Commander, Naval Air Force's mission of "…delivering the right force with the right readiness at the right time with a reduced cost...." Providing objectives, performance measures, and targets in a balanced scorecard framework will enable squadrons to reduce operating costs without sacrificing effectiveness or readiness.

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LIST OF ACRONYMS AND ABBREVIATIONS

ACES	aviation cost evaluation system
AFAST	aviation financial analysis system
ATR	average training readiness
CDB	career development board
CEP	circular error of probability
CNAF	Commander, Naval Air Forces
CNO	Chief of Naval Operations
CPI	continuous process improvement, cost performance index
DRRS-N	defense readiness reporting system-navy
FHP	flying hour program
FOD	foreign object damage
FRTP	fleet readiness training plan
GFM	global force management
MPR	maintenance personnel readiness
NAE	Naval Aviation Enterprise
NALCOMIS	Naval aviation logistics command management information system
NAMP	Naval aviation maintenance program
NATOPS	Naval aviation training and operating procedures
NAVAIR	Naval air systems command
NEC	Naval enlisted classification
NSAWC	Naval strike and air warfare center
NTA	Navy tactical task
QA	quality assurance
QPT	qualified proficient technician
RFT	ready for tasking
SFWT	strike fighter weapons and tactics
TFOM	training figure of merit

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I. INTRODUCTION

> While we hone our individual, unit and family readiness, we have to deal with diminishing resources. We must adopt and embrace a culture of fiscal responsibility and judiciousness. We must be ready and willing to make analytically sound, hard choices in the months and years ahead. Further, we must also look at innovative ways of maintaining our forward deployed and ready posture, while seeking efficiencies and reducing costs when we can. (Adm. Jonathan W. Greenert, Chief of Naval Operations)

With the conclusion of operation IRAQI FREEDOM and the impending end of operation ENDURING FREEDOM, America is entering the post-conflict cycle of budget cuts and force reductions. This time, however, the U.S. Navy finds itself in a situation different from wars past. Despite being a leaner force with fewer ships and personnel than it had on September eleventh, the demand for Naval presence and Naval aviation is not expected to subside in step with its budget authority. With limited transfer authority and the indiscriminate cuts of the Budget Control Act, the operations and maintenance accounts are being crowded out and constricted. Navy leadership must find a way to reduce operating costs while preserving readiness and capability. That effort will be no small task and success will literally require an all-hands effort.

Strike fighter squadrons have focused primarily on effectiveness since 2001; now leaders must ask them to consider efficiency and cost reduction. Reducing operating costs while avoiding negative effects on readiness and safety will require careful balance. The organizational change required to introduce cost into the conversations of how to best manage a squadron can be accomplished with the clear translation of leadership's vision into squadron personnel action. Goals at all levels will need to be set, progress will need to be measured, and feedback will be required to adjust the plan. All of these elements must be coordinated and aligned to ensure success. This thesis proposes using the balanced scorecard to bring Commander, Naval Air Force's mission of the "right readiness at a reduced cost" to the deckplates of strike fighter squadrons without sacrificing effectiveness.

The following sections provide context to the operating environment of strike fighter squadrons. The background begins with the strategic guidance of Navy leadership followed by a description of the flying hour program and execution guidance for strike fighter squadrons. The next sections discuss the role of the Naval Aviation Enterprise and the various cost analysis tools and cost saving initiatives. The last sections describe two prominent performance measure systems that drive squadron behavior and are necessary for framing the research and adapting the balanced scorecard.

A. BACKGROUND

1. Naval Aviation Strategic Guidance

Recent guidance issued by the Chief of Naval Operations (CNO) and the Commander, Naval Air Forces (CNAF) illustrates the challenges that lie ahead for Naval aviation. Their descriptions of fiscal pressure and its effects on managing the force mark a change to the environment that has prevailed since 2001. Meeting commitments in this new environment will not be easy. In his Navigation Plan, the CNO (2013) acknowledges the increasing fiscal constraints:

> We are evaluating adjustments to our FY2014 budget due to the potential for a continuing resolution and the onset of sequestration. This will challenge our ability to sustain some of the warfighting investments, forward presence and readiness described below. Regardless of reductions, we will continue to operate forward with ready forces, where it matters, when it matters. I will update this Navigation Plan if our course changes substantially and will issue a position report based on a "fix" later this year.

Despite impending fiscal constraints, the CNO (2012) holds that the following three tenets be applied to every decision:

- Warfighting first—Be ready to fight and win today, while building the ability to win tomorrow.
- Operate forward—Provide offshore options to deter, influence and win in an era of uncertainty
- Be ready—Harness the teamwork, talent and imagination of our diverse force to be ready to fight and responsibly employ our resources.

The three tenets are further reinforced by his first two guiding principles:

- Our primary mission is warfighting. All our efforts to improve capabilities, develop people, and structure our organizations should be grounded in this fundamental responsibility.
- People are the Navy's foundation. We have a professional and moral obligation to uphold a covenant with Sailors, civilians and their families—to ably lead, equip, train and motivate.

The Commander of Naval Air Forces is responsible for the funding, manning, resourcing, and training of Naval aviation forces to support combatant commanders' operational requirements. CNAF's mission statement is:

> Naval Air Forces' mission is to man, train, equip and maintain a Naval air force that is immediately employable, forward deployed and engaged. We support the fleet and unified commanders by delivering the right force with the right readiness at the right time with a reduced cost…today and in the future.

In February, 2013 CNAF issued the Naval Aviation Enterprise Strategic Guidance, 2013–2014. In it, he acknowledges the effects of an increasingly austere fiscal environment on Naval aviation.

> Operational demand for Naval aviation forces for the foreseeable future will hold steady or increase because of the value these forces bring to the fight. Juxtaposed with that fact, Naval aviation is operating in a resource constrained environment where we must balance the needs of the Navy and Marine Corps with the realities of a budget reflecting the country's deficit and rising debt. Naval aviation faces an estimated $3.5B operations and support (O&S) shortfall between FY13 and FY19. It will take a 15% reduction in total O&S costs to close this gap. An effort of this magnitude must include a dynamic O&S cost reduction strategy, a renewed emphasis on "cost-wise readiness" and a demanding "should cost" perspective across the NAE. This gap closure strategy must address not only flying hour cost but all element of O&S cost.

CNAF's gap closure strategy included the following action:

> Reduce the overall flying hour program cost per flight hour across all type model series by ten percent. Aggregate execution index of 1.1 across all TMS [type/model/series] is the goal. Specific TMS CPFH [cost per flight hour] goals will be established according to the TMS life cycle position, with newer TMS platforms having the most potential to realize CPFH savings.

Meeting all operational requirements within the current fiscal environment presents a challenge to all Navy units. The tone of urgency within the most recent statements and the clear need for creative solutions provided inspiration for this thesis.

To fully appreciate how far one must go to realize CNAF's vision, it is important to understand the current cost elements of the Navy's flying hour program budget. It is also important to identify current guidance given to strike fighter squadrons as they execute their portions of the budget.

2. Navy Flying Hour Program

The following sections provide a simplified overview of how the navy flying hour program (FHP) relates to the costs of strike fighter squadrons.

The FHP is a budgetary instrument which translates force requirements into readiness requirements, then into flight hour requirements, and finally into budgetary resources for Naval aviation. The FHP receives funding from the operations and maintenance, Navy (OMN) appropriation account and supports three mission areas: tactical air, fleet air training, and fleet air support (Jarvis, 2006).

Formulating a budget to support the FHP requires the input of required flight hours for each mission area. The Navy uses the flying hours requirements model depicted in Figure one to determine the total cost of the FHP (CBO, 2012).

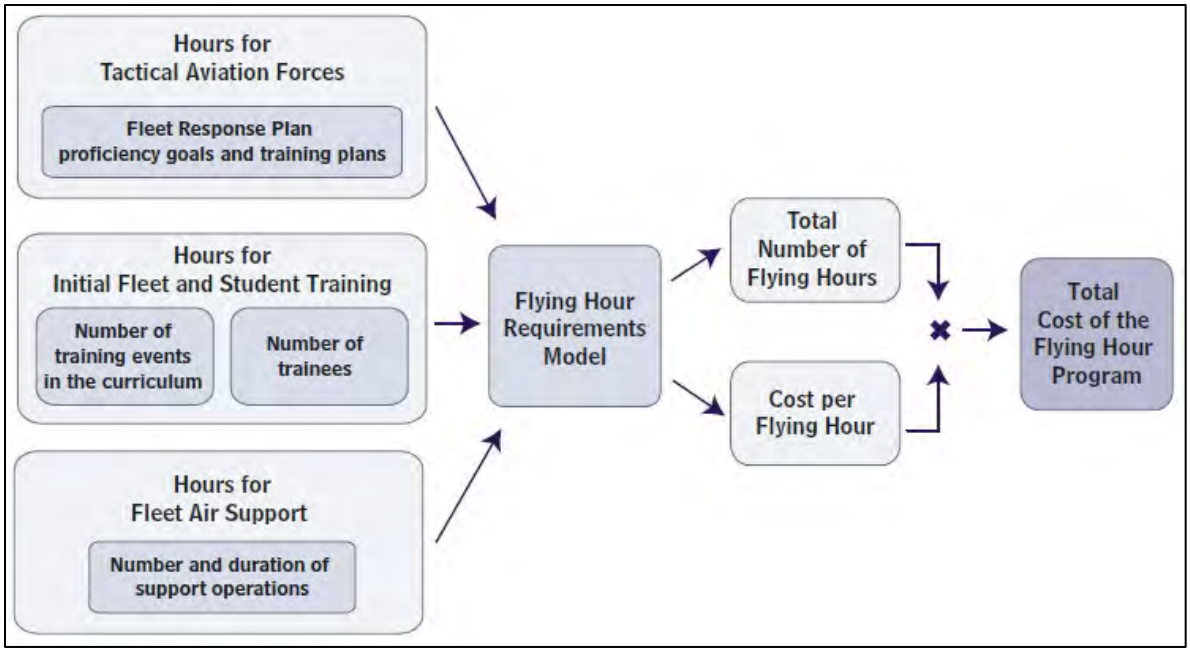

Figure 1. Flight Hour Requirements Model (from CBO, 2012)

The number of flight hours for tactical aviation is ultimately driven by the global force management allocation plan (Bouyer, 2013). This Department of Defense process, managed by the Joint Chiefs of Staff, takes the validated presence requirements of the combatant commanders in the unified command plan and creates a schedule for all military forces worldwide (Joint Forces Staff College, 2012). U.S. Fleet Forces command and U.S. Pacific Fleet implement the fleet response plan to manage Naval assets to meet the global force management (GFM) demands (OPNAV, 2006). The fleet response plan drives the deployment cycles of aircraft carriers and the readiness levels of Naval forces within the plan (OPNAV, 2006). The Commander of Naval Air Forces then develops the master aviation plan which translates the global force management plan into a schedule specific to carrier air wings and forward deployed Naval air forces (Bouyer, 2013). CNAF coordinates with U.S. Fleet Forces Command to manage the readiness levels of aviation forces required to meet the needs of combatant commanders. The fleet readiness training plan (FRTP) provides a 27 month schedule of readiness standards, funding levels, and training milestones to ensure the appropriate capabilities are provided to

combatant commanders (CNAF, 2012b). The proximity of a particular unit to its deployment date will dictate where it lies within the FRTP. Figure 2 illustrates the GFM to FRTP process.

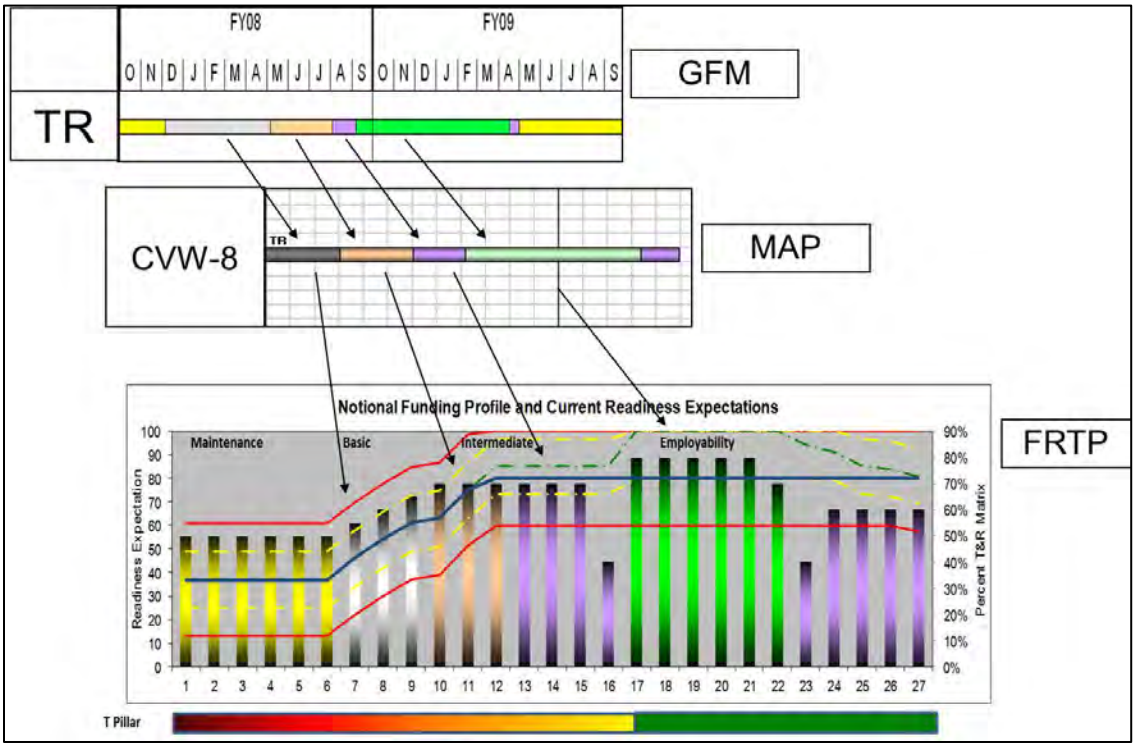

Figure 2. Translating Force Requirements to Flight Hours (from CNAF N40B1, 2012)

Each month in the FRTP, known as an R+Month, has an associated readiness expectation (left margin in the bottom pane of Figure 2), and an expected percentage of funding (right margin in the bottom pane of Figure 2). Each R+Month has a standard number of flight hours associated with its readiness expectation. The FRTP is the element of the FHP that translates strike fighter squadrons' readiness requirements into flight hour requirements (CNAF N40B1, 2012). The FRTP translation of readiness to flight hours puts the focus on flight hour execution. Meeting combatant commanders' needs means having the right level of readiness to successfully carry out the unit's mission (CJCS, 2010). Readiness is driven by flight hours under the assumption that the more one flies, the more capable (ready) one becomes. Readiness is purchased through flight hour execution (Bouyer, 2013).

With the number of flight hours known based upon all the units' positions within the MAP, the FHP uses the cost components in the flying hour requirements model to calculate a cost per flight hour (CBO, 2012). The cost components are aviation depot level repairables, aviation fleet maintenance (also known as maintenance consumables), fuel, and maintenance contracts (CBO, 2012). The calculations can be seen in Figure 3. Another cost component to the FHP is "funding other" which includes indirect expenses in support of training and operations (Glenn & Otten, 2005). "Funding other" is not specifically programmed within the FHP and is allocated to cost per hour across the other components in the aviation cost evaluation system and aviation financial analysis system (Glenn & Otten, 2005).

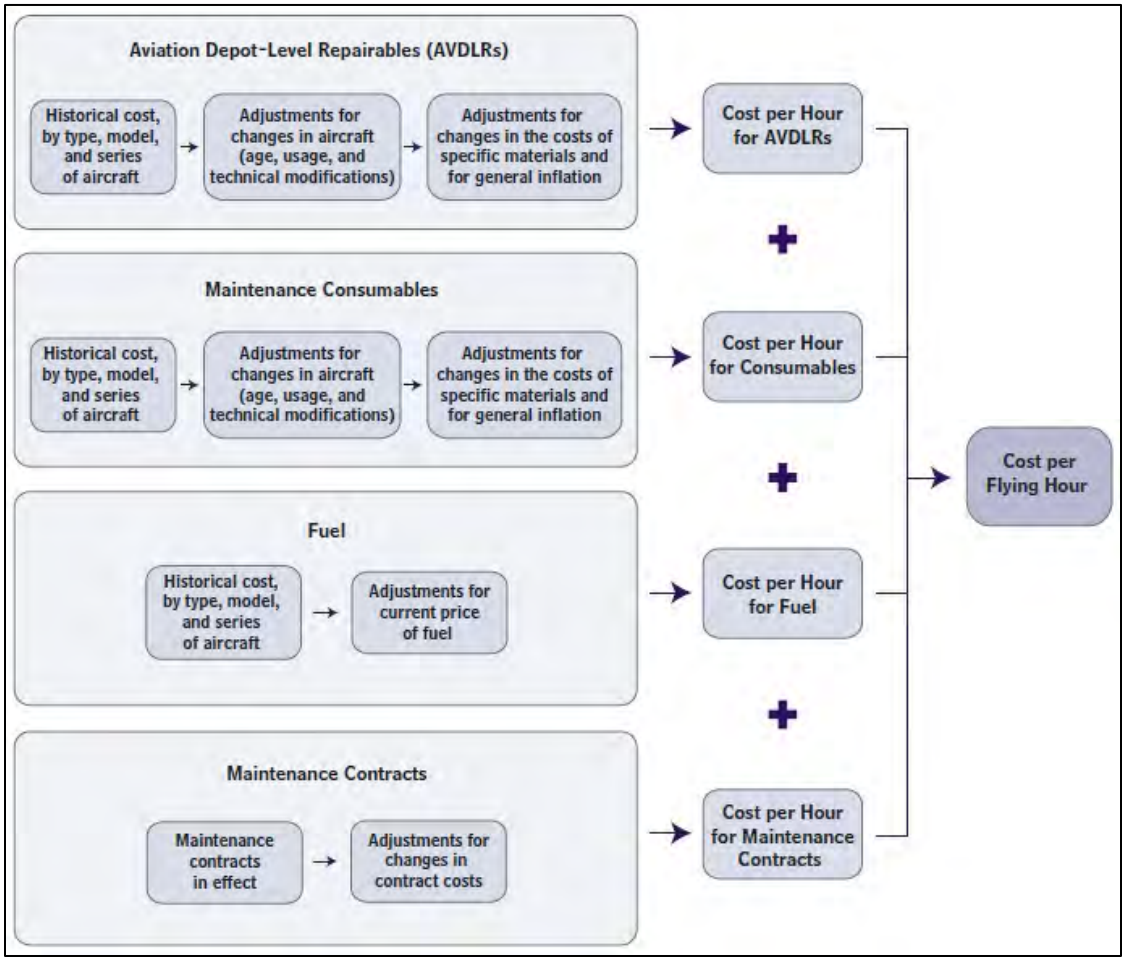

Figure 3. Components of Cost per Flying Hour (from CBO, 2012)

The final step of translating the force requirements to budgetary resources involves multiplying the required flight hours with the calculated cost per flight hour (Figure 3). This process yields the OP-20 budget exhibit which serves as primary programming and execution guidance for the FHP (Glenn & Otten, 2005).

The OP-20 budget exhibit sets the funding levels for the four budget submitting offices associated with the FHP: Commander Pacific Fleet, U.S. Fleet Forces Command, Commander, Naval Forces Europe, and Commander Naval Reserve Forces (Glenn & Otten, 2005). OMN funds are allocated to the budget submitting offices who further allocate funding to their subordinate type commands (e.g., Commander, Naval Air Forces Pacific and Commander, Naval Air Forces Atlantic) (Jarvis, 2006). Commanders, Naval Air Forces Pacific and Atlantic use the OP-20 to determine the operational targets and grants allocated to each squadron within a type wing or carrier air wing (Glenn & Otten, 2005).

Operational targets are divided into two operational functional categories: aircraft flight operations (OFC-1) and aircraft operations maintenance (OFC-50). Squadrons receive grants each quarter establishing specific funding levels for fuel (funding code 7B in OFC-1), administrative and flight equipment (funding code 7F in OFC-1), and flight hours (Jarvis, 2006). Squadrons are responsible for managing the precise expenditure of their operational targets in OFC-1 (CNAL, 1999). Squadrons are required to submit a budget operational target report to their type commander each month (CNAL, 1999). This report details the squadron's executed flight hours and expenditures for 7F and 7B coded funds. Squadron charges in OFC-50 for aviation depot level repairables and aviation fleet maintenance are entered into the Naval aviation logistics command management information system (NALCOMIS) by squadrons and fleet readiness centers (intermediate and depot maintenance facilities)(CNAF, 2013b). Squadrons are not given specific operational targets for aviation fleet maintenance or aviation depot level repairables costs, nor do they directly track or manage OFC-50 expenditures (CNAL, 1999).

While strike fighter squadrons must precisely track and manage their operational targets, they are only held accountable for the execution of flight hours (Bouyer, 2013). Figure 4 is a slide from a PowerPoint presentation given by the Commander, Naval Air

Forces Pacific flight hour program manager. This presentation is given to prospective commanding officers, executive officers, and operations officers. It provides an overview of the FHP and guidance for properly managing operational targets.

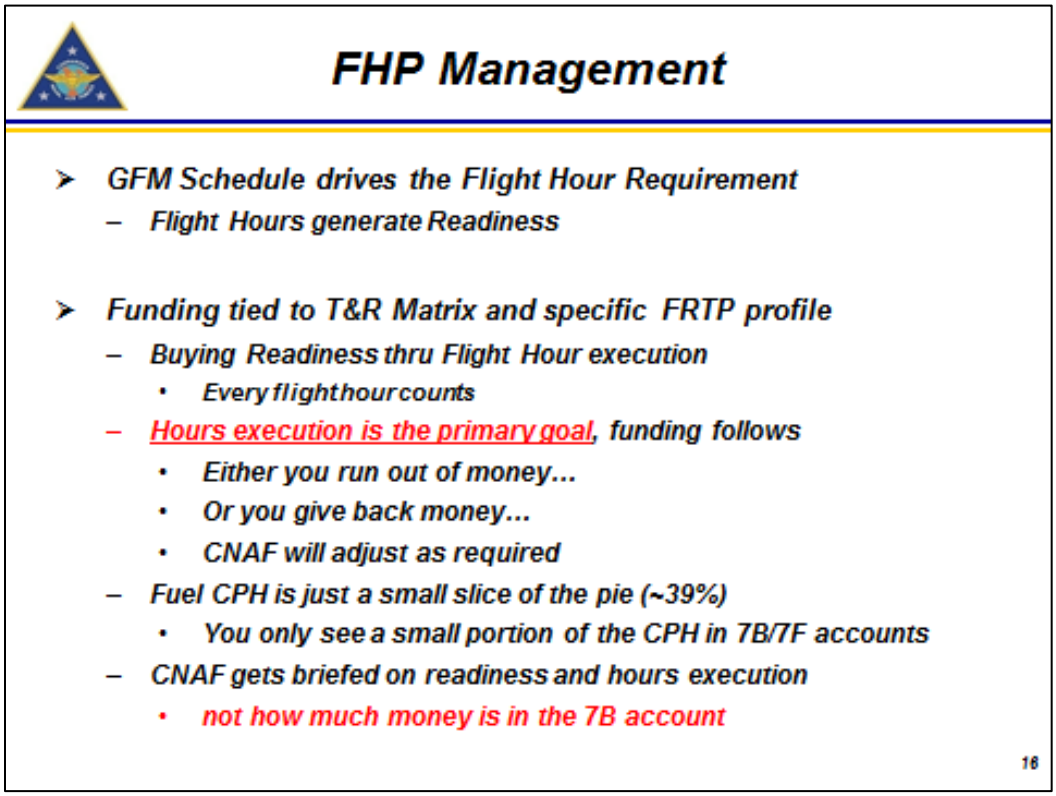

Figure 4. FHP Management Guidance to Squadrons (from Bouyer, 2013)

The presentation informs squadrons that they are scrutinized on their execution of hours not their costs. The slide in Figure 4 also asserts that fuel is a "small slice" of the overall FHP. The following slide in the presentation shows the cost structure for a typical air wing (Figure 5).

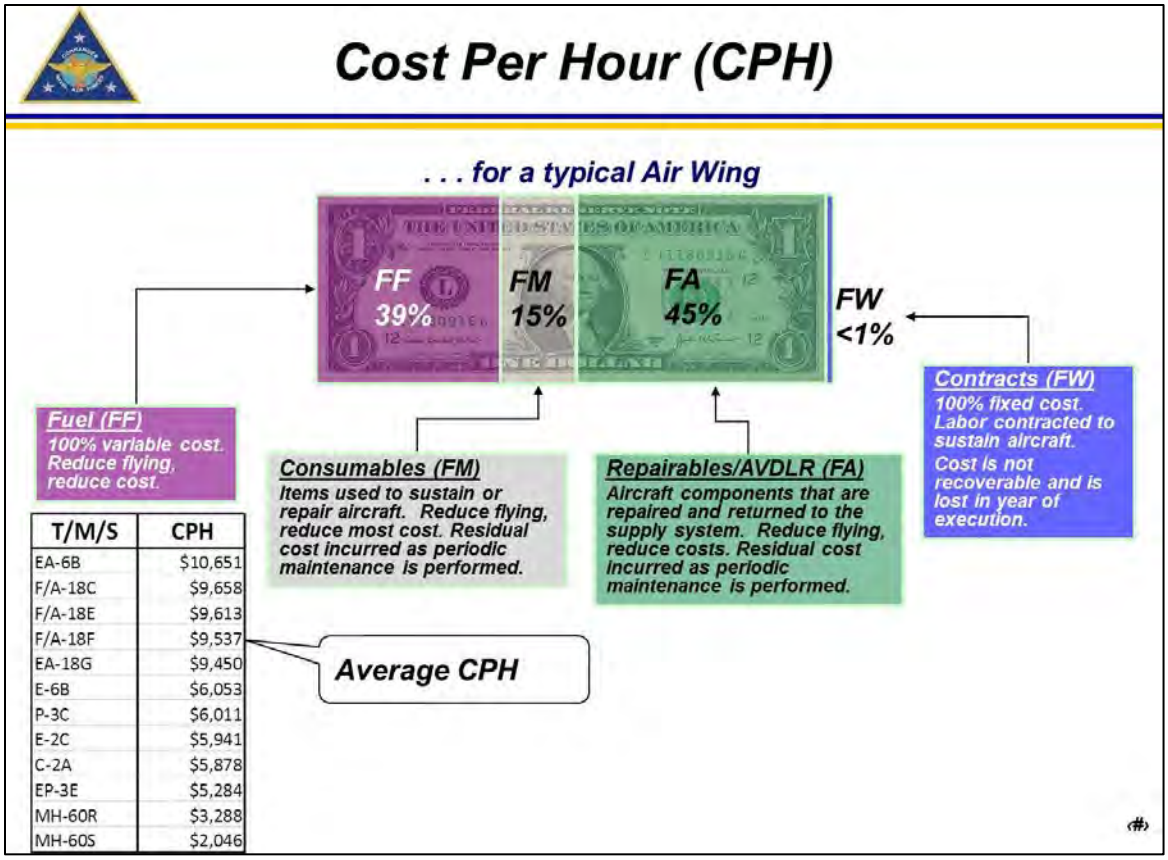

Figure 5. Air Wing Cost Structure (from Bouyer, 2013)

Figure 5 shows the cost components to the FHP and their relative share in the overall costs of a carrier air wing. An important aspect of this figure is that it groups all of the various types of aircraft in an air wing together. Table 1 shows the average cost structure for FA-18E/F operational strike fighter squadrons over a three-year period.

FA-18E/F TACAIR						
$M	FUEL (FF)	AVDLR (FA)	AFM (FM)	CNTRCTS (FW)	TOTAL	CPH
FY11	426.5	231.8	98.8	5.9	763.0	7,436.61
FY12	457.6	290.4	178.4	6.9	933.3	8,525.26
FY13	459.7	345.2	159.0	5.2	969.1	10,186.97
Avg	447.9	289.1	145.4	6.0	888.5	$8,716.28
%Total	50.42%	32.54%	16.37%	0.68%		

Table 1. Average Cost Structure and Cost Per Hour of Operational FA-18E/F Squadrons (from CNAF, 2013d)

Taking the data from Table 1 and putting it into the same graphic as in Figure 5, one can see a difference. Figure 6 shows the cost structure of all operational FA-18E/F strike fighter squadrons.

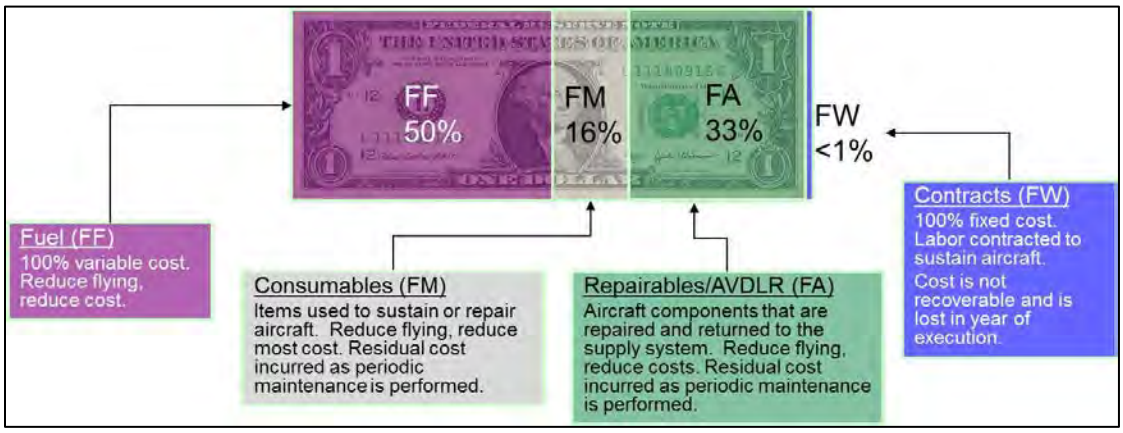

Figure 6. Average Operational FA-18E/F Cost Structure FY11-FY13

Viewing the same graphic from the perspective of the FA-18E/F type/model/series, it is probably more difficult to defend an argument that $450 million is a small part of the FA-18E/F cost. The fiscal year 2011 expenditures for all Navy type/model/series aircraft were $3.242 billion (CNAF, 2013d). Fuel expenditures for all type/model/series in the same year were $1.427 billion; 44 percent of total expenditures. Fuel expenditures for the FA-18E/F were 30 percent of total Naval aviation fuel expenditures.

Cost saving has been a major focus of Naval aviation leadership for many years. Movements to approach managing Naval aviation like a business took form in the early nineties (CNAF, 2013a). The Naval Aviation Enterprise eventually took shape and has become an element for cost saving initiatives within Naval aviation.

3. The Naval Aviation Enterprise

The Naval Aviation Enterprise (NAE) is a partnership of Naval aviation stakeholders spanning Navy and Marine Corps platform communities and functional areas to provide a “single framework for facilitating collaborations, transparency,

information sharing, and process improvement across the Naval aviation stakeholder communities" (NAE Strategic Plan, 2012). As an organization within an organization, the NAE provides a means for analysis, focus of effort, continuous process improvement implementation, culture shaping, and strategic alignment to aid the decision making of senior Naval aviation leaders. The mission of the NAE is to advance and sustain Naval aviation warfighting capabilities at an affordable cost…today and in the future (NAE Strategic plan, 2012).

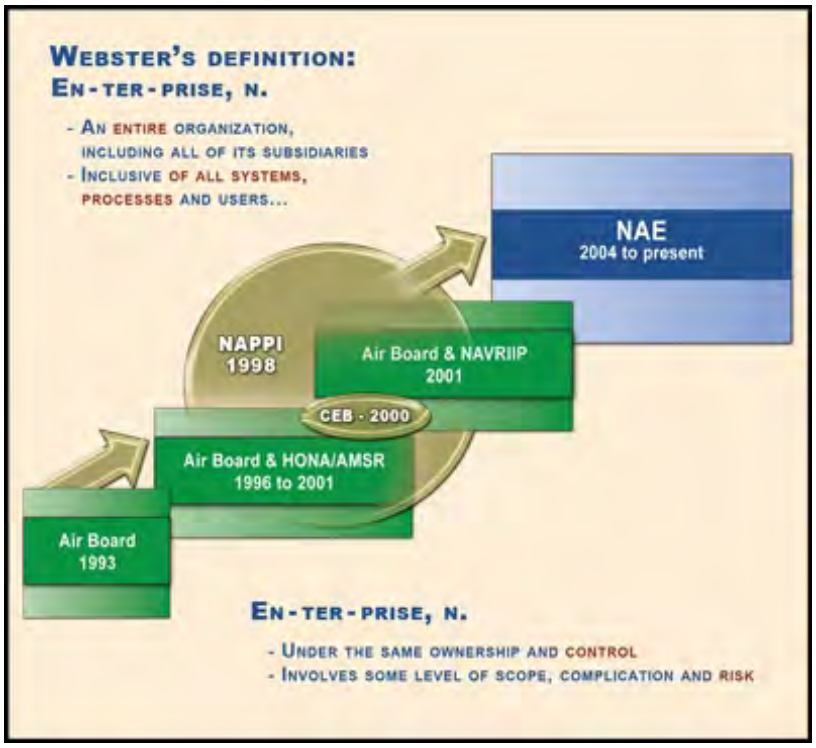

Figure 7. Evolution of the Naval Aviation Enterprise (from CNAF, 2013a)

The NAE is comprised of over 190,000 Sailors, Marines, civilians and contract employees working together to support Naval aviation warfighting capability at an affordable cost (CNAF, 2013a). To accomplish their mission, the NAE is organized into air boards and cross functional teams (Figure 8). Air boards consist of senior military leaders who develop strategic guidance to drive the efforts of cross functional teams. Cross functional teams are groups of military, civilian, and contract personnel with disparate skills and backgrounds working within, across, and outside military chains of

command to develop solutions to pressing enterprise challenges (CNAF, 2013a). The NAE utilizes collaboration, transparency, detailed analysis, and a drive for continuous process improvement to provide aviation leadership with critical tools needed for informed decisions. The cultural mindset and motivation of NAE members are embodied by the following principles (CNAF, 2013a):

- Consistently apply cross-functional process thinking
- Establish and maintain process discipline
- Use consistent, integrated, and hierarchical metrics
- Ensure full and consistent transparency of data, information, and activities
- Establish and maintain accountability for actions and results
- Apply an integrated governance structure
- Maintain a total ownership cost perspective
- Tie efforts to a single fleet-driven metric: Naval aviation forces efficiently delivered for tasking.

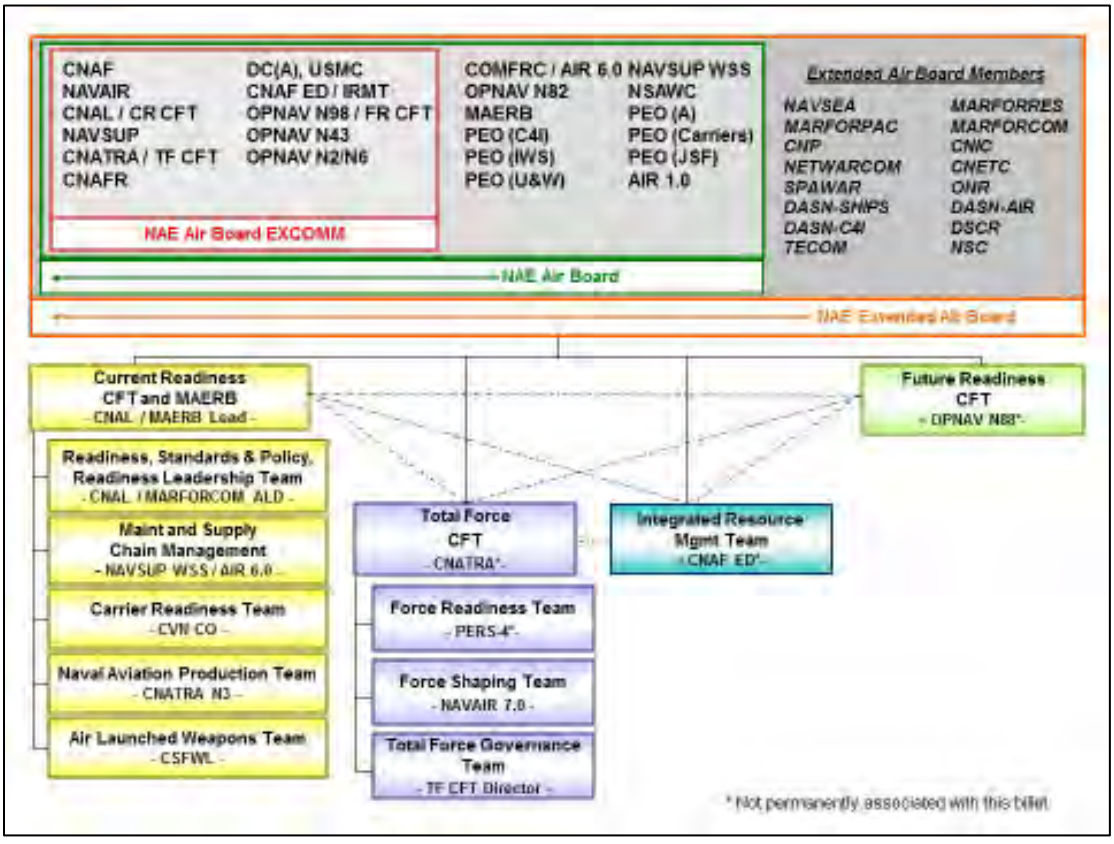

Figure 8. NAE Organizational Structure (from CNAF, 2013)

The NAE aligns its endeavors with the Chief of Naval Operation's strategic guidance by adopting the following NAE strategic objectives (CNAF, 2013a):

- Enterprise culture and communication: Achieve a culture that emphasizes and rewards collaboration, ownership, transparency, and continuous improvement among enterprise stakeholders and partners in support of Naval aviation readiness.
- Current readiness: Deliver combat-ready forces to meet current and future operational requirements at the optimal operations & support cost.
- People: Enrich, shape, and deliver a proficient, diverse, and cost-effective total force that performs all of the functions required for Naval aviation to fight and win in combat.
- Future readiness: Engage stakeholders to effectively produce required levels of future readiness while optimizing costs.
- Cost management and external integration: Develop cost management products and metrics to reduce total ownership costs for legacy and transitioning weapon systems. Develop stronger integration and collaboration with other warfare enterprises with a focus on efficiency and cost reduction.

The alignment of strategic objectives is shown in Figure 9. Figure 9 illustrates that the NAE exists outside the traditional structure of the Navy and Marine Corps but its guiding principles and strategic objectives are specifically fashioned to provide integrated support for the Navy's strategic efforts.

The NAE and others within Naval aviation have at least two tools available for cost analysis: The aviation financial analysis system (AFAST) and the aviation cost evaluation system (ACES) (CNAF, 2013a).

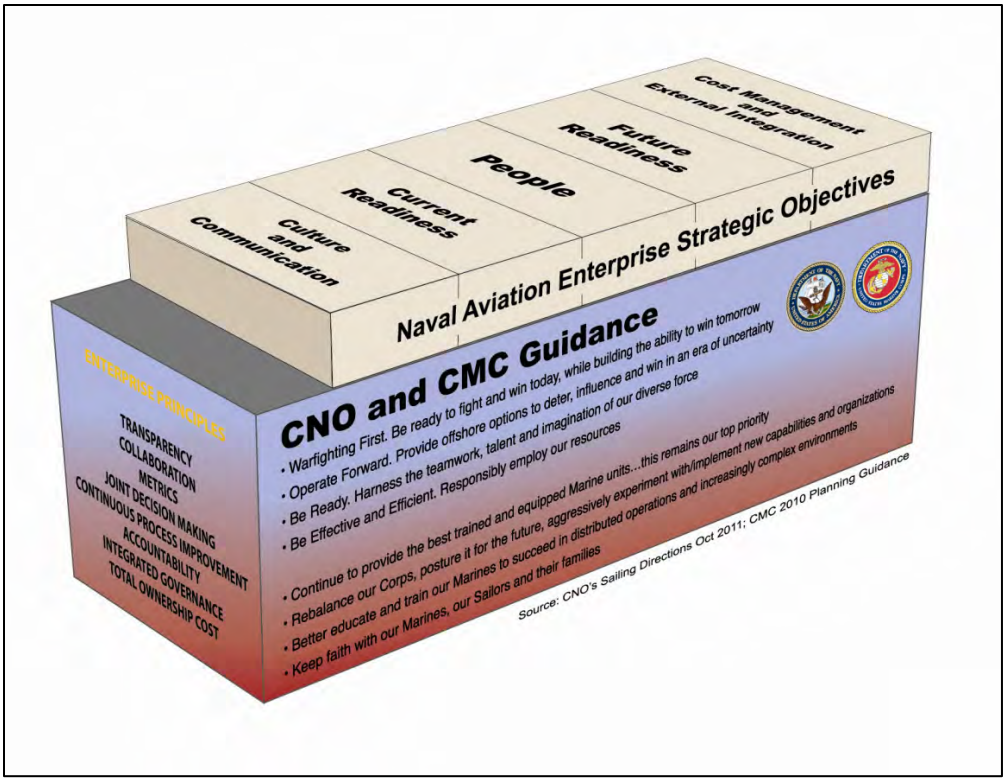

Figure 9. NAE Strategic Alignment (from CNAF, 2013a)

4. The Aviation Financial Analysis Tool

AFAST provides a means to analyze and manage cost elements within the Naval aviation FHP. AFAST collects data from various reporting sources and combines them to generate reports and graphical charts for trend analysis. The analysis derived from AFAST is used by type wing and CNAF leadership to direct policy and focus cost management efforts (CNAF N422, 2003).

Figure 10 shows the various data sources for AFAST and the three output tools. Targets and goals for the various cost elements are issued by the Commanders, Naval Air Forces Atlantic and Pacific based upon analysis of actual expenditures of the FHP provided by the Operational Plan 20 (OP-20) budget exhibit generated during the budget formulation process (Glenn & Otten, 2005). Fuel consumption rates and flight hour execution figures are collected from squadrons via their monthly budget operational targets report (CNAL, 1999). Budget operational target report data is aggregated and certified by ACES, the official flying hour cost reporting system for Naval aviation

(CNAF N422, 2003). Maintenance related costs are collected from NALCOMIS which tracks the maintenance actions and parts requisition at the organizational and intermediate levels (CNAF, 2013b). Information from the Department of Defense's accounting system, the Standard Accounting and Reporting System-Field Level, is used to resolve conflicts with ACES and, in future upgrades, will be used to incorporate financial-only costs not recorded in NALCOMIS (i.e., contract costs, financial adjustments, carcass charges, non-NALCOMIS requisitions) (CNAF N422, 2003). The financial-only charges not captured by NALCOMIS and AFAST are estimated to never exceed 15 percent and historically have been less than five percent of FHP costs. It is estimated that AFAST captures 90 percent of FHP costs (CNAP N422, 2003).

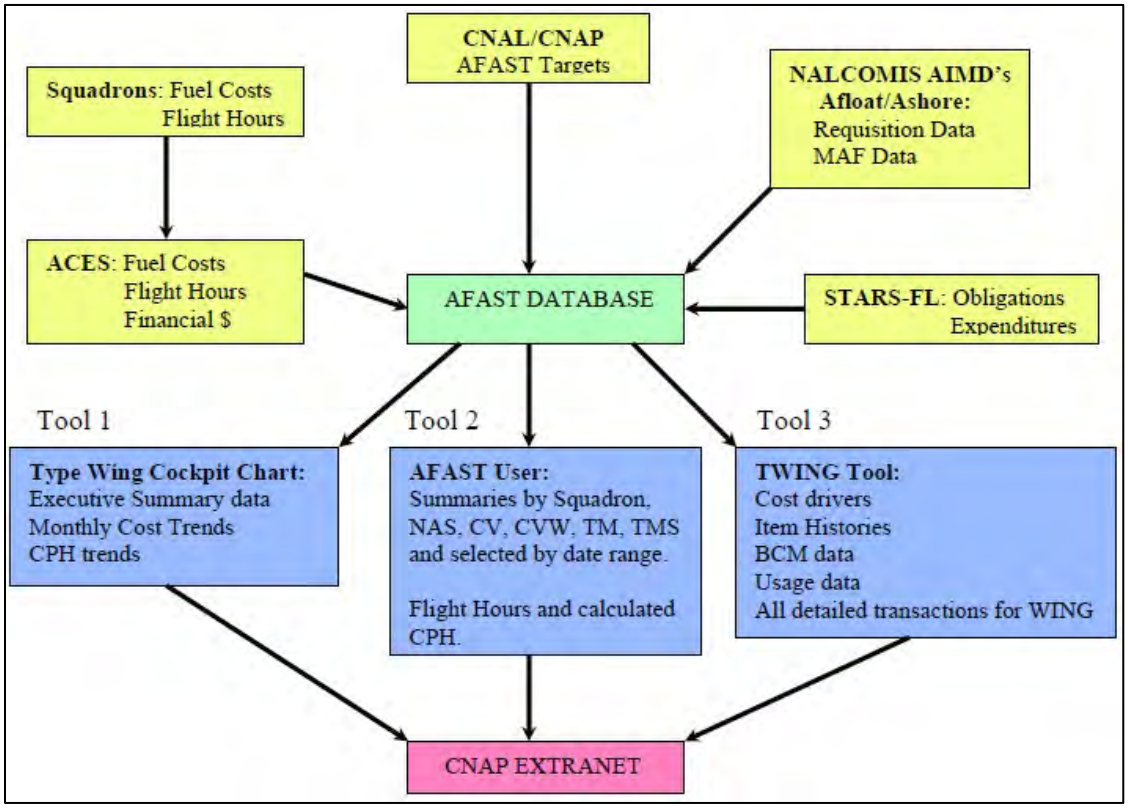

Figure 10. AFAST Data Flow (from CNAF N422, 2003)

Three tools generated by AFAST are the cockpit charts, AFAST-User, and the TWING tool (CNAF N422, 2003). The cockpit charts provide a graphical, executive

summary of FHP program costs broken down by its components and compared to the targets established by Commanders, Naval Air Forces Atlantic and Pacific. An example can be seen in Figure 11.

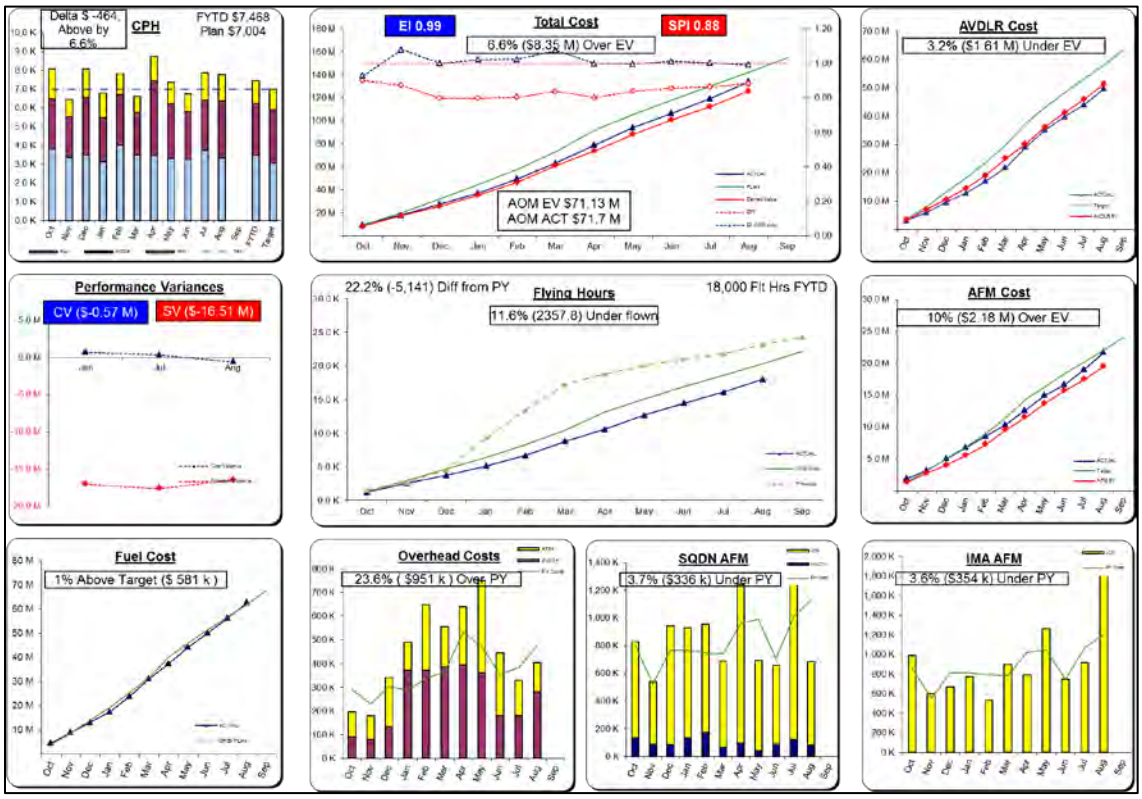

Figure 11. AFAST Cockpit Charts (from CNAF, 2013d)

AFAST-User is a database tool providing summary cost per hour information across various levels of Naval aviation (CNAF N422, 2003). Summary information can be displayed by squadron, carrier air wing, Naval air station, type model, and type model series. The information can also be displayed by fiscal year, month, quarter, fiscal year to date, or a user selected time period. The information is divided among three categories: fuel, aviation depot level repairs, and aviation fleet maintenance. AFAST-User will show the executed cost versus a "should cost" figure based upon the OP-20 budget exhibit targets which are adjusted for historical trends and costs not captured by AFAST (CNAF N422, 2003). The percent variation of the executed cost from the "should cost" is displayed along with a color coded "stop light" indicator (CNAF N422, 2003). A cost per

hour for a given category that is on target or no more than five percent over targeted cost is displayed in green. Costs which are between five and 10 percent over targets are displayed in yellow. Those exceeding ten percent are displayed in red (CNAF N422, 2003).

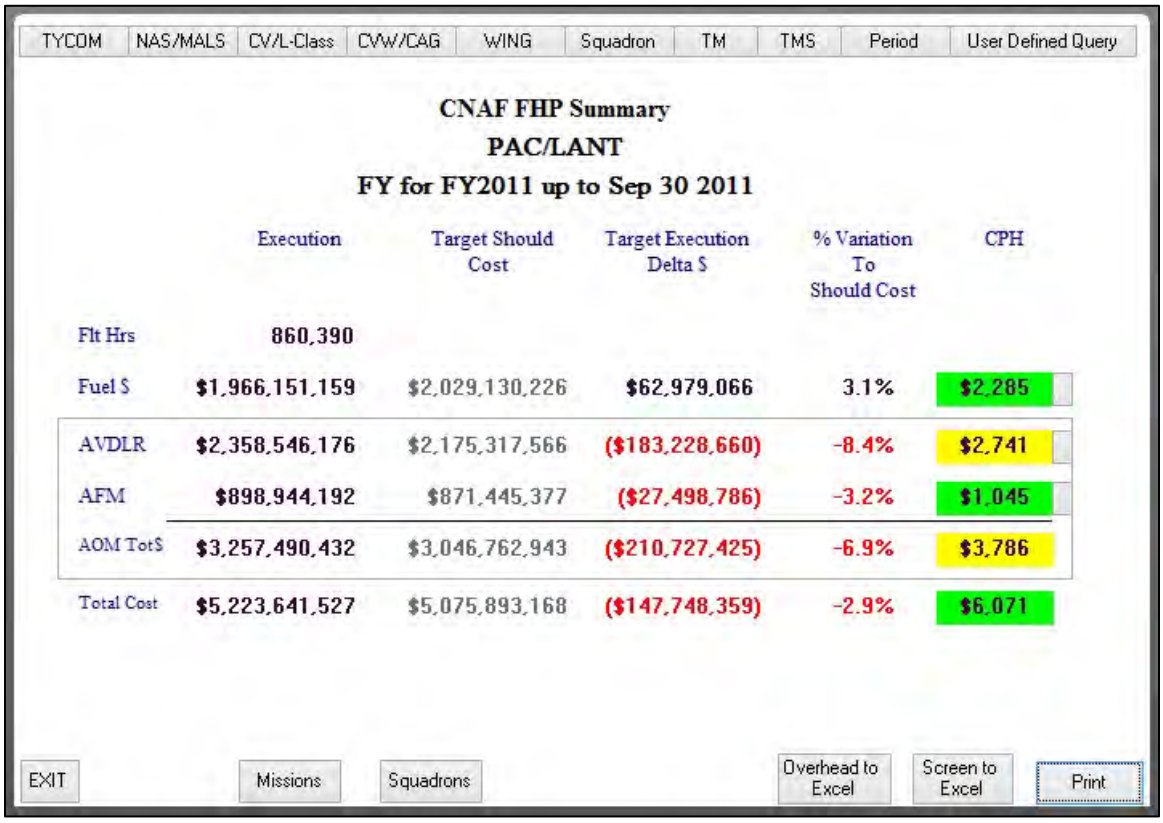

Figure 12. AFAST user Display (from CNAF, 2013d)

5. Enterprise Airspeed

Another element of cost saving initiatives by Naval aviation leadership is the AIRSpeed program. AIRSpeed is a combination of various corporate productivity and process improvement tools. AIRSpeed represents tools to assist with Naval aviation's continuous process improvement efforts (CNAF, 2013f).

The Naval Aviation Enterprise AIRSpeed initiative aims to improve performance of the aviation logistics system and the intermediate and depot level repair system using a blend of commercial practices including the Theory of Constraints, Lean, and Six Sigma

(Goldratt Institute, 2009). Enterprise AIRSpeed's primary mission is to transform the maintenance and supply chain into an integrated, reliable, demand-pull based replenishment system (CNAF, 2013f). Enterprise AIRSpeed creates a common, integrated improvement effort across various units at multiple levels within the Naval aviation logistics and maintenance systems (CNAF, 2013f).

The AIRSpeed concept began from improvement efforts at a Marine logistics squadron in Iwakuni, Japan in the late 1990s (CNAF, 2013f). The squadron's successful application of the Theory of Constraints was recognized by leadership of the Naval Air Systems Command (NAVAIR) and was adopted, eventually evolving into the NAE's Enterprise AIRSpeed in 2003 (CNAF, 2013f). Enterprise AIRSpeed sought to transform the Naval aviation supply chain into a dynamic demand-pull supply chain while solving bottleneck challenges inside intermediate and depot maintenance facilities (CNAF, 2013f). Implementation of the AIRSpeed initiative over the next several years yielded improvements in throughput at intermediate and depot maintenance facilities as well as efficiency gains throughout the supply chain (Goldratt Institute, 2009). AIRSpeed is a set of tools that Naval aviation uses to aid continuous process improvement (CPI) mandated by SECNAV instruction 5220.14 and CNAF instruction 4790.2B. Enterprise AIRSpeed belongs to a family of NAE CPI activities including NAVAIR AIRSpeed, NAVICP AIRSpeed, and Depot AIRSpeed depicted in Figure 13.

AIRSpeed initiatives have had success since 2003 (Broadus, Mallicoat, & Hardee, 2007; Goldratt Institute, 2012). AIRSpeed projects implemented during the integration of intermediate and depot level maintenance facilities in 2006 were able to reduce Fleet Readiness Center Southwest's time-to-reliably replenish from 138 days to 35 and saved over 5,300 overtime labor hours (Goldratt Institute, 2012). Marine Aviation Logistics Squadron 24 in Kaneohe Bay, Hawaii used AIRSpeed initiatives to reduce their time-to-reliably replenish from 224 days to 14, reduced their inventory by 66 percent, and improved throughput in multiple work centers (Goldratt Institute, 2012). Other advertised savings resulting from AIRSpeed include $13.9 million in the first quarter of fiscal year 2007 (Broadus, Mallicoat, & Hardee, 2007). AIRSpeed adds to the increasing value of the Naval Aviation Enterprise concept.

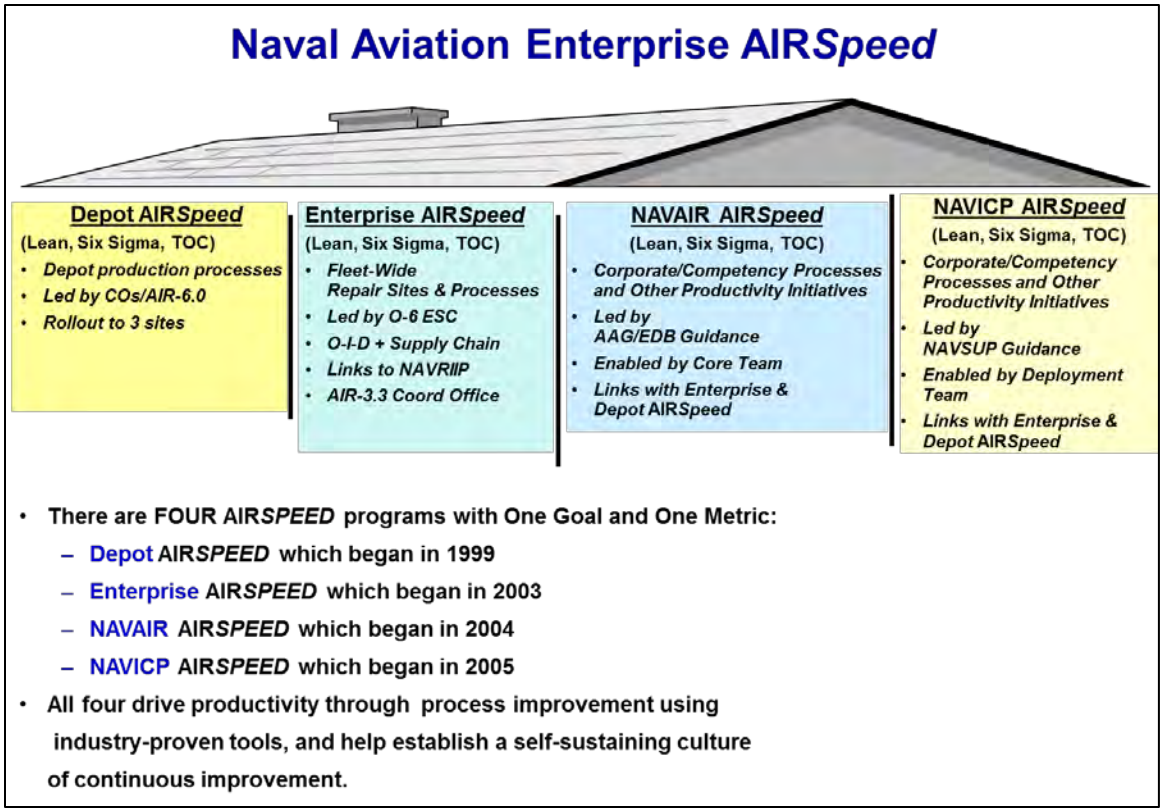

Figure 13. AIR*Speed* Program Family (from Moore, 2007)

B. PERFORMANCE MEASUREMENT SYSTEMS

Two systems which collect and measure performance data from strike fighter squadrons in a systematic and periodic manner are the Defense Readiness Reporting System and the Battle Effectiveness award. These two performance measurement systems are a factor driving the focus and behavior of squadrons. Their influence is important to understand in the context of this research.

1. Defense Readiness Reporting System

The Defense Readiness Reporting System is a standardized Department of Defense system which supports the Joint Chiefs of Staff in assessing and managing forces worldwide (CNAL, 2013). Readiness assessment is focused on a unit's ability to perform mission essential tasks which support capability areas required to carry out missions during major combat operations (CJCS, 2010). Defense Readiness Reporting System-Navy (DRRS-N) assesses a Naval unit's ability to achieve its required capability

level across five perspectives, known as pillars (CNAL, 2013). The five pillars are personnel, equipment, supply, training, and ordnance. Naval aviation units are only assessed in the personnel, equipment, and training pillars (CNAL, 2013). DRRS-N contains a computed assessment using data from a variety of authoritative sources and a commander's assessment representing the commanding officer's subjective opinion of the unit's ability to accomplish its mission essential tasks, also known as Navy tactical tasks (NTA) (CNAL, 2013). The assessments are color coded and represent a statement of whether the unit can perform an assigned mission essential task to specific standards in specific conditions. Computed assessments in each pillar formulaically compare reported data to standards to quantify the capability in each NTA. The color codes are green for yes (80–100), yellow for qualified yes (60–79), and red for no (0–59). Figure 14 shows the DRRS-N assessment module.

Figure 14. DRRS-N Assessment Module (from CNAL, 2013)

The personnel pillar assesses the unit's ability to accomplish its assigned NTAs based on its manning (CNAL, 2013). The computed assessment calculates a personnel figure of merit for each NTA based on a ratio of current onboard personnel to a standard requirement. The ratio includes the number of officers, enlisted, Naval enlisted classification (job specialty), and training and education (advanced qualifications).

The equipment pillar compares the number of aircraft and missions systems capable of accomplishing the NTAs to the requirements for each NTA (CNAL, 2013). The equipment pillar uses a standard from a look-up table specific to each type/model/series aircraft to calculate the aviation maintenance figure of merit for each NTA.

The training pillar assesses the aircrew's ability to accomplish the unit's NTAs (CNAL, 2013). The training figure of merit is calculated by multiplying a performance factor and an experience factor. The performance factor is the number of "skilled crews" divided by the required number of skilled crews in each NTA. To become skilled in an NTA, aircrew must complete a variety of specific tasks each flight that comprise skills (CSFWP, 2013) The tasks must be completed a number of times within a certain period of time to achieve and maintain the skill. Each NTA has a specific combination of skills. Once a crew acquires all the skills within an NTA, they are considered skilled in that NTA (CSFWP, 2013). The experience factor is the ratio of squadron requirements section events completed to those events required. Required events include significant unit training evolutions during FRTP, aircrew qualification levels, and specific ordnance expenditures (CNAL, 2013).

NTAs are grouped into capability areas and their assessments in each pillar are aggregated into one score and color per pillar. Each pillar score is then aggregated into an overall score for the capability areas. The commander's assessment is entered manually and provides a means for commanders to communicate extenuating circumstances or obstacles to achieving required readiness levels (CNAL, 2013). The computed assessments are present to assist the commander in making his assessment. The commander's assessment is the only information which is passed up through the system to the overall Defense Readiness Reporting System (CNAL, 2013).

DRRS-N serves as the primary performance measurement system utilized by strike fighter squadrons (CNAF, 2011). All efforts within a squadron are focused on meeting the requirements in DRRS-N. Despite its importance, DRRS-N does little to assist a squadron in planning or managing operations (CSFWP, 2013). Readiness levels are expected to be "in the red" at certain points within the FRTP (CNAL, 2013). For

example, a unit in the maintenance phase of FRTP will be at approximately 50 percent funding and is expected to execute very little training relative to the deploy phase. The Training figure of merit for such a squadron would be expected to be red. As the squadron progresses through FRTP, the training figure of merit increases as funding and training increases (CNAL, 2013). The foundation of DRRS-N's purpose is to assist a commanding officer in answering the question: "Is your unit capable of accomplishing its mission during major combat operations?" (CNAL, 2013). DRRS-N does not assist the squadron in planning its operations, maintenance, and personnel management to get itself into a position where it can reply to that question with, "yes" (CSFWP, 2013).

2. The Battle Efficiency Award

The Commander of Naval Air Forces annually awards the Battle Efficiency award to one squadron in the Atlantic fleet and one in the Pacific fleet for each type/model/series of aircraft (CSFWP, 2012). The Battle Efficiency award (Battle "E") is awarded to the squadron which demonstrates the highest "cost-wise" and performance readiness. Winners of the award may be regarded as the "best" squadron within their type/model/series community. Units winning the Battle "E" are authorized to paint a large "E" on their hangars and aircraft fuselages and their personnel are authorized to wear a uniform decoration signifying their role in the achievement (CSFWP, 2012). Such recognition can provide a strong incentive to win the award.

Units competing for the award are evaluated on 45 different criteria in two competitive areas, cost-wise readiness and performance readiness (CSFWP, 2012). The 45 criteria are spread among categories and subcategories within each competitive area. Table 2 lists the categories and subcategories along with their weighted contribution to a unit's score.

Table 2. Battle "E" Subcategory Weights (from CSFWP, 2012)

Category Weight (Overall Weight)
40% Cost-wise Readiness Metrics - 40 points
20% Aircraft Material Readiness (AMR)
20% Schedule Performance Index (SPI)
60% Performance Readiness Metrics - 60 points
15% Operational Achievements
10% (1.5%) Carrier Landing Grade (Index)
10% (1.5%) Day Boarding Rate (Index)
10% (1.5%) Night Boarding Rate (Index)
20% (3.0%) Number of Operational Missions
10% (1.5%) Operational Mission Completion Rate
20% (3.0%) Total Embarked Hours
10% (1.5%) Total Night Carrier Landings
10% (1.5%) Actual Combat Expenditure
12% Training and Readiness
25% (3%) Non-FRP Exercise Mission Completion Rate
25% (3%) Weapons Training Efficiency
20% (2.4%) Simulator Utilization
30% (3.6%) SFWT Progress
6% Inspections
50% (3.0%) NATOPS Unit Evaluation
50% (3.0%) Conventional Weapons Technical Proficiency Inspect.
9% Material Readiness
20% (1.8%) Aviation Maintenance Inspection
20% (1.8%) Material Condition Inspection
20% (1.8%) Cannibalization Rate
20% (1.8%) NEC Fit
20% (1.8%) Qualified Proficient Technician (QPT) Fit
6% Personnel Readiness
30% (1.8%) Retention Rate - Zones A, B & C
20% (1.2%) Advancement Rate
10% (.6%) Passed but Not Advanced (PNA) Rate
20% (1.2%) Physical Readiness Standards
10% (.6%) Medical Readiness Score
10% (.6%) Health Promotion Score
6% Aviation Safety
20% (1.2%) Class A mishaps
10% (.6%) Class B mishaps
10% (.6) Chargeable FOD occurrences
10% (.6%) HAZREPS submitted
7% (.4%) NATOPS changes submitted
13% (.8%) NATOPS changes accepted
7% (.4%) Safety articles submitted
13% (.8%) Safety articles published
10% (.6%) NAMDRP reports submitted
3% Weapons and Tactics Development
10% (.3%) Tactical documents submitted
20% (.6%) Tactical documents published
20% (.6%) Tactical projects completed
7% (.2%) TACMAN changes submitted
13% (.4%) TACMAN changes accepted
10% (.3%) Professional articles submitted
20% (.6%) Professional articles published
3% General Contributions
33% (1%) Bomb Derby Participant
67% (2%) Bomb Derby Winner

The first competitive area is cost-wise readiness, comprised of two categories: aircraft material readiness and schedule performance index (CSFWP, 2012). Cost-wise readiness accounts for 40 of the 100 total points with each of its categories contributing 50 percent. The cost-wise readiness categories are objective measurements of squadrons' performance compared to an optimum goal that is common to all competing units.

Aircraft material readiness is the average percentage of aircraft reported as "ready for tasking" versus the requirement for each month of the fiscal year. Ready-for-tasking (RFT) is the number of aircraft properly equipped and capable of carrying out operational and training requirements. RFT requirements for each squadron are dependent upon its timing within its fleet readiness training plan (FRTP). For example, a squadron six months into its FRTP (R+6), might have an RFT requirement of 5.63 aircraft. If that squadron is only reporting an average daily RFT number of five for that month, they would score 88.8. The average score over the 12 month competitive period is averaged to tally the total score for aircraft material readiness (CSFWP, 2012).

Schedule performance index is the ratio of flight hours executed to flight hours granted (CSFWP, 2012). Each squadron is granted a specific number of flight hours to execute based upon its timing within the FRTP cycle. Flight hour grants occur quarterly and can be adjusted for extenuating circumstances beyond the squadron's control (e.g., additional tasking, unusual events prohibiting training). Squadrons executing within five percent of their grant receive the maximum score; squadrons beyond five percent receive no points (CSFWP, 2012).

The second competitive area is performance readiness (CSFWP, 2012). The scope of the performance readiness categories is broad and some subcategories lack established goals. As a result, each squadron's score is calculated using a relative-ranking methodology (CSFWP, 2012). For each sub-category, the range of scores is divided into the overall weight of that sub-category (table one) to find a weight-per-range-point. The squadron's score for the sub-category is found by multiplying the amount of points it differs from the optimum by the weight-per-range-point, then subtracting that figure from

the overall sub-category weight (CSFWP, 2012). In simple terms, the squadron which performs the best in a given subcategory is given the maximum score; all other squadrons are ranked relative to that performance level.

Operational achievements is the first category in the performance readiness area (CSFWP, 2012). Its subcategories include metrics related to performance while deployed or engaged in combat and are as follows:

- Squadron landing Grades (landings are graded only at sea using a four point scale)
- Squadron boarding rate (Day) (ratio of arrested landings to attempted arrested landings)
- Squadron boarding rate (Night) (same ratio but applied only to night arrested landings)
- Deployed operational and combat missions (any flight while deployed is considered operational)
- Deployed operational and combat mission completion rate (ratio of missions completed to missions scheduled)
- Total embarked hours
- Total night carrier landings
- Actual combat expenditure (points given for different types of weapons employed during combat)
- The training and readiness category includes metrics related to training directly related to readiness, aircrew qualifications, or non-FRTP exercises:
- Mission completion rate for exercises and detachments (ratio of missions completed to those scheduled during non-FRTP exercise and detachments)
- Weapons training efficiency (penalty points assessed for not meeting readiness requirements for each type of weapon)
- Simulator utilization (ratio of simulator hours actually used to those scheduled)
- SFWT progress (the number of aircrew who advance one strike fighter Weapons and tactics qualification level)

The inspections category includes scores recorded during inspections for Naval air training and operating procedures (NATOPS) unit evaluation and conventional weapons technical proficiency inspection (CSFWP, 2012). A unit receives full credit for passing the inspection, and no credit if failed.

The material readiness category includes maintenance related inspection results, qualification achievement rates (QPT fit), and a metric which assesses the gaps of personnel required to fill various critical billets (NEC fit) (CSFWP, 2012). Scores for these metrics are compiled based on data previously reported to and contained in the Naval aviation readiness integrated improvement program database.

- Aviation maintenance inspection (two points for each maintenance program graded “on track,” one point for “needs more attention,” zero points for “off track”)
- Material condition inspection (two points for each aircraft passing inspection divided by total number of points possible)
- Qualified proficient technician (QPT) fit (ratio of the number of qualified technicians to established standards)
- The personnel readiness category contains metrics related to retention, advancement, physical fitness, and medical related metrics.
- Retention rate (ratio of Sailors reenlisting to those at expiration of obligated service)
- Advancement rate (ratio of Sailors E4-E6 who advance in rank to those who took the advancement exam)
- Passed-not advanced rate (ratio of Sailors E4-E6 who passed the advancement exam but did not advance to those who took the exam)
- Physical readiness (ratio of personnel who passed the physical readiness test to those eligible)
- Medical readiness (scores based upon percentage of squadron personnel who fall into one of four medical readiness categories)
- Health promotion score (percentage of satisfactory elements of a squadron’s health promotion program)
- The safety category includes scores related to the number of mishaps or foreign object damage (FOD) events. It also includes scores based on the number of reports and change requests submitted to various safety-related organizations.

- Class alpha mishaps (100 point penalty for mishaps resulting in fatalities, permanent disability, or destruction of aircraft that are attributable to the squadron)
- Class bravo mishaps (50 point deduction for mishaps resulting in partial permanent disability or the hospitalization of three or more personnel that are attributable to the squadron)
- Foreign object debris (FOD) occurrences (reportable FOD events attributable to the squadron)
- Hazard reports submitted (number of hazard reports submitted)
- NATOPS change requests submitted (number of change requests submitted to Naval air training and operating procedures standardization manuals)
- NATOPS change requests accepted (number of change requests accepted)
- Safety articles submitted (number of safety related articles submitted)
- Safety articles published (number of safety related articles published)
- Naval aviation maintenance discrepancy reports submitted (number of discrepancy reports submitted to Naval aviation maintenance program manuals or procedures)
- The weapons and tactics development score includes the number of tactical documents, procedure changes, or professional articles submitted and/or published.
- Tactical documents submitted (number of documents submitted to tactical journals)
- Tactical documents published (number of documents published in tactical journals)
- Tactical projects (number of projects enhancing strike fighter tactics or capabilities)
- Tactical manual changes submitted (number of change requests submitted to tactical manuals)
- Tactical manual changes accepted (number of change requests accepted)
- Professional articles submitted (number of articles submitted to journalist media publications)
- Professional articles published (number of articles published)

The final category includes general contributions to the strike fighter community (CSFWP, 2012). This includes whether or not the squadron participated in and/or won the “bombing derby” (bombing competition). It also includes a section for the

commanding officer to write comments highlighting the squadron's accomplishments or reconciling notable shortcomings outside the squadron's control.

To gather data for the award, the strike fighter wing sends out an Excel spreadsheet for the squadrons to enter data (CSFWP, 2012). A number of the metrics are self-reported by the squadron and some are pulled from various computer databases containing previous reports made throughout the fiscal year. To be eligible for the award, a squadron must first be endorsed by their carrier air wing commander (CSFWP, 2012). Spreadsheets are submitted to the strike fighter wing, scores are calculated, and a nominee is forwarded to Commander, Naval Air Forces Pacific and Atlantic for final decision and announcement (CSFWP, 2012).

Despite its prestige, one might argue the battle "E" is not without its shortcomings. A number of the measures can only be achieved at a competitive level while deployed (CSFWP, 2012), others are not controlled by the squadron (CSFWP, 2012), and a number could be argued as being unnecessary or unimportant. Some of the measures, however, might be useful in a balanced scorecard.

C. BENEFITS OF THE STUDY

As the fiscal pressures of budget reductions mount, balancing reducing squadron operating costs with the need to remain ready and capable is likely to be a challenge. This thesis proposes adopting a tool long embraced by the business community to do just that. Companies have used the balanced scorecard to clarify their strategy, identify objectives to support that strategy, and communicate their strategy throughout all levels of the organization. The strike fighter balanced scorecard provides a practical tool squadrons can use to accomplish CNAF's mission of producing the right readiness at a reduced cost, without sacrificing their effectiveness.

D. METHODOLOGY OVERVIEW

This thesis took a pragmatic approach to adapt the balanced scorecard to a strike fighter squadron. The approach began with a thorough review of the salient literature describing the concepts and applications of the balanced scorecard. Structured interviews

allowed identification of links between the strategies of Naval aviation's leadership and the priorities of operational commanders. The interviews also revealed perceptions of success within the strike fighter community and identified objectives and measures best to achieve it. The balanced scorecard was then adjusted to fit the military environment and fashioned into an easy-to-use tool. Finally, this thesis provides recommendations for implementing the strike fighter balanced scorecard, a system to perpetuate its use throughout the fleet, and a method of feedback and adjustment to maintain its relevance.

II. LITERATURE REVIEW

A. BALANCED SCORECARD

Since its development, the balanced scorecard has been adopted by hundreds of companies throughout the world and was named one of the most influential management ideas of the past 75 years by the editors of the Harvard Business Review (2013). Application methods and guidelines for the balanced scorecard are as diverse as the interpretations of the concepts originally expressed by its authors (Brewer, Davis, & Albright, 2005; Niven, 2003; Bush, 2005). Diverse methods and interpretations have led to many failures and pose myriad pitfalls to would-be adopters (Norreklit, Jacobsen, and Mitchell, 2008; Schneiderman, 1999; Cokins, 2010). Many governmental agencies (Niven, 2003), including some in the Department of Defense (Cavoli, 2004), have adopted the balanced scorecard but examples within available literature were at high levels in the organizational structure (e.g., echelon 2/3, budget submitting office) and little information could be identified about applications below them. This review analyzes current literature regarding basic concepts of the scorecard, application methods, peculiarities associated with its use in government, and common pitfalls.

1. Balanced Scorecard Basics

The balanced scorecard is an integrated, balanced management system that translates an organization's strategy into external and internal objectives and measures such that each member of the organization understands their part in achieving the organization's mission. The balanced scorecard was developed by Robert Kaplan and David Norton in the early 1990s as an improvement or advancement over other similar concepts such as the corporate scorecard developed by Arthur Schneiderman (Kaplan & Norton, 1996, p. vii). Kaplan and Norton's research questioned how well firms were measuring performance. Initial findings suggested that firms were too focused on short-term financial measures and lacked an ability to develop consistent plans to achieve long-term growth. They concluded that a reliance on financial performance measures was inadequate to evaluate or direct a firm's path toward competitive advantage (Kaplan &

Norton, 1996). Through their research and pilot programs conducted by research partners, they produced the balanced scorecard to address the shortcomings of current performance measurement and management systems.

The balanced scorecard derives its balance by incorporating internal and external considerations, leading and lagging performance indicators, and objective and subjective measures. The balance is created by identifying objectives and measures within four perspectives that support the firm's strategy. Kaplan and Norton (1996) list the four perspectives as financial, customer, internal business processes, and learning and growth. The financial perspective contains objectives relating to profitability (e.g., operating income, economic value added, return on equity employed). Customer measures, such as customer satisfaction, are intended to measure the company's performance from the customer's perspective. Internal business process measures reflect core competencies, recognize strengths and shortcomings, and identify areas for improvement. A key feature of this perspective is that it may include processes that the firm does not currently carry out; it focuses on what processes should be executed to support the strategy. The learning and growth perspective contains measures that relate to the people, systems, and organizational procedures that must be supported to ensure long-term improvement and growth.

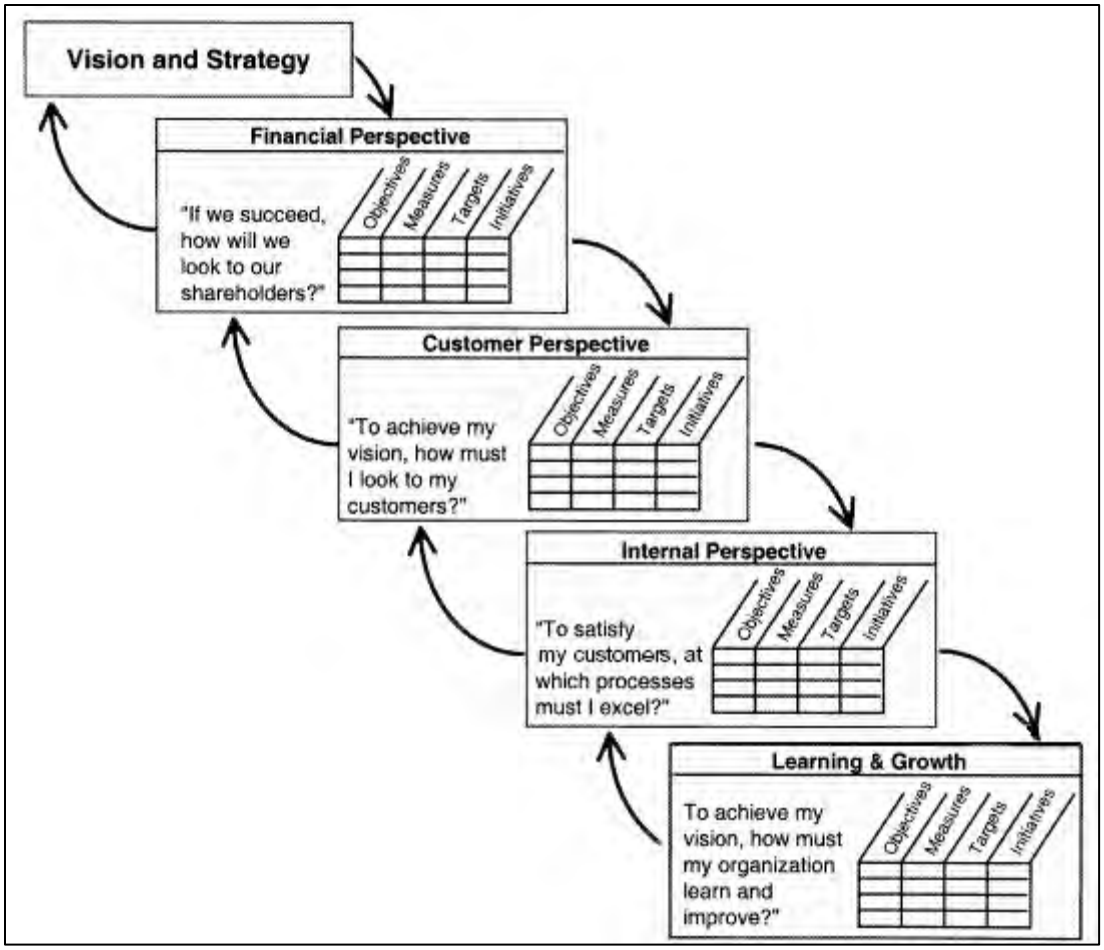

Figure 15. Balanced Scorecard Perspectives (from Kaplan & Norton, 1996)

Kaplan and Norton (1996) point out that the four perspectives are a starting point and can be modified as needed to accurately represent the perspectives most critical to the firm's value chain. The balanced scorecard helps management identify objectives within each of the four perspectives that support the firm's strategy. Quantitative and qualitative measures that indicate progress in achieving the objectives are then identified. The measures must be tied to the objectives in a causal relationship and should span all four perspectives (Kaplan & Norton, 1996). The objectives and measures should be formulated in such a way that, when pieced together, they clearly describe the firm's strategy. The measures used to track progress in achieving the objectives must be linked

to specific actions that can be taken by employees to impact the firm's success. The entire process creates a direct line of influence all the way from the firm's strategic goals down to the actions of individuals throughout the firm.

2. Application of the Balanced Scorecard

The balanced scorecard has been applied in many industries and in many ways since its development (e.g., Kaplan & Norton, 2001; Carr & Gratton, 2001, Niven 2003). Research by the Hackett Group (Williams, 2004, p. 19) indicates that successful balanced scorecards have six common characteristics:

- Focus: They are designed as a day-to-day diagnostic tool to guide executive actions and are not tied to compensation.
- Balance: They have a mix of leading and lagging indicators tied to internal and external financial and operating metrics.
- Scope: They provide a limited number of balanced metrics which support and help explain strategy. They are updated as data and the environment changes.
- Audience: They adapt to their audience. Many firms develop multiple scorecards for business units or individual employees. All must be tied to firm strategy.
- Technology: They match technology delivery to the need for timeliness in reporting and analysis.
- Implementation: They are phased in by division or level incrementally. Once the scorecard is mature at one level, it can be introduced in the next level.

While the six characteristics may make sense, there are multiple views in the literature regarding the first characteristic of focus. In the list, we are led to believe that research indicates that a successful balanced scorecard is not tied to compensation. Kaplan and Norton (1996) state early in their book, "The balanced scorecard should be used as a communicating, informing, and learning system, not a controlling system" (p. 25). Later in the same book, however, they assert, "Ultimately, for the scorecard to create the cultural change, incentive compensation must be connected to achievement of scorecard objectives. The issue is not whether, but when and how" (Kaplan & Norton, 1996, p. 217). In their second book, The Strategy Focused Organization, Kaplan and Norton (2001) devote an entire chapter to the concept of the balanced paycheck. Their

research indicated that 88 percent of 214 companies which tied compensation to their balanced scorecard did so effectively. They go on to acknowledge that such a connection is contingent upon the scorecard process being mature enough to ensure that the appropriate measures have been selected, the data are reliable, and objectives and strategy have not produced unintended consequences.

Others have developed guidelines to follow when utilizing the balanced scorecard as a means of evaluating the performance of an employee or determining compensation (Albright, Burgess, Hibbets, & Roberts, 2010a, 2010b). All of the reviewed literature indicates that selection of performance measures is the critical piece to evaluating business units or individuals. Measures must be carefully selected to avoid behavioral displacement and perceptions of comparative inequity. Employees should be included in the process of selecting performance measures and targets. Targets for the measures should be clearly defined, challenging yet attainable, and within the control of the employee (Brewer et al., 2005).

Four steps have been identified to ensure the measures are effective in communicating priorities and providing a way to compare and evaluate employee performance (Albright et al., 2010a). Each measure should be individually evaluated using an appropriate point scale. Weights should be assigned to the measures commensurate with their importance in supporting strategy and tailored to the individual or his position. Once each measure has a weighted score, the scores are added up to create an aggregate overall score representing the success or failure in achieving the targeted measures. Finally, the evaluator should have some discretion to alter the scores to account for events out of the control of the employee or for extenuating circumstances. To guard against perceptions of favoritism, the evaluator should be required to justify his or her departure from the standard (Albright et al., 2010a).

In his book, *Rethinking Performance Measurement*, Marshall Meyer (2002) argues against the balanced scorecard on the basis of performance measurement. Meyer contends that performance measurement, as approached by the balanced scorecard, is flawed for two reasons. The first reason is due to the nature of organizations. He argues that it is impossible to accurately disentangle the interdependencies of business processes

to clearly identify cause and effect. The second reason is the nature of people. Behavioral displacement can be a problem in any management control system, especially in the balanced scorecard if measures are poorly chosen. Meyer uses an analogy of a teacher "teaching to the test" to illustrate the point. Because the nature of organizations prohibits one from accurately identifying the measures that directly cause the objectives to be met, there is invariably some inherent error as well as gamesmanship by the employee held accountable for the measure (Meyer, 2002).

Meyer (2002) also points out that the competitive business environment can change so rapidly that even an accurately selected measure today may not retain its cause and effect relationship tomorrow. Moreover, measurement performance can run-down over time as result of learning to a point where it is impossible to determine good from bad performers. Meyer (2002) provides an example using analysis of major league baseball batting averages. The average batting averages remained roughly the same from 1876 to 1980 but the variance dropped dramatically. As the skill of most players increased and the selection criteria for recruitment were refined, batting average became less of an effective measure by which to evaluate the quality of a player (Meyer, 2002). If nothing else, this highlights the importance of feedback and constant vigilance to recognize when measures must be adjusted or changed entirely.

Additional problems may arise when the balanced scorecard is used to evaluate employee performance or determine compensation levels. Measures in a balanced scorecard may be qualitative and must be interpreted subjectively by the evaluator. Therefore, the link between employee performance and compensation may become unclear as the measures are aggregated to determine performance or compensation. Feelings of inequity among employees may result from the ensuing differences in compensation. Conversely, if the compensation or evaluation is tied to quantitative measures in a formulaic way, employees can be expected to employ some form of gamesmanship to enhance their compensation or performance marks (Meyer, 2002).

Still, others argue the balanced scorecard can be used for performance evaluation of business units and individuals successfully if the following five requirements are met (Albright et al., 2010b, pp.69–70):

- Fairness or equality in the assessment process
- Communication to understand organizational goals and individual contributions to the goals
- Involvement by those being evaluated in the development of measures and standards
- Challenging yet attainable goals
- Meaningful reward system

The process of building a balanced scorecard also varies among some authors. For example, Kaplan and Norton (1996) instruct a firm to begin with selecting the appropriate organizational unit and identifying the linkages between the unit and the top corporate level. The linkages with the corporate level are important to ensure alignment with the organization's mission, vision, values, and strategy. The process then moves on to identifying objective in each of the four perspectives that support the strategy. Groups of team members then develop specific measures that cause the objectives to progress in support of the strategy. After debate and consensus on the above elements, the team then develops an implementation plan (Kaplan & Norton, 1996). Kaplan and Norton (2001) later added the concept of constructing a strategy map to facilitate the early steps of the process and to assist in visualizing the interdependencies of the strategy, perspectives, objectives, and measures.

Differing from Kaplan and Norton, Brewer et al. (2005) developed an eleven-step process utilizing a business modeling approach to facilitate the successful construction of a balanced scorecard. The process developed by Brewer et al. differs from that of Kaplan and Norton by not directly addressing mission, vision, values, and strategy. The eleven-step process seems to implicitly derive the strategy through the questions a firm must answer at each step in the process. This approach may very well help avoid confusion caused by misinterpretations or misidentifications of the mission, vision, values, or strategy espoused by corporate leaders.

The process developed by Brewer et al. (2005) provides an otherwise absent methodology for accurately identifying measures with a cause-and-effect relationship with strategic objectives (Figure 16). The process begins in phase one where managers define financial goals, customers, processes, and asset inputs. The second phase then

identifies cause-and-effect relationships between business model components identified in the first phase. In the third phase, performance measures are selected for each of the four scorecard perspectives that support the business model components and overall firm strategy. A key point in their eleven step process is that performance measures are not selected until step seven. Brewer et al. (2005) argue that the success of the balanced scorecard can be jeopardized by premature selection of performance measures that are not causally linked to the business model components or the objectives that support strategy.

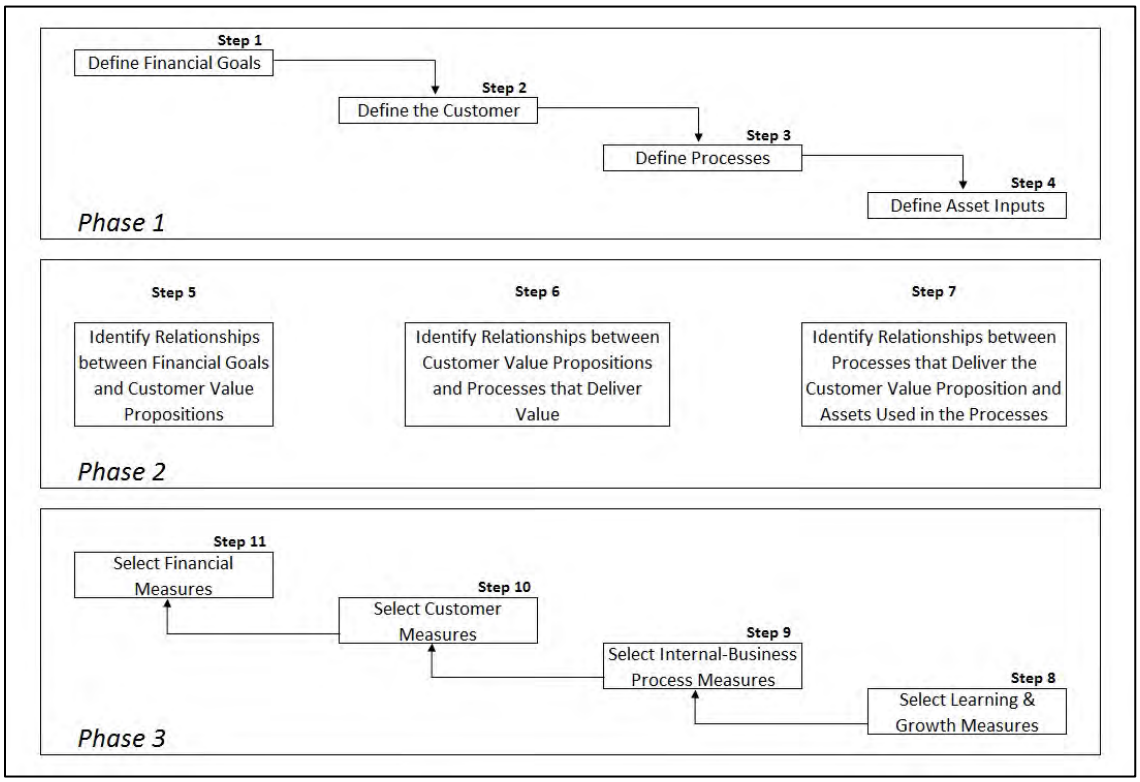

Figure 16. Business Modeling Framework (from Brewer et al., 2005)

Identifying measures that truly have a cause-and-effect relationship with objectives that facilitate the achievement of an organization's strategy is challenging, especially when objectives and measures are non-financial or qualitative. As a result, Kaplan and Norton (1996) stress the importance of feedback and strategic learning. The strategic learning process allows decision makers to evaluate the validity of measures,

objectives, and the overall strategy. The strategic learning process should collect data to assess whether implementation of the strategy will achieve the organization's mission and test the relationships between the measures and objectives. Once data are collected and analyzed, a team of individuals from various levels within the organization must move to appropriately adjust the balanced scorecard. Adjustments are necessary to ensure the effectiveness of driving the actions employees take to achieve organizational goals (Kaplan & Norton, 1996).

The frequency and scope of scorecard adjustment varies significantly from firm to firm. However, balanced scorecard adjustment is asserted as a necessity by Kaplan and Norton in their first two books. Their approach to strategic learning mitigates Meyer's criticism of performance measure run-down. Niven (2003) described a benchmarking study in which 62 percent of participants modified their scorecards annually, 15 percent biannually, and 23 percent every three months. Twenty-five percent of measures were found to be changed when firms updated their scorecards (Kaplan & Norton, 2001). The magnitude and periodicity of change required to sustain the benefits of the balanced scorecard may be a trouble area for its application to military units. Rapid and frequent changes to measures will likely be difficult to manage across multiple units. Careful assessments of the appropriate unit level scope and whether or not a scorecard can be standardized across multiple units in a military organization will be essential to further study.

3. Government Application Specifics

Application of the balanced scorecard in the private sector is generally motivated by a desire to achieve financial objectives while competing in complex environments (Kaplan & Norton, 1996). In the public sector, motivations are different (Niven, 2003). Sometimes, government agencies choose the balanced scorecard as a means to comply with the Government Performance and Result Act, which requires agencies to set goals, measure performance, and report progress (Bush, 2005). Whittaker (2001) describes the

process the Veterans Benefits Administration undertook to apply the balanced scorecard to comply with the Government Performance and Result Act and increase its effectiveness.

Others looked toward the balanced scorecard as a way to drive transformation to meet dramatic changes in the external environment or increase their effectiveness in accomplishing their mission (Johnson, 2005). Empirical evidence supports the notion that the need for transformation is particularly suited to the balanced scorecard (MacBryde, Raton, Grant, & Bayliss, 2012). Bush (2005) argues that the balanced scorecard approach is a change process and a not a measurement process. He goes on to say that if a balanced scorecard is installed for the sole reason of performance measurement, it is destined for failure.

Others adopt the balanced scorecard to provide focus in a world awash with unconnected streams of data (Cavoli, 2004). Department of Defense Special Assistant to the Secretary and Director for Program Analysis & Evaluation, Ken Krieg, sums up such aspirations by stating, “We measure everything, but by measuring everything and aligning nothing at senior levels, we really measure nothing” (Cavoli, 2004, p.10).

Despite a variety of examples and case studies of government agencies adopting the balanced scorecard, no examples could be found of its application by a low-level (e.g., Navy echelon 4 or 5) military combat unit. The U.S. Army implemented the balanced scorecard in what it called the strategic readiness system in 2001, but it cascaded down to only the brigade level (Johnson, 2005). The apparent lack of research in this area is particularly troubling to the scope of this study because no direct comparisons can be made between this effort and others. A combat unit does not have customers in the same context as a service unit. While a service unit may provide products to a combat unit (e.g., Defense Logistics Agency provides parts for aircraft repair), the combat unit provides combat effectiveness to its immediate commander. This difference is not specifically addressed in the literature, but there are some similar situations faced by other government agencies when adopting the balanced scorecard.

The differences between government agency and corporate focus and operating environment can take multiple forms. Financial perspectives within the government are quite different than those in a private firm. A private firm seeks to maximize shareholder wealth; a mission funded government agency seeks to provide the most service while exhausting its appropriated budget authority; and an agency funded through a working capital fund seeks only to recover its costs to show no loss or gain at the end of the period. Because of these differences, the customer perspective is given a higher priority than the financial perspective (Niven, 2003). Moreover, multiple stakeholders may be critical to the agency's success or may serve simultaneously as customer, supplier, and partner. For this reason, the agency may need to alter the scorecard perspectives to suit its particular operating environment.

The Naval Undersea Warfare Center acknowledged that the fleet it serves acts as a customer in one sense and a stakeholder in another; it added a fifth perspective for stakeholders to make a clear distinction (Niven, 2003). The Dallas Family Access Network modified their perspective considerably to better represent their purpose. Their perspectives were health care, social services, operational, consumer, and financial. Two thirds of all subjects in a study described by Niven (2003) chose not to alter the perspectives provided with Kaplan and Norton's balanced scorecard. Balanced scorecard perspectives should be based on what is necessary to tell the firm's strategic story (Niven, 2003).

Whittaker's (2001) book, Balanced Scorecard in the Federal Government, provides examples of successful government applications of the balanced scorecard but does not provide details on the selection of perspectives, objectives, or measures. Kaplan and Norton (1996, 2001) provide some guidance on dealing with governmental differences in both of their books. Because success is not based on financial terms, a government agency must elevate the customer or stakeholder to be the highest priority (Kaplan & Norton, 1996). Success in the public sector is based upon how effectively and efficiently an agency provides its services to its constituents, so strategy must support that end (Kaplan & Norton, 2001).

The application of the balanced scorecard to a Navy strike fighter squadron in this study will help close the gap in some of the knowledge regarding how government agencies modify the balanced scorecard to best suit their environment.

4. Challenges to Implementing a Balanced Scorecard

The path to a successful application of the balanced scorecard is beset by many perils. Recent research reveals that 70 percent of balanced scorecard initiatives are abandoned within two years (Carr & Graton, 2013). A majority of the literature reviewed agrees on many core issues, but there is some divergence. Some of the literature focuses on the author's experience (e.g., Schneiderman, 1999); some are case studies focusing on one application (e.g., Rompho, 2011); and a few actually represent studies involving many firms (e.g., Car & Gratton, 2013). Many of the factors leading to failures outlined in the literature have direct and significant implications on the potential application of the balanced scorecard to a Navy strike fighter squadron. Strike fighter squadrons have high personnel turnover rates, operate in disparate environments from one another, and enjoy decentralized management control. The implications of those factors will need to be carefully considered throughout the study. The following sections discuss various pitfalls associated with developing and implementing a balanced scorecard.

When Kaplan and Norton wrote their book, The Strategy Focused Organization, in 2001, it had been five years since their first book and over ten years since the first adoption of the balanced scorecard. They devote an entire chapter to avoiding the pitfalls (Kaplan & Norton, 2001 p. 355). Kaplan and Norton (2001) described three contributing factors common to balanced scorecard failures. "Transitional issues" is their first factor, and according to Kaplan and Norton, it results mostly from the attrition of scorecard champions. As firms are acquired and the management or organization is changed, the high-level support for the balanced scorecard is often compromised. Sometimes, CEOs are involuntarily replaced, their balanced scorecard initiatives are often replaced as well (scorecard performance associated with CEO performance). "Design failure" is the

second factor affecting balanced scorecard failure. Design failures result when the measures and objectives do not tell the story of the organization's strategy and can take multiple forms:

- Too many or too few measures
- Failure to balance leading and lagging measures
- Selecting measures without a specific link to objectives
- Scorecards among different business units that do not align with organizational strategy

The third factor, "process failures," is most often responsible for balanced scorecard failures (Kaplan & Norton, 2001, p. 361). Process failures relate to deficiencies in the implementation of the scorecard and can take the following forms:

- Lack of management commitment
- Too few individuals involved
- Keeping the scorecard at the top (not cascading it to the lower levels of the organization)
- Taking too long to develop the scorecard or viewing it as a one-time process
- Treating the balanced scorecard as a systems project
- Hiring inexperienced consultants to assist in development and execution
- Using the balanced scorecard only for the purpose of calculating compensation

One pitfall not addressed by Kaplan and Norton (2001) is the concept of gamesmanship (Meyer 2002). Gamesmanship arises because performance measures almost never perfectly reflect employees' actions and contributions to overall objectives. Imperfect measures may cause employees to take actions that enhance the measure for their own self-gain while negatively affecting strategy or their peers' performance. This theme occurs in other literature, specifically Norreklit, Jacobsen, and Mitchell (2008) and Mintchik and Blaskovich (2008). Kaplan and Norton (1996) provide an early warning in their first book stating that the balanced scorecard should be used as a communicating, informing, and learning system not a control system. As pointed out earlier in this review,

they later qualify that statement to say that the balanced scorecard should not be tied to compensation or reward until it is mature and the measures and objectives have been verified.

Tied to the concept of gamesmanship is the tendency for management to impatiently monitor employee performance (Cokins, 2010). By doing so, they compromise the causal links between measures and strategy, thus creating an environment ripe for gamesmanship. Albright et al. (2010a) provide a four step process to guard against such impatience by management, as well as the complexities involved in combining multiple performance measures. Schneiderman (1999) points out that employee involvement in the development of measures and goals is critical to avoid situations and perceptions that lead to gamesmanship and micromanaging. Kaplan and Norton (1996, p.250) devote a chapter to feedback and strategic learning describing a number of efforts firms can employ to identify and correct for deficiencies in the initial design of a balanced scorecard.

Transitional issues are particularly lethal factors in failure of the balanced scorecard. Kaplan and Norton (2001) and Carr and Gratton (2013) describe a number of cases where leadership in a firm changed, leaving support for the balanced scorecard vulnerable. Whether identified as a transitional issue or an organizational dynamic, the loss of leaders committed to the success of the balanced scorecard led to its demise in every case. Carr and Gratton (2013) reference six sources they consider “significant research” and assert that their conclusions are based upon case studies from the field. How many cases contribute to their conclusions is unclear. What is particularly disturbing about transitional issues is that none of the sources suggested an effective response. Carr and Gratton (2013) briefly mention a “succession plan” but fail to elaborate on how to implement the plan. The implications of this factor appear to be important for the balanced scorecard application to a Navy strike fighter squadron. Leadership changes every fifteen months within a squadron, so attention to the poignancy of this factor will need to be given during the course of the study.

Another relatively common pitfall described in the literature relates to strategy. Difficulties related to the definition and formulations of strategy have been well-

documented over the years and are arguably beyond the scope of the balanced scorecard. Despite that, it is important to review how relevant literature views strategy as it relates to the balanced scorecard. While Kaplan and Norton (1996, p. 37) do not approach the subject of selecting strategy, they do define it:

> ...choosing the market and customer segments the business unit intends to serve, identifying the critical internal business processes that the unit must excel at to deliver the value propositions to customers in the targeted market segments, and selecting the individual and organizational capabilities required for the internal, customer, and financial objectives.

Kaplan and Norton also assert their definition is in-line with the ideas of the widely recognized business author, Michael Porter (1996). Niven (2003, pp. 129–130) defines strategy as "…the broad priorities adopted by an organization in recognition of its operating environment and pursuit of its mission." Brewer et al. (2005) do not even mention identifying strategy during their eleven-step process to apply the balanced scorecard. Why the difference, and why does it matter? One explanation is that the differences lie in the different perspectives. Kaplan and Norton's perspective was arguably tilted more toward large corporate businesses operating in intensely competitive environments that were likely well versed on the idea of business strategy. Niven's (2003) book is directed at government and non-profit organizations operating in a much different environment. Brewer et al. (2005, pp. 29–30) avoid the topic directly, presumably because of the well documented difficulties of executives to agree on strategy (e.g., Ambrosini & Bowman, 2003; Porter, 1996), but rather approach it indirectly. The first four steps of their process are:

- Define financial success (e.g., revenue growth, profit margin, cash flow)
- Define the customer value proposition
- Define processes that facilitate customer value proposition
- Identify the tangible and intangible assets that enable process excellence

Comparing their first four steps to the definition of strategy provided by Kaplan and Norton, one can see that they lead the organization down the same road but in an indirect, methodical way. These differences have distinct implications on the application of the balanced scorecard to a Navy strike fighter squadron. Selecting a definition or a

process to identify the appropriate strategy for a military combat unit, from a management perspective, is not well addressed within the literature identified.

Regardless of how firms identify or define their strategy, the studies seem to agree that failure to review and update strategy and performance measures spell certain doom for the balanced scorecard. While Kaplan and Norton (2001) do not address it directly as a pitfall, the concept of feedback and strategic learning outlined in their first book, when followed properly, forgoes such a threat. That would indicate that a significant pitfall in applying the balanced scorecard is not precisely following the process provided by Kaplan and Norton. This is supported by Cokins, (2010) who asserts there is much confusion on what exactly constitutes a balanced scorecard. It would be difficult to properly execute the application of a balanced scorecard if executives do not agree on what it is, let alone knowing they need to update it. That may be why Cokins (2010) asserts that the strategy map is the most important part of the process. If the executives cannot agree on the strategy, they certainly will not make it past the strategy map.

The relation between non-financial measures and financial outcomes is a well-researched topic in the literature (Ittner, Larcker & Meyer, 2003). Schneiderman (1999) states the time between an improvement in non-financial measures and a discernible impact on the firm's financial performance can be as much as five to ten years and demands patience and discipline to endure such a lag time. While the empirical nature of his statement is questionable, it is supported in other work. Norreklit et al. (2008) point to the impatience of management that leads to abandonment of the balanced scorecard because of great lag times between measures and financial improvement. They also point out that firms must evaluate whether the cost to meet the non-financial objectives is outweighed by the increase in financial performance.

Meyer (2002) attempts to refute the existence of connections between non-financial performance measures and firm financial performance. He contends that external influences can quickly overpower any link between a non-financial measure and a firm's financial performance. For example, one could meet objectives relating to customer satisfaction and operating efficiency but still see a drop in profits if external market forces alter the competitive environment (e.g., substitution resulting from

innovation by competitors). Schneiderman (1999, p. 10) calls the link between non-financial measures and firm financial performance a leap of faith, “We do these the non-financial things because it is the collective wisdom of the organizations that they will improve our chances of success.” There is a distinct lack of empirical evidence in the reviewed literature to resolutely evaluate connections between non-financial measures and financial outcomes.

The literature suggests that the most pervasive factor leading to balanced scorecard failures is improper performance measure selection (Norreklit et al., 2008; Rompho, 2011; Kaplan & Norton, 2001). A critical concept that holds the balanced scorecard together is the cause and effect relationship between the performance measures and the strategic objectives. If improving the measures does not accomplish the objectives, the whole process is for naught. While the literature seems to agree that failing to properly select key performance measures leads to ruin, there is not agreement on how to specifically avoid such failure.

The literature contained a variety of methods for selecting measures. Brewer et al. (2005) provide a methodical approach to developing measures through a series of if-then statements utilized in their eleven-step business modeling approach. Wu (2012) utilizes the decision making trial and evaluation laboratory (DEMATL) to provide an analytical approach to determining cause and effect relationships between measures and objectives. Kaplan and Norton (1996) provide guidance for ex-post analysis to verify the links between measures and objectives, but offer few details on how to determine the links during design. Regardless of method, or lack thereof, the authors reviewed agree that a practitioner must approach the balanced scorecard as an iterative process that must be continually evaluated and adjusted. This has distinct implications on applying a standardized balanced scorecard to Navy strike fighter squadrons. The natural turnover in personnel within a squadron and the bureaucratic process that would likely be needed to change a standardized scorecard pose hurdles in light of these pitfalls.

B. SUMMARY

In summary, there is empirical evidence supporting the benefits and effectiveness of the balanced scorecard improving the performance of a firm. Applying the balanced scorecard is more of an art than a science due to the disparate nature of firms and the environments in which they operate. While many government agencies have adopted the balanced scorecard, Niven's (2003) examples provide little assistance to an application for a Navy strike fighter squadron. Many of the common pitfalls leading to failures of the balanced scorecard pose challenges for the application to a Navy strike fighter squadron. The data provided by this study should contribute to the body of knowledge regarding the flexibility of balanced scorecard applications and methods for identifying and overcoming common challenges.

III. METHODOLOGY

A. INTRODUCTION

Because of the differences between civilian business and the military, the process of adapting the balanced scorecard to a strike fighter squadron cannot precisely follow the steps described by Kaplan and Norton (1996) or Brewer et al. (2005). Finding a way to harness all the potential benefit of a successful scorecard while avoiding the myriad pitfalls of its application posed challenges for the researcher. The researcher exerted effort to thoughtfully consider the complexities of the military environment and how the concepts within the reviewed literature could be translated to it in a meaningful and practical way.

B. RESEARCH STRATEGY

The research strategy focused on the goal to develop a practical framework for strike fighter squadrons to deliver the right readiness at a reduced cost. The researcher structured this study to follow Kaplan and Norton's process as closely as possible while making alterations as required for a military application. The researcher chose to follow Kaplan and Norton's process because it required fewer adjustments than Brewer et al. (2005) and is the model upon which others reviewed are based (e.g., Niven, 2003).

To achieve the goals of this thesis, the research needed to answer several questions necessary for the application of the balanced scorecard. First, how do various stakeholders perceive success for a strike fighter squadron? Second, what objectives support this vision of success and align squadron outcomes with Naval aviation leadership's mission? Finally, based upon the definition of success and the specific objectives identified in the first two research phases, how might one formulate a practical balanced scorecard for a strike fighter squadron?

C. STUDY DESIGN

The research strategy provided a basis for designing a systematic approach to this adaptation of the balanced scorecard. The following steps taken represent a logical and practical approach spanning from the preliminary literature review to the refinement of a useful scorecard:

- Literature review: The researcher conducted an extensive review of available publications on the theory, applications, and successes and failures of the balanced scorecard. The review revealed cautionary signals that were heeded during the development of the research strategy and design.
- Incorporate researcher knowledge: The researcher spent approximately ten years in mid-level management within strike fighter squadrons. The knowledge gained from reviewing the literature and spending a decade within the strike fighter community provided a reasonable knowledge base to design interviews for data collection and the appropriate adaptation of the balanced scorecard framework to a squadron.
- Data collection: The researcher collected qualitative data to answer the first two questions identified in the research strategy. Quantitative data were collected from documentary sources to provide stretch targets for a number of measures during development of the scorecard. Qualitative data were analyzed by grouping common responses to interview questions or commons themes within discussions. Due to the limited number of participants and the nature of the questions, the researcher chose not to use coding for qualitative analysis.
- Findings: The researcher reported findings drawn from analysis of the data. The findings from interviews were critical to properly adjusting the scorecard framework and replicating a process that would otherwise be conducted in a group meeting (i.e., business unit groups identifying measures to support objectives in a scorecard).
- Develop preliminary framework: The researcher brought together the knowledge gained in the literature review, his own experience and knowledge of strike fighter squadrons, and the findings from data analysis to construct a preliminary balanced scorecard framework.
- Respondent feedback: The researcher coordinated the critical feedback loop described by Kaplan and Norton. Original respondents were consulted and adjustments were made based on the frequency of specific feedback or the strength of logic in their arguments. Such feedback and adjustments were critical to maintaining the trustworthiness of the balanced scorecard.

- Final report: The researcher compiled all the results and products of the study into this thesis.

D. DATA SOURCES AND COLLECTION PROCEDURES

This study used two methods of collecting data:

- Documentary evidence.
- Structured interviews.

The documentary evidence was collected from Navy directives, instructions, historical reporting data found in various Navy databases, and previously submitted entries for the Battle "E" award to identify appropriate targets for use in the balanced scorecard.

The researcher designed a structured interview to answer the questions necessary to apply the scorecard and assess alignment of priorities between operational and administrative leaders within Naval aviation. The researcher crafted the questions to lead respondents, who might not be familiar with the balanced scorecard, along a path similar to Kaplan and Norton's (1996) process of building a balanced scorecard. The interview questions also sought to explore respondents' perceptions of priorities and guidance communicated to squadrons. Three questions sought to elicit respondent opinions of whether the Battle "E" award is a signal for success or a suitable source for some measures. The researcher provided interviewees with an "if-then drivers" diagram (Figure 18) to guide their selection of cause and effect relationships between objectives. Interview protocol can be viewed in Figure 17.

Interview Questions and Protocol

1. Record time, place, and position of interviewee.
2. Notify interviewee that he will remain anonymous and obtain his consent to being interviewed.
3. Would you describe your role and responsibility in your current position and how it relates to Naval Aviation?
4. How has the Navy, historically, defined a successful strike fighter squadron?
5. Are squadrons which win the Battle "E" considered the most successful? Why or why not?
6. Provide the subject with a list of Battle "E" performance metrics.
7. Which of the performance measures in the Battle "E" contribute most to success, which contribute the least? Why?
8. What guidance are squadrons given concerning their priorities and performance requirements to achieve success?
9. Do any current Navy performance requirements inhibit a squadron from achieving success? If so, why?
10. Are squadrons incentivized to reduce the costs of their flight operations, maintenance, supply, and administrative efforts?
11. Could you name five or more objectives in operations, maintenance (including supply), and admin that a squadron must accomplish to achieve success?
12. What objectives could a squadron establish in operations, maintenance, and admin to facilitate CNAF's vision to produce a fighting force with the right readiness at a reduced cost? For example: Reduce fuel cost per hour without sacrificing quality of training.
13. Introduce the subject to the "if-then drivers diagram".
14. What performance outcomes would lead to achieving those objectives (e.g., lower gallons per hour while meeting readiness requirements)?
15. What specific actions would a squadron have to take to produce those performance outcomes?
16. Would any of the objectives, performance measures, or actions change from ship to shore?
17. Do you have any additional comments or questions regarding this research?

Figure 17. Structured Interview Protocol

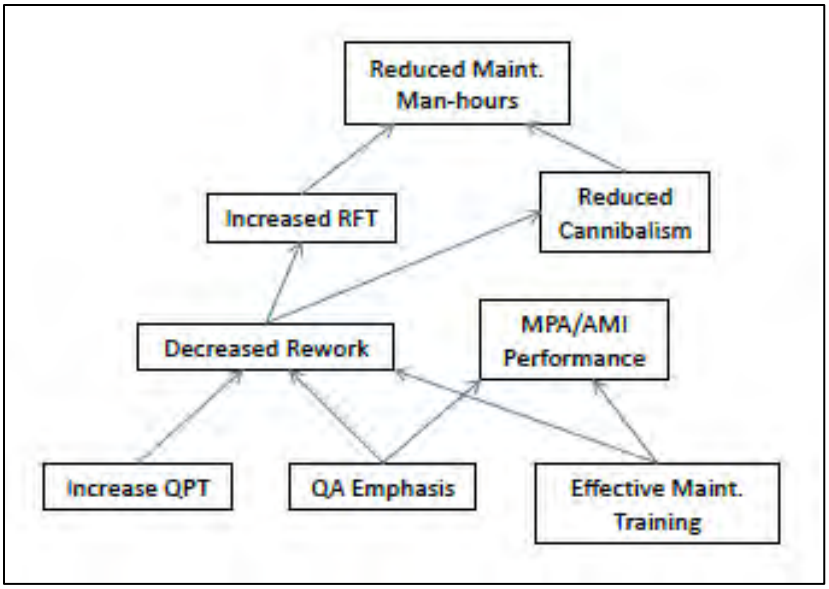

Figure 18. If-Then Drivers Diagram

The researcher selected nine participants from different levels, backgrounds and functions within Naval aviation. The group consisted of active and retired military personnel who served as commanding officers, air wing commanders, type wing commodores, NAE personnel, professional maintenance leaders, or command master chiefs. As part of the institutional review board's approval for human subject research, their identities are not revealed. The researcher selected this group in an effort to closely adhere to the recommendations given by Kaplan and Norton for building a balanced scorecard. Not only do the interviewees represent executive leadership, they also possess disparate perspectives and filled disparate roles within Naval aviation. The diversity in perspectives helped mitigate important omissions or oversights when selecting objectives or targets. The disparity of the respondents' backgrounds and perspectives also facilitated an assessment of how well the strategic guidance of CNAF and the CNO aligned with the respondents' views of success.

The researcher conducted the structured interviews via telephone, face-to-face, and in one case e-mail. Interviews were recorded with the permission of the interviewees and subsequently transcribed for data analysis by the researcher and safeguarded by institutional review board procedures.

E. DATA ANALYSIS

Data obtained from documentary sources served to set targets for measurements selected for the balanced scorecard. Directives and instructions provided explicit targets while award submissions and other reporting system entries had to be manipulated to formulate appropriate targets. Specific cases of those manipulations are discussed in Chapter Five.

The researcher analyzed qualitative data by reviewing the interview transcripts and grouping data according to the interview question or topic. Common responses or themes among respondent replies formed patterns which the researcher could use to assess the alignment of priorities among stakeholders and identify viable scorecard objectives and measures. This type of analysis was intended to closely replicate what might happen in a balanced scorecard team meeting described by Kaplan and Norton (1996).

F. METHODOLOGICAL CHALLENGES AND ISSUES

The structured interviews provided a wealth of information and data; but they were not absent of shortcomings. The researcher provided the questions to the interviewees via e-mail approximately one week prior to the interview. This was done to allow the respondents an opportunity to contemplate their perspectives on cause and effect relationships among the objectives and measures. A number of the interviewees did indeed take the time to reflect on the questions and formulate thoughtful answers ahead of the interview. However, their proactive intent was overcome by some confusion over terminology. Two of the respondents did not fully understand the term “performance requirement” in the context intended by the researcher. Another form of confusion, or perhaps distraction, resulted from the enclosed if-then drivers diagram. Instead of using the diagram as a template for a thought process, some of the respondents tended to focus on the specific example in the diagram. The diagram shows an objective of reduced maintenance man-hours along with suggested causal elements. Four of the interviewees focused on that specific objective and causal elements. Instead of stimulating discussion toward that kind of framework, they would argue the validity of the objective or the

causal elements in the diagram. In three cases, this resulted in a distraction from which the respondent could not be extracted resulting in little usable data for that portion of the interview.

Despite the designed structure, five of the interviews strayed into a semi-structured form with the interviewee entertaining several intriguing yet unrelated tangential trains of thought. While three returned on topic, two interviews were effectively derailed and ended without answering questions 12 through 15. While disappointing, one could argue that similar events might transpire during a balanced scorecard meeting among executives.

G. SUMMARY

The strategy and design of the research provided enough data to successfully answer questions necessary to apply the balanced scorecard to a strike fighter squadron. The research data also revealed important patterns in the perceptions of a disparate group of Naval aviation stakeholders. Those patterns, even without a scorecard, provide insight into how Naval aviation leaders might focus efforts to manage the fiscal challenges presented by shrinking budgets resulting from the budget control act of 2011.

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IV. FINDINGS AND RESULTS

This chapter describes the findings and results from data collection and analysis relevant to the research strategy and necessary for the construction of a usable and appropriate balanced scorecard for a strike fighter squadron. The following sections integrate results and findings into the development of the scorecard while complying as closely as possible with Kaplan and Norton's process.

A. STRATEGIC LINKS

Kaplan and Norton (1996) recommend beginning the process of creating a balanced scorecard by selecting the appropriate organizational unit and identifying linkages between the business unit and the top corporate level to ensure alignment of mission, vision, values, and strategy. The author chose to focus on a strike fighter squadron as the business unit and align its objectives with the strategic guidance issued by the CNO and CNAF.

The exploratory aspect of this research focused on how various stakeholders within Naval aviation define a successful strike fighter squadron. This concept was vital to the construction of the balanced scorecard because it provided the means to identify links (or breaks) between the business unit and the top corporate level of the organization. A disparity of priorities or views of success within the ranks of Naval aviation would complicate the process of shaping behavior toward leadership's goals.

The congruency of attitudes regarding success in the interviews was striking. Without exception, each respondent began their description of success with one of various ways to describe combat effectiveness (e.g., warfighting ability, warrior ethos, combat performance). The remaining themes did not appear in the same order but were equally consistent. The respondents' answers, when grouped by most prevalent themes, describe a successful strike fighter squadron as one which:

- Excels in combat effectiveness (warfighting ability)
- Demonstrates skillful flying in the carrier environment

- Takes care of its Sailors
- Complies well with directives (e.g., orders, instructions, requirements)

Compared to the tenets and guiding principles found in the CNO's Sailing Directions (2012), one might conclude that his message translates well into stakeholders' perceptions of success. In the author's view, this finding is not likely to surprise anyone who has taken part in the Global War on Terror within the last twelve years. No one can dispute the immense efforts and focus raised by this generation to bring the Navy's incredible power to bear upon the enemy. The primacy of the focus on effectiveness, however, can obscure the vision required for difficult fiscal decisions in the post-conflict environment.

Recognizing the tenuous nature of maintaining a capable and ready force within a volatile fiscal environment, CNAF issued the Naval Aviation Enterprise Strategic Guidance (2013c). His guidance described budgetary shortfalls and included a gap closure strategy which directed a reduction in cost of the flying hour program across all type/model/series by ten percent. This aspect of strategy was not reflected in the remarks of any of the respondents.

Every respondent acknowledged direct, negative impacts of budget shortfalls, sequestration, and the government shutdown; however, none of them believed that squadrons are incentivized to reduce their operating costs. Once again, it is unlikely that anyone who has been a part of a strike fighter squadron in the past twelve years will be surprised by this finding. Individuals may even argue that the system is not designed for a squadron to focus on such endeavors. This finding and its divergence from CNAF's strategy, is the primary driver for the importance and relevance of this thesis. The implications and interaction of this finding and the balanced scorecard are addressed in Chapter Five.

B. PERSPECTIVES

After formulating strategy, Kaplan and Norton (1996) advised the next step is to select objectives within the four perspectives which support the strategy, or in this case, the overall squadron objective. This was where Kaplan and Norton's framework needed

to be adjusted to properly fit a strike fighter squadron. The financial, customer, internal business processes, and learning and growth perspectives used in civilian business do not easily translate to a military unit. Figure 19 shows the perspectives and objectives integrated in a strategy map for a strike fighter squadron. The strategy map is useful for visualizing the overall strategy, the cascading effect of objectives, and the interactions among the drivers (Kaplan & Norton, 2004). The following sections discuss how the perspectives were adjusted to properly fit a strike fighter squadron's structure and value proposition.

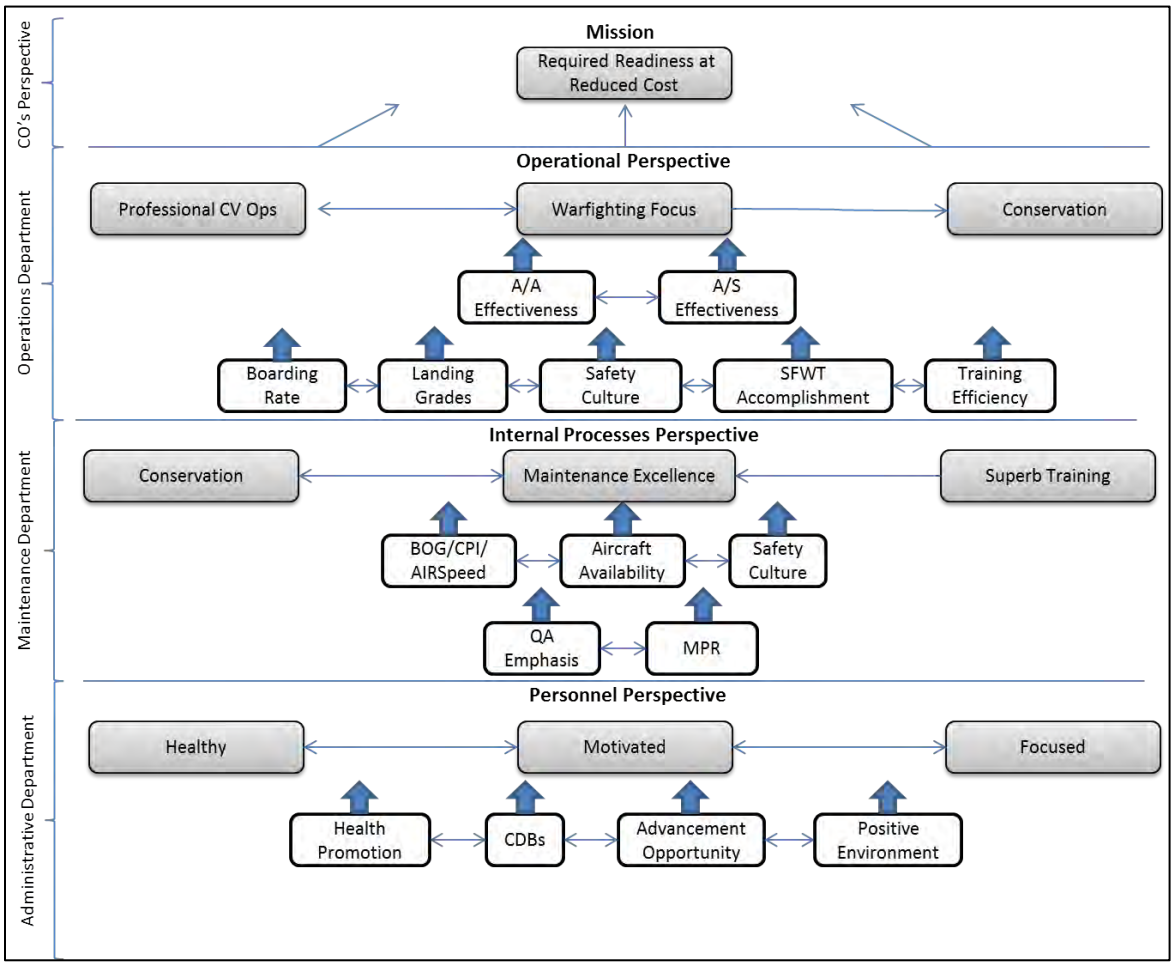

Figure 19. Squadron Strategy Map

The adjusted perspectives must be compared to criteria recommended by Kaplan and Norton (1996). Referencing Figure 19, the perspectives represent the structure of the

organization. For the strike fighter squadron, the perspectives are divided among the commanding officer and the squadron's major departments: operations, maintenance, and administrative. The nature of departments' contributions to the squadron's value proposition facilitate a cascading effect of objectives and measures from one perspective to the next. At the foundation of the new framework, the administrative department focuses on developing and caring for personnel. Properly supported, those personnel set to the task of preparing and maintaining the resources required to create value. With resources at the ready, the operations department executes the training plan to create readiness (combat effectiveness) from available resources. At the top of the framework, the commanding officer holds the responsibility for the ultimate outcome of the cascading efforts. This framework follows Kaplan and Norton's (1996) guidance of having perspectives that follow the structure of the organization, represent the value proposition, and possess relationships that allow objectives to cascade throughout the organization.

As its name implies, the financial perspective of a civilian corporate balanced scorecard focuses on concepts such as profitability, sales growth, return on assets, or return on equity. However, readiness, rather than financial performance, is the ultimate goal of a strike fighter squadron. Regardless, cost control is becoming increasingly important as a component of readiness. The CNO and CNAF use the term "cost-wise readiness." These two elements (cost and readiness) directly reflect the achievement of the overall squadron objective and therefore should fall under the purview of the commanding officer. Because of the differences between military units and civilian business, the financial perspective has a different desired outcome. For those reasons, the author adjusted the financial perspective to become the commander's perspective. The commander's perspective can be seen at the top of Figure 19.

The customer perspective is not as easily adapted. To Kaplan and Norton, the customer perspective contains objectives relating to how the customers interact with the company. For example, the customer perspective might include objectives relating to customer retention, new customer accounts, or customer satisfaction. Who then is the customer of a strike fighter squadron? Kaplan and Norton (2004) write extensively about

the value proposition, or the defining characteristics resulting from the company's operations that set it apart from its competitors or other industries. One can easily argue that a strike fighter squadron produces combat effectiveness for combatant commanders. The combat effectiveness of a strike fighter squadron cannot easily be substituted by other units. The value proposition therefore is the combat effectiveness provided by the specific capabilities of a strike fighter squadron. Readiness can be thought of as a prediction of the combat effectiveness of a strike fighter squadron. Specifically, readiness is defined as the "ability to provide capabilities required by the combatant commander to execute assigned missions, and derived from the ability of each unit to conduct the mission(s) for which it was designed" (CJCS, 2010 p. 2). Readiness is of great value to combatant commanders and that value is created through the aviation training carried out by the operations department of a squadron. Objectives relating to the creation of value for the customer will be centered upon the squadron's ability to hone its warfighting capabilities. Based upon that, the author chose to change the customer perspective to the operational perspective. The operational perspective lies just beneath the commander's perspective in Figure 19.

No aviation training can be had without appropriate resources and equipment. The responsibility to manage and maintain resources rests with a squadron's maintenance department. With the exception of coordinating supplies and spare parts, the activities of the maintenance department are generally internal in nature. These characteristics translate well to Kaplan and Norton's internal processes perspective. While no adjustment to this perspective is needed, all of the objectives within this perspective concern maintenance processes and training. The internal processes perspective sits beneath the operational perspective in Figure 19; accomplishing all the objectives within the internal processes perspective enables the operations department to create combat readiness.

The final perspective of learning and growth contains objectives which relate to people, systems, and organizational procedures that ensure long-term improvement and growth Kaplan & Norton, 1996). Just as no training can be had without resources and equipment, no maintenance can be completed without personnel. Specific attention must

be paid to the needs of those on whom all operations depend. Early and often in an officer's career, he or she is instructed to, "Take care of your Sailors." It is widely recognized that without a sincere commitment to those they lead, leaders will never gain a significant following. It is in this spirit that the learning and growth perspective approaches personnel in a strike fighter squadron. Because the central focus of this perspective is personnel, the author chose to rename the learning and growth perspective as the personnel perspective. Objectives within the personnel perspective will focus on taking care of Sailors. People are the foundation of any organization which is why the personnel perspective sits at the bottom of the strategy map in Figure 19.

C. OBJECTIVES

Data analysis of the interviews, incorporating CNAF's mission, and the author's experience within the strike fighter community yielded the following objectives within each perspective:

- Commander's Perspective
  - Produce the required readiness at a reduced cost
- Operational Perspective
  - Warfighting Focus
  - Professional Carrier Operations
  - Conservation
- Internal Process Perspective
  - Maintenance Excellence
  - Superb Training
  - Conservation
- Personnel Perspective
  - Healthy Sailors
  - Motivated Sailors
  - Focused Sailors

The following sections describe how each objective was selected. Figures 19 and 20 show how the objectives are organized within the balanced scorecard.

Strategic guidance, the choices made regarding the scope of the scorecard, and the findings of the interviews led the researcher to define the overall squadron objective as: produce the required readiness at a reduced cost. Required readiness from a squadron's perspective is calculated depending on its location within the FRTP profile, which is assigned by U.S. Fleet Forces Command. While individual aviators might argue that more readiness is always better, that is not always the case. A squadron that attains a higher level of readiness than its funding provides may consume more than its intended share of scarce resources. As a result, another squadron may be deprived of reaching its required level of readiness. The "right readiness" described in CNAF's mission statement speaks to that concept and therefore urges squadrons to adhere to their assigned profile.

Asking respondents their thoughts on objectives for squadrons to achieve success resulted in answers that mirrored their descriptions of successful squadrons. For the operational perspective, every respondent listed warfighting focus and professional carrier operations. A central theme among interviews (~70 percent) regarding maintenance (internal process perspective), was an emphasis on "by the book maintenance" and quality training. "By the book maintenance" can be viewed as maintenance excellence, or the department's ability to adhere to the Naval Aviation Maintenance Program (NAMP, COMNAVAIRFORINST 4790.2B) and CNAF's material readiness standards. Maintenance training might normally be included in the learning and growth perspective, but the author chose to include maintenance training in the internal process perspective because it is the primary driver of excellence within a maintenance department. Training is critical because personnel turnover in a military unit is constant by design. A squadron will replace approximately one third of its personnel every year. With the exception of a few billets, the personnel within a squadron will be completely different after a three-year period. Taking care of the Sailors was another dominant theme during the interviews. Taking care of one's Sailors means to demonstrate a sincere commitment to their goals and well-being. Providing the right guidance and policy to ensure a positive work environment, a robust program to facilitate career aspirations, and a healthy workforce is the foundation upon which all is accomplished within a squadron.

The author chose the objectives of conservation because none of the respondents included cost reduction when discussing success. The interview data indicated that squadron leaders are not engaging in discussions about cost reduction. When asked, every respondent agreed that squadrons should be incentivized to reduce their costs. Only three of the respondents had specific ideas to accomplish that. Four of the respondents asserted that the best way to reduce maintenance related costs was to ensure a high number of well-trained technicians who strictly adhere to NAMP procedures. Better training and discipline leads to fewer costly mistakes. Of the six respondents who were aviators, all agreed that operations could be adjusted in some cases to reduce fuel consumption, but warned that some techniques would not be appropriate in every situation.

Only two respondents mentioned safety as important objectives for successful squadrons. Four of the respondents considered safety to be a byproduct of professionalism. From their perspective, safety is an integral part of the objectives of professional carrier operations, warfighting focus, and maintenance excellence; Attributable mishaps are indicative of unprofessionalism and hence an unsuccessful squadron. The other three respondents either did not discuss safety at all or mentioned it briefly as part of another objective as an implied condition.

D. DRIVERS AND MEASURES

The author selected measures based upon data gathered during structured interviews. The interview respondents were presented with a list of measures used in the Battle “E” award. Respondents indicated which measures they felt contributed most to success and which contributed the least. The competitive timeframe of the Battle “E” is one year, so many of the chosen measures needed to be modified to present timely data useful for a balanced scorecard. Additionally, a number of the measures needed to be modified because they were not precisely connected to the desired results or they were not under the squadron’s control. Measures not derived from interview data were selected using the author’s experience within the strike fighter community and knowledge of the balanced scorecard. The author chose measures based upon simple criteria. The measures

were required to be easily tracked, fully controllable by the squadron, and have a direct, causal link to the objectives. A general overview of the measures within each perspective is depicted in Figure 20.

STRIKE FIGHTER BALANCED SCORECARD				
Objectives	Measures		Targets	Weights
COMMANDER'S PERSPECTIVE				
Required Readiness at	Training Readiness	Average TFOM across NTAs ÷ Average Training Readiness Standard	>LCL, ≤Stndrd	7%
Reduced Cost	Cost Performance Index	(Budgeted CPH x Executed Flt Hrs) ÷ (Actual CPH x Executed Flt Hrs)	1.1	5%
OPERATIONAL PERSPECTIVE				
	Training Efficiency	Missions Accomplished (Meeting All Intentions) ÷ Missions Planned	90%	7%
	Sim Utilization	SFWT Event Sim Preparation ÷ Eligible SFWT Events Completed	95%	3%
Warfighting Focus	SFWT Accomplishment	Aircrew On Track ÷ Aircrew in SFWT Syllabus	95%	6%
	Air-to-Air Effectiveness	Valid A/A shots ÷ Total Air/A Shots taken	90%	4%
	Air-to-Surface Effectiveness	Valid A/S Deliveries ÷ Total Air/S Deliveries Attempted	90	6%
Proffessional Carrier	Boarding Rate	Carrier Landings ÷ Carrier Landing Attempts	95%	5%
Operations	Landing Grades	Squadron GPA ÷ Air Wing Avg GPA	>1.0	3%
	Operational Safety Assesment	Operational Safety Climate Assessment	3	3%
Conservation	Gallons Per Hour	(Gallons Consumed ÷ Hours Flown) ÷ Budgeted Gallons Per Hour	0.95	5%
INTERNAL PROCESSES PERSPECTIVE				
Maintenance	Aircraft Availability	Avg Daily Reported RFT ÷ RFT Standard	100%	7%
Excellence	Late QA Audits	Late QA Audits ÷ Total QA Audits (6 months)	5%	3%
	Repeat Discrepancies	Repeat Discrepancies ÷ Total Discrepancies For Most Recent Audits	<20%	3%
	Drills	Program/Work Center Drills Completed ÷ Drills Planned	100%	3%
Superb Training	MPR Fit	Maintenance Personnel Readiness (Average Fit rate for all quals)	90%	7%
	Maintenance Safety Assessment	Maintenance Safety Climate Assessment	3	3%
Conservation	# CPI Training Events	# of Boots on Ground/CPI Projects/AIRSpeed Training Events Completed	1	4%
PERSONNEL PERSPECTIVE				
Healthy	Health Promotion Plan	Number of goals met or events complete ÷ goals or events planned	100%	3%
Motivated	Late Career Development Boards	Late CDBs ÷ CDBs Required	<5%	5%
	Advancement Exam Pass Rate	Sailors Who Passed Adv Exam ÷ Total Sailors Eligible for Adv Exam	95%	5%
Focused	Positive Environment	Monthly survey of reps from JOPA, Chiefs' Mess, FCPOA, & JSA	3	3%

Figure 20. Strike Fighter Balanced Scorecard Framework

The following sections describe each measure and the rationale behind its inclusion within the balanced scorecard.

1. Commander's Perspective: Objectives–Required Readiness at Reduced Cost

Two measures in the commander's perspective indicate progress toward achieving the required readiness at reduced cost: training readiness and cost performance index. These measures ensure the commander maintains awareness to the squadron's readiness level and the targeted total cost per hour (comprised of fuel, aviation fleet maintenance, and aviation depot level repairs). A failure to meet targets in either of these measures would prompt the commander to investigate their various elements to identify root causes.

a. *Training Readiness*

Training readiness compares the actual reported readiness of the squadron against the average training readiness (ATR) requirement based upon the squadron's position in the FRTP. This measure is easily calculated by the officer in charge of tracking training and readiness through a "current readiness report" generated from the Sierra Hotel Advanced Readiness Program. Once the report is generated, the officer must calculate a training figure of merit (TFOM) for each Navy tactical task (NTA). The current readiness report report gives a performance factor and experience factor for each NTA. The officer would multiply the performance factor by the experience factor and divide by 100 to get the NTA's TFOM. Taking the average of all the TFOMs would yield the final figure to compare with the ATR for the given readiness month (R+Month). The readiness standards instruction (CNAF, 2012b) lists the ATRs for each R+Month and provides thresholds for green, red, and yellow color coding.

b. *Cost Performance Index*

Cost performance index can be derived from the aviation financial analysis tool (AFAST) user module. The AFAST user module displays the actual costs for the squadron for fuel, aviation fleet maintenance, and aviation depot level repairs and compares them against the "should cost" figures. The "should cost" is actual flight hours executed, multiplied by the budgeted cost per hour as calculated in the OP-20 funding document (CNAF N422, 2003). Dividing the "should cost" figure by the actual cost per hour yields the cost performance index. Not meeting the total cost target for this measure would prompt the commander to investigate its different components to determine causal factors. Even though AFAST costs are adjusted for differences in captured costs and executed financial costs reported in the aviation cost evaluation system (ACES), they are not considered a fully burdened cost (CNAF N422, 2003). Using AFAST data, which only include aviation depot level repairable, aviation fleet maintenance, and fuel costs, is desirable because the measures used by the squadron need only be those controllable by the squadron.

2. Operational Perspective: Objectives–Warfighting Focus, Professional Carrier Operations, Conservation

a. *Training Efficiency*

Training efficiency is a vital measurement that should shape critical behaviors within the squadron. Training efficiency measures the rate of mission accomplishment, but in a slightly different way than aviators may be familiar. Training efficiency counts how many missions were flown when the designated crew received the intended training with an appropriately configured and equipped jet on a suitable training range with the correct ordnance; that number is then divided by the total number of missions planned for that month. This measure would not include those missions that did not launch for reasons beyond the control of the squadron (e.g., weather, base closure). The training efficiency measure supports teamwork and coordination among different departments within the squadron. A majority of the respondents discussed the importance of communication among the different departments of the squadron. The operations and maintenance departments require effective communication and coordination to successfully satisfy all five requirements of the measure on a regular basis. Interview data revealed that a number of squadrons hold weekly maintenance-ops meetings and planning boards for training to facilitate coordination and communication between the maintenance and operations departments, but some do not. The training efficiency measure would force close coordination and cooperation among maintenance, operations, and the ordnance officer. Additionally, since the denominator is planned missions, critical thought must be given to a spare jet game plan in the event a maintenance discrepancy precludes launching an aircraft.

b. *Simulator Utilization*

Simulator utilization changed very little in the strike fighter community from the 1970s through 2002 (Schank, Thie, Graf, Beel, & Sollinger, 2002). Three of the respondents, who were current aviators, asserted that simulator fidelity has improved dramatically in recent years, but it can never fully replicate all of the value aircrew get from actually flying a jet. Despite that, the respondents also acknowledged that practicing

certain tasks in a simulator prior to actual flight, leads to fewer mistakes and a higher quality of training. The simulator utilization measure would count the number of strike fighter weapons and tactics (SFWT) syllabus flights that were preceded by a simulator event divided by the total number of SFWT flights flown that month. The denominator would include only those flights for which a practice simulator is listed within the syllabus. Interview data revealed that fleet squadrons are given only 11 percent of the monthly capacity of the simulators in Lemoore. As a result, most simulator events in the SFWT syllabus are optional. The simulator utilization measure should incentivize greater effort to use the simulators and lead to greater training efficiencies.

c. *SFWT Accomplishment*

Respondents confirmed that an important part of furthering warfighting focus within a squadron is the advancement of the skill and qualifications of aircrew. There are five levels of the SFWT program with levels two, three, and four normally being achieved while in a fleet squadron (CSFWP, 2010). Managing the progression of aircrew through their syllabi can be challenging, specifically in squadrons which employ the two-seat model (FA-18F) with twice the number of aircrew. There is no defined standard for the time it should take an aviator to complete the various levels (CSFWP, 2010). Interview data showed some squadrons set goals while others do not. The SFWT accomplishment measure would count how many aircrew in a SFWT syllabus are on schedule and divide that by the total number of aircrew in the SFWT program. This measure would allow a squadron to choose its own schedule and track their progress in adhering to it. Shortfalls in this ratio would give the commander warning and push him/her to investigate possible causes (e.g., a lack of resources, a lack of planning, or repeated re-flies by underperforming aircrew).

d. *Air-to-Air Effectiveness*

Encouraging fighter aircrew to take air-to-air training seriously is not a difficult task. Air-to-air missions are challenging, dynamic, and can be immensely enjoyable for aircrew. Measuring the effectiveness of that training is a distinct challenge. One method would be through the ratio of valid air-to-air weapons employed to the total

number of air-to-air weapon employment attempts (simulated). The act of properly employing an air-to-air weapon can be difficult, especially when facing fourth generation adversaries in a dynamic and complex tactical situation while utilizing a data-link network. The Naval Strike and Air Warfare Center (NSAWC) developed criteria for the valid employment of each air-to-air weapon (NSAWC, 2011). The criteria puts an employment into one of three categories: valid, invalid, and "unassessable." A high ratio of valid shots to total shots taken, signals a well disciplined and knowledgeable cadre of warfighters.

e. *Air-to-Ground Effectiveness*

In the same manner of measuring air-to-air effectiveness, NSAWC valid delivery criteria can be used to measure the effectiveness of air-to-surface employment. In addition to the criteria set forth by NSAWC for valid air-to-surface deliveries, time-on-target adherence, proper weapon function, and circular error of probability (CEP, a measure of delivery accuracy) will be included in evaluating the delivery. While an NSAWC instructor might argue those things should already be taken into account, fleet aircrew may not always consider each of those components in practice. Proper weapon function demands quality from the ordnance work center when actual ordnance is carried. In training scenarios when ordnance is simulated, aircrew would assume the weapons functioned properly and accurately.

f. *Boarding Rate*

To gauge professionalism when flying in the carrier environment, two traditional measures have been used: boarding rate and landing grades. Deficiencies in either of these measures might signal a lack of focus, training, or both. Boarding rate is simply the ratio of carrier arrested landings to landing attempts (not including wave-offs outside the pilot's control). The boarding rate measure is important because failure to land on the first attempt increases the time and fuel required for the recovery of aircraft. Not only wasteful, such increases can jeopardize survival during combat when time and resources may be scarce as a result of enemy action.

g. *Landing Grades*

Each time a pilot makes an approach to a carrier, his/her pass is graded by a Landing Signal Officer for the purposes of trend analysis (NAVAIR, 2013). Landing Signal Officers' primary responsibility is to communicate with pilots during the terminal phase of landing to ensure the safe and expeditious recovery of aircraft (NAVAIR, 2013). Landing Signal Officers are required to periodically brief pilots about trends that developed in their landing technique (NAVAIR, 2013). Landing Signal Officers utilize a four point grading scale and a series of coded comments for each landing to facilitate trends analysis using the Automated Performance Assessment and Readiness Training System (NAVAIR, 2009). As a wing-qualified Landing Signal Officer in an operational strike fighter squadron and a training-qualified Landing Signal Officer in a fleet replacement squadron, the author experienced the topic of landing grades to become polarizing among aviators. A number of aviators may argue against the emphasis on grades, but others might argue that grades lead to safety and focus by forcing a pilot to protect his reputation via his grade point average. Landing Signal Officers evaluate and grade each pilot's pass using criteria standardized through supervised on-the-job training and formal ground training at the Landing Signal Officer School in Oceana, Virginia (NAVAIR, 2013). Despite the effort to standardize, grading and evaluation criteria can be applied slightly differently between air wings. Because of the variation in grading from one air wing to the next, the Battle "E" award scoring process, described in Chapter One, indexes a squadron's grades against other squadrons within the same air wing (CSFWP, 2012). For the purposes of this balanced scorecard, the landing grades measure would be a relationship of the squadron's landing grade point average versus the air wing grade point average. Above average landing grades should signal a healthy amount of skill, focus, and training without over emphasizing numerical competition.

h. *Operational Safety Assessment*

The effectiveness of a safety program is extremely difficult to measure (Nieva & Sorra, 2003). Simply counting the number of mishaps and assigning a score defeats the purpose of a safety program, which is to prevent mishaps. One way to

measure the nature of a safety program would be to use a qualitative assessment by the commanding officer or the command's safety officer. A squadron's safety culture can be described by elements such as individual attitudes regarding safety, the utilization of operational risk management, and collective knowledge of emergency procedures and systems. After lengthy observation, a commanding officer could rate the squadron's safety culture on a scale of one to five. A score of one would represent a total disregard for safety and risk management; a five would represent a zealous quest for safety. A reasonable target would be a score of three which might represent a squadron that utilizes reasonable situational emergency training, legitimate monthly immediate action exams, and practices thoughtful operational risk management on a routine basis. Despite a lack of quantitative measurement, the process of thoughtful reflection upon the safety culture of the squadron might invite a higher level of awareness leading to a more proactive safety program.

i. *Gallons Per Hour*

Based on the cost structure of a strike fighter squadron presented in Chapter One, one might argue the greatest impact the operations department can have on the cost of readiness is through fuel consumption. Two of the respondents suggested selecting a measure that would calculate the gallons of fuel per unit of readiness; however, there are various problems with such a measure. First, a unit of readiness is difficult to define. Aircrew must complete a variety of tasks within specified time periods to become a "skilled crew" in each capability area (NTA). The tasks which contribute to each NTA can be mixed and matched in different combinations to achieve "skilled" status (CSFWP, 2013). To measure gallons per task would encourage aircrew to complete as many tasks as possible per flight or to fly those missions which have the highest number of tasks associated with them. Either case is not necessarily what is intended. Moreover, some flights are not flown for the sole purpose of readiness. Some flights are flown for the advancement of aircrew qualification and some are flown in support of other units' training. Naval aircraft are often used to facilitate the training of Joint terminal air controllers and to act as oppositional forces for various military exercises. Some readiness is gained through that, but in those cases readiness may not be the focus.

Using gallons per readiness task as a measure would also fail to address the fact that not all crews need to be skilled in all NTAs (CSFWP, 2013). Additionally, the measure is so obscure that it might be difficult to analyze trends. If at the end of the month, it is found that the squadron has missed the target for gallons per task, what might be the cause? What would be the corrective action? It is for these reasons the author did not choose gallons per task.

The author chose gallons per hour because it is a measure that is easy to understand, analyze, and record. Gallons per hour, however, has a gamesmanship element that must be considered. If gallons per hour is the measure, then aircrew might be encouraged to maximize their flight time and minimize their fuel burn rate on each mission. This is desirable in very few cases. Not using afterburner during a defensive counter air mission because one wants to draw out the flight time as long as possible would likely fail to meet the training objectives and measures of performance for that mission (CSFWP, 2013). Managers can mitigate gamesmanship by having other measures which counteract potential negative behaviors. For example, the gallons per hour measure is countered by air-to-surface effectiveness, air-to-air effectiveness, and training efficiency. Based upon the training objectives and measures of performance listed in the wing training manual (CSFWP, 2013), it would be implausible to remain effective and accomplish intended training for most missions by flying a fuel conserving profile for the entire flight. There are actions, however, that can be taken to save fuel. For instance, reducing the drag by changing the configuration of the aircraft can extend flight time without sacrificing training. Some flights may be conducted without external fuel tanks (short missions at nearby ranges). Ground operations can be minimized to reduce fuel consumption. Not all situations will warrant such action but there are many ways squadrons can reduce their fuel consumption. One might argue that thinking in terms of gallons per hour is the most practical way to influence aircrew behavior toward conservation.

3. Internal Processes Perspective: Objectives–Maintenance Excellence, Superb Training, Conservation

a. *Aircraft Availability*

According to the interviews, aircraft availability is one of the most highly scrutinized maintenance measures. It is measured using a concept known as ready for tasking (RFT). An aircraft ready for tasking is one which is not only capable of flight but also has an appropriate complement of usable combat systems to carry out the squadron's NTAs (CNAF, 2012b). The readiness standards instruction (CNAF, 2012b) lists the RFT requirements for squadrons in each R+Month throughout FRTP. In this balanced scorecard, meeting RFT would indicate successful outcomes of an excellent maintenance department. Not meeting RFT requirements would not necessarily negate the maintenance department's excellence. Interviews revealed a host of reasons that might lead to a squadron not meeting RFT requirements. For instance, one air wing commander interviewed specifically listed spare parts availability, a lack of qualified personnel, and several aircraft sent to a maintenance depot or on loan to NSAWC as reasons for one of his squadrons only having one out of twelve aircraft available to fly. In a normal FRTP cycle, not meeting RFT would give a commander cause to investigate the management of his maintenance department.

The Quality Assurance (QA) division can have influence over a maintenance department's level of excellence if properly empowered. The objectives of the QA division outlined in the NAMP, Chapter 7.1.1are:

- Improve the quality, uniformity, and reliability of the total maintenance effort.
- Improve the work environment, tools, and equipment used in the maintenance effort.
- Eliminate unnecessary man-hour and dollar expenditures.
- Improve training, work habits, and procedures of maintenance personnel.
- Increase the excellence and value of reports and correspondence originated by maintenance personnel.
- Effectively disseminate technical information.

- Establish realistic material and equipment requirements in support of the maintenance effort.
- Support the Naval aviation maintenance discrepancy reporting program (NAMDRP).
- Support the foreign object damage (FOD) prevention program.

The strike fighter balanced scorecard utilizes three QA related measures to signal progress in achieving maintenance excellence: expired audits, repeat discrepancies, and drills.

b. *Late QA Audits*

An important part of achieving QA's objectives is the QA audit program. QA division personnel conduct audits of work centers and maintenance programs on a scheduled and unscheduled basis throughout a given year. The audits are used to identify, investigate, and correct deficiencies within the maintenance department (CNAF, 2013b). The Quality Assurance Supervisor and Quality Assurance Officer are responsible for the management of the QA division and its audit program (CNAF, 2013b). Setting a schedule for program and work center audits in compliance with the NAMP and then adhering to that schedule, demonstrates a dedication to the importance of the audit program. The late QA audits measure for this balanced scorecard would take the number of late audits divided by the total number of audits for the previous six months. A high percentage of late audits would signal an impending backlog of audits and a possible degrade in their quality as personnel rush to catch up. High quality audits are essential to ensuring work center and program compliance with the NAMP along with organizational learning (CNAF, 2013b).

c. *Repeat Discrepancies*

Closely related to the late QA audit measure is the repeat discrepancy measure. Instead of measuring the QA division's commitment to the QA audit program, repeat discrepancies measures the commitment of the work center or program to improve its performance. The measure identifies the percentage of discrepancies from the most recent audits that are repeated from the previous audit. This measure would be tracked for

each program and work center audit and aggregated over the previous six month period for the balanced scorecard. The six-month period would ensure that an audit of every work center and program would be included in the percentage. A high percentage of repeat discrepancies would indicate a lack of learning and improvement which could stem from work center or program mismanagement or from poor assistance and feedback from the QA division.

d. *Drills*

The final QA related measure concerns program and work center drills. Drills are a key part of preparing for two major maintenance inspections, the Maintenance Program Assist conducted by the type wing and the Aviation Maintenance Inspection conducted by CNAF inspectors (CSFWP, 2009; CNAF 2013b). Both inspections occur once per FRTP cycle or 24 months (CSFWP, 2009; CNAF 2013b). Both inspections test a squadron's maintenance department on how well it adheres to policies within the NAMP. Part of the inspection process includes drills, testing the coordinated reaction of maintenance personnel to a variety of emergent situations (CNAF, 2013b). Interview respondents indicated some squadrons may delay their preparation for these inspections and end up "cramming" their efforts to get ready a few months out. Such behavior often negatively impacts flight operations and morale. The intent of the inspection process is to compel squadrons to operate each day as if they were preparing for an inspection, "safely and efficiently perform its mission as defined by applicable directives" (CNAF, 2013b, ch. 2, p. 2–3). The QA division is often responsible for coordinating the drills and inspection preparation because of its other responsibilities outlined in the NAMP. Having a measure that compares the efforts to prepare for inspection against a monthly preparation plan encourages behavior that should ultimately lead to a successful inspection cycle. A coordinated and concentrated effort to prepare for inspection throughout the year is likely to enhance the performance level of work center supervisors and program managers.

e. *Maintenance Personnel Readiness Fit*

A new measure put in use by strike fighter type wing commanders is one called maintenance personnel readiness (MPR) (CNAF, 2013e). This measure expands upon older measures such as qualified proficient technician fit (QPT fit) and Navy Enlisted Classification fit (NEC fit) (CSFWP, 2012). QPT fit measured how many maintenance personnel in each work center held the expected qualification level (apprentice, journeyman, master) based on their rank (CSFWP, 2012). While important, QPT fit fails to capture other qualifications outside the QPT program. NEC fit measures how many personnel within a squadron hold a specific career qualification (NEC) against an expected standard (CNAP, 2010). One interview respondent pointed out the shortcomings of NEC fit. He stated that it does not recognize that some Sailors with certain NEC codes may not be able to perform the work described by their NEC because of their work center assignment. For example, a Sailor who holds an NEC which qualifies him to work on aerial refueling stores might be a supervisor for an unrelated work center. Putting that Sailor into a billet to specifically work on aerial refueling stores would negatively impact his career and create a gap in a supervisory role in his original work center. So while the squadron might appear to have enough personnel to work on aerial refueling stores, the reality is they are one short. Additionally, the respondent asserted that new personnel arriving to the squadron sometimes might not have an NEC they were expected to have based upon the billet they were expected to fill. Squadrons have little control over who gets sent to their squadron and what NECs they hold. For the reasons indicated by the respondent, NEC fit is not a suitable measure for how well a squadron manages its maintenance training. MPR attempts to correct for these shortcomings by including QPT along with a variety of other critical qualifications within the maintenance department. MPR does not include NEC qualifications but it does take into account who can actually fill the duties of the other critical qualifications (CNAF, 2013e). For the strike fighter balanced scorecard, MPR fit is the average percentage of appropriately filled qualifications. A high MPR illustrates a maintenance department that has an adequate number of qualified personnel to complete required maintenance tasks in a two-shift work day.

f. *Maintenance Safety Assessment*

The safety culture within a maintenance department is as important as in the operations department but it is of a different nature because the maintenance department focuses on compliance with maintenance related safety regulations listed in the Navy safety and occupational health program manual (OPNAVINST 5100.23G) and the NAMP. The maintenance safety culture measure was configured similarly to the operational safety assessment using a qualitative assessment by the commander or an officer of his choosing (e.g., Safety Officer, Quality Assurance Officer, Assistant Maintenance Officer). The assessment would be made along the same five point scale but would focus on aspects of safety applicable to the maintenance department.

g. *CPI Training Events*

The structured interviews revealed that squadrons do not routinely practice or train to the concepts of continuous process improvement or AIRSpeed managed by the Naval Aviation Enterprise and directed by DODI 5010.43. According to the interviews, much of the training relating to AIRSpeed is lengthy, formalized, and often not accessible to fleet squadron personnel. However, the basic levels of AIRSpeed and CPI training might be helpful in creating a culture of process improvement and efficiency within both the operations and maintenance departments. Arguably, the creative ideas of junior personnel will lead to process improvement. However, junior personnel must first be equipped with the concepts and encouraged by leaders to question old ways of doing business. For the strike fighter balanced scorecard, the measure would simply be how many AIRSpeed, CPI, or NAE "boots on ground" (CPI site visit projects) training events the squadron participated in during the month. This leading measure should set the tone for an environment of improvement and efficiency.

4. Personnel Perspective: Objectives–Healthy, Motivated, and Focused Sailors

a. *Heath Promotion Plan*

The health promotion program (CNAFR, 2009) is a system of education and interventions focusing on health, social, economic, and environmental issues to

encourage healthy lifestyles and increase organizational and individual readiness. Squadrons' health promotion programs are evaluated each year and those meeting specific criteria will win an award called the Blue "M" (CNAFR, 2009). Crafting a robust health promotion program and establishing a plan of action to achieve the goals not just to win the Blue "M" but to truly enhance the physical wellbeing of Sailors is likely to contribute to their ability to accomplish the mission. The measure for this balanced scorecard would be the number of goals reached or events completed (e.g., physical readiness test pass rate, tobacco cessation, dietary training) for that particular month divided by the number of goals and events planned for that month as dictated by the squadron's health promotion program instruction.

b. *Late Career Development Boards*

Part of maintaining a motivated workforce is through demonstrating a sincere commitment to every Sailor's career aspirations. Two measures which are direct indications of a squadron's commitment are career development boards (CDB) and a advancement exam preparation program. CDBs are meetings with each Sailor, the Command Career Counselor, the Command Master Chief, and a supervisor and/or mentor (OPNAV, 2012). The purpose of the board is to review the career progress of the Sailor, his/her service record, and future steps needed to reach the Sailor's goals. CDBs are held within 30 days of a Sailor reporting to the squadron, the six month point, the 12 month point, and then every 12 months thereafter (OPNAV, 2012). Keeping the program on schedule ensures that Sailors are getting the information they need to make sound career decisions. This balanced scorecard measure would be the number of late CDBs divided by the total number of boards required that month. A low percentage of late CDBs would represent that the program is receiving the required attention to keep it relevant and effective.

c. *Advancement Exam Pass Rate*

Sailors in the paygrade of E-4 through E-7 must pass a navy-wide advancement exam to be eligible for advancement in rate. (BUPERS, 2007). Advancement exams for E4 through E-6 are held twice a year in September and March,

for E-7s they are held in January (BUPERS, 2007). An advancement exam preparation program which integrates preparation efforts into the workweek instead of forcing Sailors to study off-duty is one way to demonstrate a squadron's commitment to Sailors' success. The measure for the strike fighter balanced scorecard would be the number of those who passed the test divided by the number of those who took the test for the most recent exam cycle. While this measure would not reflect monthly progress, it would provide an indication of overall program health.

d. *Positive Environment*

The final measure facilitating a focused workforce is to maintain a positive environment. Hostile work environments, excessive workload, drug and alcohol problems, discrimination, and sexual harassment are all distractions which can keep Sailors from doing their best. This measure would be a qualitative measure collected from representatives of various groups within the squadron (i.e., junior officers, chiefs, first class petty officers, and junior enlisted). One representative from each group would rate the morale of their group on a scale of one to five. A score of one would indicate conditions so poor that almost all members of that group hold deep animosity toward the squadron. A score of five would mean that every member of the group is happy with conditions, task loading, and group cohesion. A target score of three would be an appropriate target where a majority of members in the group are satisfied with working conditions, workload, and generally feel valued by the command. Measuring in this way provides timely feedback to command leadership, protects the anonymity of complainants, and provides a regular avenue of communication to leadership from the lower ranks.

E. TARGETS AND WEIGHTS

Four of the respondents, who were or had recently been in operational positions, expressed concern about the establishment of targets and the use of the scorecard as a tool to compare squadrons. They said their concerns were based on the fact that squadrons operate in extremely variable environments. Even though the measures and targets might be normalized for a squadron's position within the FRTP profile, external

forces might prohibit a squadron from being able to meet its requirements. For example, because of the government shutdown in October, 2013, the fleet readiness center in San Diego fell behind in its depot level repair work. This resulted in aircraft not being returned to the fleet on schedule; combined with requirements to lend aircraft to NSAWC or other agencies, some squadrons simply did not have enough aircraft to conduct even the most basic training. Such a situation would look fairly dire on the balanced scorecard. For that reason, the respondents agreed that the balanced scorecard should be a tool that remains at the squadron level. This way the commanding officer can change the targets based upon the squadron's situation. The commander would not change the objectives but rather he would take into account the means available to meet the ends. Take for example the squadron unable to conduct training as a result of too few jets. Once the situation gets resolved, the squadron will have to set to the task of retraining its aircrew. Because of the lapse, it is not likely the commanding officer would reasonably expect a weapons efficiency score of 90 percent. It is in this way that the commanding officer could adjust the targets based upon the context in which the squadron finds itself.

Initial targets selected for this balanced scorecard were based upon documentary evidence of training requirements or historical values. CNAF's strategic guidance for the NAE set the target for CPI at 1.1 (CNAF, 2013c). Due to variation among individual scores, the author chose to use the average scores from the 2012 battle "E" award submissions from FA-18E/F squadrons of strike fighter wing, Pacific for the measures of boarding rate and advancement exam pass rate. Commanding officers would likely wish to set their own targets for boarding rate and advancement exam pass rate based upon their particular squadron's situation. The readiness standards instruction (CNAF, 2012b) provides targets for training readiness and aircraft availability. Respondents reported a historical trend of air-to-surface effectiveness of approximately 80 percent. The author chose a target for air-to-surface effectiveness of 90, because three respondents stated their dissatisfaction with the historical trend. The author set the remaining targets based upon interview discussions and his experience within the strike fighter community.

The author assigned weights to the measures based upon common themes of importance within the interviews and the strategic guidance issued by the CNO and

CNAF. The weights for each measure are reported in Figure 20. The weights range in magnitude from three to seven percent. The measures relating to objectives identified in interviews as most important were give weights of seven: training readiness, training efficiency, aircraft availability, and MPR fit. SFWT accomplishment and air-to-surface effectiveness were assigned weights of six percent because, while subordinate to those at seven percent, they still require much attention to ensure success. Cost performance index and gallons per hour were assigned five percent, below measures related to warfighting focus and maintenance excellence, because of the emphasis each interview respondent put on warfighting ability. As the strike fighter balanced scorecard matures, there will likely be cause to adjust the weights and targets.

F. SUMMARY

The research revealed that stakeholders from various parts of Naval aviation view successful strike fighter squadrons as those which most closely follow the CNO's tenets. The research also revealed that operational squadrons make no systematic efforts to reduce operating costs. The author used data from structured interviews, a review of salient balanced scorecard literature, and his experience in the strike fighter community to construct a practical balanced scorecard. The strike fighter balanced scorecard will assist commanders in reducing operating costs without compromising what is most important to ensure success. Specific details of the strike fighter balanced scorecard can be seen in the Appendix.

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V. IMPLICATIONS AND RECOMMENDATIONS

A. IMPLICATIONS OF FINDINGS

The idea that middle managers within Naval aviation do not expend noticeable effort to reduce their costs should be shocking from an enterprise perspective. The NAE has created an array of financial analysis tools available to every squadron, yet one can argue squadron personnel do not know how their actions affect operating costs. Given mounting fiscal pressure, the proper tool could help CNAF to translate his mission, producing the right readiness at a reduced cost, down to the lowest levels of each squadron. Civilian companies have used the balanced scorecard to do that very thing, but the balanced scorecard is not a plug-and-play panacea. Kaplan and Norton (2001) are quick to point out that executive level support for the balanced scorecard is essential to its success. The admirals' support alone will not make the balanced scorecard successful. The O-6 level leaders must also recognize and support the importance of introducing the concept of cost reduction into conversations about the proper management of a strike fighter squadron. Support by the admirals and O-6s is a necessary condition for the balanced scorecard to have any utility.

Interview respondents asserted there must be an incentive for squadrons to reduce their costs; some kind of reward. Integrating rewards into a work environment and/or the balanced scorecard can be complex and invite unintended consequences (Albright, Burgess, & Davis, 2011). Such an undertaking is beyond the scope of this thesis. Squadron commanders know that warfighting skill is important to their superiors and make great effort to meet expectations. Squadron commanders who do not meet expectations for warfighting skill are held accountable through their fitness reports and reputations. Following that logic, if squadron commanders know that reducing operating costs is important to their superior, they will make an effort to meet expectations. The strike fighter balanced scorecard is a method to communicate the importance, expectations, and manner in which squadrons can achieve CNAF's mission.

B. IMPLICATIONS OF A SUCCESSFUL BALANCED SCORECARD

If the strike fighter balanced scorecard works as intended, the ultimate result would be an under-execution of the FA-18 program's operations and maintenance budget. From a comptroller perspective, this might seem unacceptable; in their view, efficient budget execution is the proper and complete exhaustion of allotted funds within the specified time period. Failure to expend all allotted funds in one period is an indication that less may be required in the next period. An organization that does not spend its money this year may receive less next year. To some extent this is true but not insofar as the concept applies to the management of a strike fighter squadron and its relation to the Navy's flying hour program. Squadron leaders are trained that the flying hour program buys readiness through flight hours. "Hours execution is the primary goal. Either you run out of money or you give back money, CNAF will adjust as necessary" (Bouyer, 2013, slide 16). This is arguably why squadron leaders make no effort to reduce operating costs; they are only held accountable for executing their assigned flight hours. If squadrons were to use the strike fighter balanced scorecard to reduce their operating costs, then yes, at some level there will be an indication of under-execution. However, if under-execution resulting from squadron efficiencies leads to a reduction in the funds allotted to the FA-18 program with the same amount of flight hours, then one might argue that is mission success. If each flight hour costs less this year than last, perhaps the degree to which flight hours are reduced can be lessened even as the Department of Defense's budget authority declines.

A successful strike fighter balanced scorecard may also reduce variation among squadrons in cost per flight hour, tactical performance, and readiness achievement. While a reduction in variation of tactical performance will hold the attention of operational leaders, the idea that variation in readiness and cost per flight hour will be of concern to those involved in the planning, programming, budgeting, and execution process. Reducing the variation in cost per flight hour across the fleet could result in a more accurate flight hour projection system and better fidelity in the OP-20 funding document. Reducing the variation associated with achieving readiness may help better identify the relationship between the number of flight hours and the level of readiness that can be

achieved. In any case, involving those within each squadron in the process of finding efficiencies may alleviate some degree of difficulty in the decisions faced by Naval aviation's leaders.

C. RECOMMENDATIONS FOR IMPLEMENTATION

The author attempted to design a practical balanced scorecard that is easy for squadrons to implement and use. The figures of the balanced scorecard in the appendix show data sources for each measure and a recommendation for whom should be responsible to collect the data. Each of the measures contains data that personnel in successful squadron are likely already tracking, so the process of populating the scorecard should not be time consuming.

The measures and targets within this strike fighter balanced scorecard are neither definitive nor have they been tested; they serve as a starting point from which to build. Whether in magnitude or scope, some part of this strike fighter balanced scorecard will need to be adjusted as learning occurs and the scorecard matures. Kaplan and Norton (1996) describe feedback loops and how critical they are in maintaining the effectiveness and relevance of the balanced scorecard. To facilitate the feedback and coordination of changes to the balanced scorecard, it should be controlled and distributed by an appropriate representative within the Naval Aviation Enterprise. Custody of the scorecard could be given to the current readiness cross functional team, integrated resource management team, or even the type wing. Whoever is named responsible for the scorecard should make every effort to solicit, collect, and validate feedback from commanding officers. Armed with that feedback, the responsible party must make thoughtful changes to the scorecard that truly support the objectives and the mission. Without these vital steps, the literature suggests the scorecard will have little chance for success.

D. LIMITATIONS OF THE STRIKE FIGHTER BALANCED SCORECARD

The idea that the strike fighter balanced scorecard can assist squadron leaders in reducing their cost per flight hour is based upon the assumption that the number of flight hours will not change significantly. A large reduction in the number of flight hours may

counteract the efforts of even the most ardent conservationist. Some degree of the maintenance cost is not variable with respect to flight hours. Some maintenance required is based upon how much time has elapsed (e.g., 14 days, 84 days), not how many flight hours have been flown. Additionally, if aircraft are not flown for a period of 30 days or more, there is the cost of inspections and functional check flights associated with bringing the aircraft back into service. Aside from the maintenance aspect, the cost associated with bringing the currency and skill of aircrew back to acceptable levels after long periods of reduced flying is real and difficult to forecast. For these reasons, even if a squadron were to implement the strike fighter balanced scorecard in earnest, it may not be able to reduce the cost per flight hour due to loss of economies of scale.

There are a variety of limitations associated with the strike fighter balanced scorecard. The balanced scorecard was constructed from data extracted from only nine interviews. While that is not necessarily a negative mark when compared to Kaplan and Norton's description of a balanced scorecard team, it is a negative mark in terms of a sufficient sample size to truly determine cause and effect relationships between objectives and their drivers and measures.

The top management of Naval aviation was not directly engaged in the development of the strike fighter balanced scorecard. This would defy Kaplan and Norton's (1996) recommendations. They advise that once senior managers have been interviewed and the preliminary framework has been developed, the results should be reviewed by top management to ensure consensus. The author lacked interaction with the top management of Naval aviation during the development of the strike fighter balanced scorecard. Because of this, there might be some degree of misalignment among the strategy, objectives, and measures.

The strike fighter balanced scorecard does not include the air wing commander, to whom the squadron commanding officer is responsible. If the air wing commander does not hold the squadron commander accountable for the squadron's readiness *and* its cost, the balanced scorecard ceases to be relevant. The balanced scorecard is a tool to assist

squadron commanders in accomplishing what is most important for success. If the air wing commander does not see reducing cost as important to success, a cost reduction tool of any kind will be of little or no help.

The strike fighter balanced scorecard leaves much discretion to the squadron commanding officer to set performance targets. If commanding officers do not appreciate the utility of the strike fighter balanced scorecard, they may not select challenging targets or robust plans against which they can measure their progress. In such cases, the scorecard measures may indicate success but the actual outcomes may not.

These weaknesses can only be shored up through support from senior Naval aviation leadership in both the operational and administrative chains of command. Without pressure from above, the feedback loop so essential to the maturation of the balanced scorecard will not be maintained and the balanced scorecard will almost certainly be doomed to failure.

E. CONTRIBUTIONS OF THIS THESIS

The research in this study identified a weakness in the Naval Aviation Enterprise and proposed a practical means of balancing cost reduction and combat effectiveness at the squadron level. Balanced scorecard practitioners can benefit from the adjustments made to the perspectives to fit a military combat unit. Most notably, the internal processes perspective holds training related objectives while the personnel perspective holds health, career, and morale objectives. This adjustment reflects a different way of adapting the balanced scorecard than found in the literature reviewed. The measures throughout the strike fighter balanced scorecard can be of benefit to both Naval aviation stakeholders and balanced scorecard practitioners. Many of the measures employed in the strike fighter balanced scorecard are adaptations of currently used measures that have the potential to represent the effects of squadron actions in a more timely and clear manner. Ideally, the successful implementation of the strike fighter balanced scorecard will make Naval aviation stakeholders and balanced scorecard practitioners members of one group instead of two.

F. RECOMMENDATIONS FOR FUTURE RESEARCH

Despite the analysis that went into the development of the strike fighter balanced scorecard, some of the measures may not have causal impacts on the objectives. The links between this scorecard's measures, or other measures widely used by the Navy, and the objectives within each perspective should be researched to understand the true nature of their relationships.

Five of the stakeholders expressed frustration with manning levels during the interviews. The problems were not just with the number of personnel, but also with the level of training and experience some Sailors have when reporting to their units. For example, an E-6 reporting to a strike fighter squadron is expected to have a certain level of expertise (QPT, NEC) and experience with FA-18s. An E-6 might report to a strike fighter squadron having the correct NEC and QPT level, but his experience was gained with a different aircraft type (e.g., helicopters). This individual is then placed in the position of supervising a work center but not being qualified to work on the aircraft himself. It is not hard to see how conflicts and difficulties might arise from such situations. Research should be conducted to investigate the correlation of under-manning in critical billets with maintenance costs. How much does it cost us to not properly man a squadron?

Three of the interview respondents discussed aviation depot level repairs at some length. Each of them expressed uncertainty about the relationship of squadron actions and aviation depot level repairs costs. Aviation depot level repair trends may be difficult to trace to squadron actions because the depot level repair facilities are funded through the Navy Working Capital Fund. The depots must adjust their service levels or prices (parts and service) each year to correct for losses or gains in the previous year. Their goal is to only recover their costs and achieve a net operating result of zero each year (Naval Postgraduate School, 2011). This can cause relatively erratic fluctuations in service levels and prices. Variation in prices might make it difficult to ascertain the effect of squadron actions on their aviation depot level repairables costs over long periods of time. Variation of service levels may also be negatively affecting the fleet. Unanticipated fluctuations in demand for depot parts and services may also contribute to price fluctuations in later

periods as the depot adjusts pricing to achieve a zero net operating result (Naval Postgraduate School, 2011). Funding the depot level repair facilities through the Navy Working Capital Fund provides cost visibility within their facilities (DoD, 2013), but it may obscure cost visibility to their customers. The question one must ask is where is the priority? Is it on fleet requirements, or the depot's Navy Working Capital Fund corpus? Research should be conducted to investigate the possibility of changing depot level fleet readiness centers to mission funding. The congressional budget office conducted a study comparing Navy working capital funding to mission funding in Naval shipyards; something similar should be done for aviation.

Stakeholders in the strike fighter community have argued over the fuel/drag benefits of removing external fuel tanks and weapon pylons versus the work required to install and remove them. Research should be conducted to investigate costs and benefits of various configurations in various environments. Would it save the fleet money to operate super hornets with no centerline external fuel tank while shore based at Naval Air Station Lemoore? Individuals argue that pilot technique, detailed mission planning, and efficient training scenario management coupled with less drag would make up for the reduced fuel load. Others argue that one must use the configuration that is the expected for combat. Who is right and what is the priority? If the author had to choose between fewer flight hours and reduced realism due to configuration in training, he would choose reduced realism. What is the opportunity cost of not choosing the optimum configuration when one considers fuel cost and maintenance man-hours?

Current readiness instructions view all aircrew the same regardless of their experience or capability. All aircrew must accomplish the same number of tasks to be "skilled" in a given NTA. For example, the current readiness instructions do not allow for the argument that a senior pilot might need less practice at basic fighter maneuvering than a junior pilot to become skilled in the offensive counter air and defensive counter air NTAs. That level of precision is not present in our current readiness measuring systems. Research should be conducted to determine a practical method for measuring readiness based upon differing experience levels and/or competence levels.

G. CONCLUSION

Twelve years of conflict have created a laser-like focus on effectiveness with little regard for costs in strike fighter squadrons. As Naval aviation leaders struggle with solving difficult problems, assistance from all hands down to the lowest ranking Sailor is required. Old budget execution ideas of "use it or lose it" must be addressed at the appropriate levels and cost reduction within squadrons must have support and clear expectations from the O-6 level. The strike fighter balanced scorecard is the first step of bringing cost-wise readiness to the deckplates of a strike fighter squadron. It is the "balance" of the balanced scorecard that brings value to Naval aviation. With this tool, leaders can ask squadrons to reduce cost without fear of losing their focus on warfighting, operating forward, or being ready. Properly supported and maintained, the strike fighter balanced scorecard can overcome a weakness in the Naval Aviation Enterprise and make readiness at a reduced cost a reality.

APPENDIX

The strike fighter balanced scorecard is intended to be a tool for commanding officers to use on a monthly basis to aid them in achieving the required readiness at a reduced cost. The author constructed the scorecard in such a way that collecting and managing the data would not be too burdensome on squadron personnel. The overview sheet includes a column for the party responsible for collecting data and another column indicating the data source. The input sheets are organized by perspective/department. The author recommends that only the commanding officer and department heads have the ability to modify the scorecard. Each department head could then gather the data from their subordinates and enter it into the scorecard. The following pages display Excel screenshots of a sample strike fighter balanced scorecard.

Training Officers and Landing Signal Officers could be made responsible for collecting the data required for the operational perspective's measures. Successful squadrons already collect much of the data, so little additional work load would be needed in most cases. Squadrons would need to record data for the training readiness, air-to-air effectiveness, and air-to-surface effectiveness measures after each flight. The Squadron Duty Officer, who manages the daily flight schedule, could be assigned responsibility for collecting data-collection forms from the flight-lead after each flight. Strike fighter weapons school personnel collect similar data during the strike fighter advanced readiness program (formal unit-level training exercise), so collecting such data after each flight would not seem foreign to most aircrew. Landing Signal Officers have access to the air wing database which tracks landing performance; they usually post this data in the ready room aboard ship on a daily basis. Although not in the operations department, the squadron Material Control Officer would provide the data for the gallons per hour measure because he/she has access to the computer system which tracks fuel charges.

The Quality Assurance Officer, Assistant Maintenance Officer, and Maintenance Material Control Officer are best suited to collect data required by the internal processes perspective. The Quality Assurance officer should already be tracking the timeliness of

QA audits; however, tracking the measures for work center discrepancies, and drills would likely be a new concept. The Assistant Maintenance Officer is responsible for manning and training within the maintenance department and likely already closely tracks QPT, NEC, and maintenance personnel readiness. Because of their training and experience, The Material Control Officer or the Maintenance Material Control Officer could be responsible for managing and measuring training events associated with AIRSpeed, continuous process improvement, or the "boots on ground/deck" programs.

The Command Master Chief, Educational Services Officer, and Health Promotion Program Officer should be the only ones necessary to gather data required for the personnel perspective. The Command Master Chief is the senior enlisted person in a squadron and is in the best position to collect the survey data for the positive environment measure. The Command Master Chief is also responsible for oversight of the career development boards and would easily be able to track how many are behind schedule. The Educational Services Officer and Health Promotion Program Officers are responsible for the advancement exam preparation and health promotion programs respectively. They should have data necessary for their associated measures readily at hand.

The Assistant Operations Officer and Material Control Officer would have easy access to the data required for measures in the commander's perspective. Based upon their squadron duties, both should know how to quickly calculate the measures.

This intent of this section is not to prescribe the specific manner in which squadrons implement the strike fighter balanced scorecard, rather it is to illustrate that integration of the strike fighter balanced scorecard into the daily activities of squadron personnel should not cause noticeable displacement of other important duties. The strike fighter balanced scorecard requires no additional software, no additional instructions or directives, and no additional training. The strike fighter balanced scorecard does not hope to standardized squadrons' actions; it hopes to standardize squadrons' focus and priorities. The strike fighter balanced scorecard is a tool squadrons can employ to introduce cost reduction into the conversations of how to best manage a strike fighter squadron; doing so can bring cost-wise readiness to the squadron level of Naval aviation.

Objectives	Measures		Targets	Weights	Data Source	Responsible Parties
FA-18 Strike Fighter Squadron Balanced Scorecard						
Commander's Perspective						
Required Readiness at Reduced Cost	Training Readiness	Average TFOM across NTAs ÷ Average Training Readiness (ATR) Standard	>LCL, ≤Standard	7%	SHARP	AOPS
	Cost Performance Index	(Budgeted CPH x Executed Flt Hrs) ÷ (Actual CPH x Executed Flt Hrs) [includes AVDLR, AFM, Fuel]	1.1	5%	AFAST	MCO
Operational Perspective (Operations Department)						
Warfighting Focus	Training Efficiency	Missions Accomplished (right crew, right training, right equip, right range, right ord) ÷ Missions Planned	90%	7%	Flight Debrief Form	SDO/TO
	Sim Utilization	SFWT Event Sim Preparation ÷ Eligible SFWT Events Completed	95%	3%	Flight Sched/SFWT	TO
	SFWT Accomplishment	Aircrew On Track ÷ Aircrew in SFWT Syllabus	95%	6%	Training Tracker	TO
	Air-to-Air Effectiveness	Fox Efficiency = Valid Air-to-Air shots ÷ Total Air-to-Air Shots taken	90%	4%	Flight Debrief Form	TO
	Air-to-Surface Effectiveness	Valid Air-to-Surface Deliveries ÷ Total Air-to-Surface Deliveries Attempted	90%	6%	Flight Debrief Form	TO
Professional Carrier Operations	Boarding Rate	Carrier Landings ÷ Carrier Landing Attempts	95%	5%	APARTS	Sqdn LSO
	Landing Grades	Squadron GPA ÷ Air Wing Avg GPA	> 1.0	3%	APARTS	Sqdn LSO
	Safety	Operational Safety Climate Assessment	3	3%	Safety O	CO/Safety O
Conservation		Gallons per Hour ÷ Budgeted Gallons Per Hour	0.95	5%	AFAST/SHARP	OPS/MCO
Internal Processes Perspective (Maintenance Department)						
Maintenance Excellence	Aircraft Availability	Reported RFT ÷ RFT Standard	100%	7%	AMSRR/3510	MMCPO
	QA Emphasis	Late QA Audits ÷ Total QA Audits (6 months)	<5%	3%	QA Audit Tracker	QAO
		Program & Work Center Repeat Discrepancies ÷ Total Discrepancies For Most Recent Audit	<20%	3%	CSEC/Audit Tracker	QAS
		Program & Work Center Drills Completed ÷ Program & Work Center Drills Planned	100%	3%	AMI POA&M	QAO
Superb Training	MPR	Maintenance Personnel Readiness (Average Fit rate for all quals)	90%	7%	CSFWP Website	AMO
	Safety	Maintenance Safety Climate Assessment	3	3%	Safety O	Safety O
Conservation		# of Boots on Ground/CPI Projects/AIRSpeed Training Events Completed	1	4%	MMCO	MMCO
Personnel Perspective (Administrative Department)						
Healthy	Health Promotion Program	Number of goals met or events complete ÷ goals or events planned	100%	3%	MRRS	HPPO
Motivated	Career Development	Late Career Development Board ÷ Career Development Boards Required	<5%	5%	CDB Tracker	Pers O
	Advancement Opportunity	Sailors Who Passed Advancement Exam ÷ Total Sailors Eligible for Advancement Exam	95%	5%	FLTMPS	PERSO
Focused	Positive Environment	Monthly survey of reps from JOPA, Chiefs' Mess, FCPOA, & JSA	3	3%	CMC/OPSO	CMC/OPSO

Figure 21. Strike Fighter Balanced Scorecard Overview

Commander's Perspective

	ACTUAL		ACTUAL			TARGET		Raw Score	Weight	Weighted Score	
	Average TFOM for each NTA Based on SHARP "Current Readiness					Training Readiness Standards for specific R+Month from CNAFINST					
						UCL Red	65.90				
Training Readiness	Avg TFOM	11				UCL Yellow	47.95	0.91	7	6.39	
						Standard	30.00				
						LCL Yellow	12.05				
						LCL Red	0.00				
	Actual Monthly Total Cost reported in 'AFAST User'		Total "Should Cost" Listed in 'AFAST User'								
Cost Performance Index	Total Cost	3400	Should Cost	3500	1.03		1.1	0.94	5	4.68	
									Total	Total	
									12.00	11.07	92%

Figure 22. Commander's Input Sheet

Operational Perspective

	ACTUAL			ACTUAL			TARGET	Raw Score	Weight	Weighted Score	
	Number of Mission With The Right Crew, Right Training, Right Config., Right Range, Right Ordance			Number of Missions Planned for the Month Minus Missions Canceled Beyond Control of the Squadron (e.g. Wx, Boat, Base)							
Training Efficiency	# Complete	60	/	# Planned	67	90%	90%	1.00	7	6.97	
	Number of Simulator Events Completed Prior to their Associated SFWT Flight			Number of SFWT Flights Completed that Have an Associated Simulator Event							
Simulator Utilization	# Complete	14	/	# With Sim	25	56%	95%	0.59	3	1.77	
	Number of Aircrew On Schedule for SFWT Completion			Total Number of Aircrew in the SFWT Program							
SFWT Progression	# On Sched	10	/	# in SFWT	12	83%	95%	0.88	6	5.26	
	Total Number of Valid Air-to-Air Weapon Employments			Total Number of Air-to-Air Weapon Employments							
Air-to-Air Effectiveness	# Valid	67	/	# Shots	80	84%	90%	0.93	4	3.72	
	Total Number of Valid Air-to-Surface Deliveries. (Including ToT, CEP, & Weapon Function if Appropriate)			Total Number of Air-to-Surface Deliveries							
Air-to-Surface Effectiveness	# Valid	54	/	# Attempts	65	83%	90%	0.92	6	5.54	
	Total Number of Carrier Arrested Landings			Total Number of Carrier Landing Attempts (Do not include FDWO, No-Counts, T&Gs)							
Boardig Rate	# Traps	200	/	# Attempts	205	98%	95%	1.03	5	5.13	
	Average Squadron Landing Monthly GPA			Average Air Wing Monthly Landing GPA							
Landing Grades		3.65	/		3.5	1.04	1	1.04	3	3.13	
	Operational Safety Climate Assessment										
Safety		3					3	1.00	3	3.00	
	Gallons Per Hour Reported on the Current BOR			Budeted GPH on FHP Grant Message			5% Below GPH on FHP Grant Message				
Conservation		1200			1244		1181.8	0.98	5	4.92	
									Total	Total	
									42.00	39.44	94%

Figure 23. Operational Perspective Input Sheet

Internal Processes Perpective

	ACTUAL		ACTUAL		TARGET	Raw Score	Weight	Weighted Score	
	AverageDaily RFT Reported on AMSRR				RFT Standard Listed in CNAFINST 3510.11C				
Aircraft Availability	5.5				5.63	0.98	7	6.84	
	Number of QA Audits Currently Outside Six Month		Total Number Of Audits Due in the Past Six						
Late QA Audits	2		34	6%	5%	0.85	3	2.55	
	Total # of Discrepancies on Most Recent Audits that Also Appear on the Previous Audits		Total Numer of Discrepancies on the Current Audits						
Repeat Discrepancies	47	/	300	16%	20%	1.28	3	3.83	
	Total Number of Program or Work Center Drills Completed for the Month		Total Number of Program or Work Center Drills						
Drills	4	/	5	80%	100%	0.80	3	2.40	
	Average MPR Fit for all Qualifications for the Month								
MPR	89%				90%	0.99	7	6.92	
	Maintenance Safety Climate Assessment								
Safety	2				3	0.67	3	2.00	
	Total Number of CPI Projects, AIRSpeed Training Events, or Boots On Ground Events								
Conservation	1				1	1.00	4	4.00	
							Total	Total	
							30.00	28.54	95%

Figure 24. Internal Processes Perspective Input Sheet

Personnel Perspective

	ACTUAL		ACTUAL		TARGET	Raw Score	Weight	Weighted Score	
	Number of Goals Met or Events Completed During the Month		Number of Goals or Events Planned For the Month						
Health Promotion Program	5	/	6	83%	100%	0.83	3	2.50	
	Number of Late Career Deveopment Boards		Number of Career Development Boards Due During the Month						
Career Development Boards	2	/	35	6%	5%	0.88	5	4.38	
	Total Number of Sailor Who Passed the Advancement Exam		Total Number of Sailors Eligible to Take the Exam						
Advancement Opportunity	25	/	30	83%	95%	0.88	5	4.39	
	Average Score From Monthly Survey of Reps (JOPA, Cheifs' Mess,								
Positive Environment	3				3	1.00	3	3	
							Total	Total	
							16.00	14.26	89%

Figure 25. Personnel Perspective Input Sheet

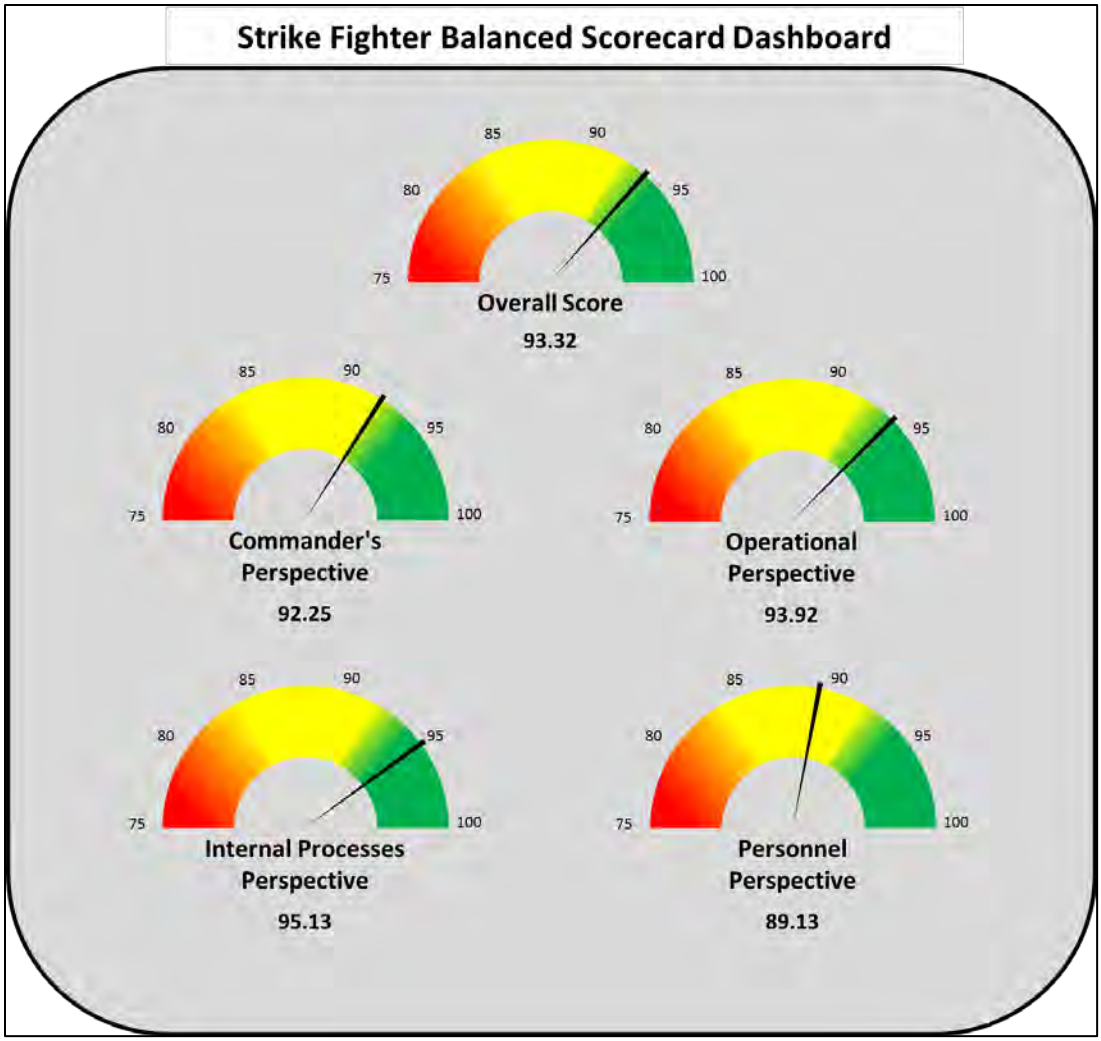

Figure 26. Strike Fighter Balanced Scorecard Dashboard

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