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THESIS

**A LEGACY OF EXCELLENCE:
THE USAF WEAPONS SCHOOL'S CHALLENGE TO
MAINTAIN STANDARDS**

by

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**A LEGACY OF EXCELLENCE: THE USAF WEAPONS SCHOOL'S
CHALLENGE TO MAINTAIN STANDARDS**

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ABSTRACT

This thesis investigates the effects of resource constraints on the United States Air Force Weapons School (USAFWS). Highly regarded as the Combat Air Force's (CAF) Center of Excellence, the USAFWS is responsible for producing a weapons officer who is finely tuned in the skills of communication, integration of joint forces, large force mission planning, training plan development, and tactical leadership. The CAF demands a weapons officer who is highly skilled and possesses traits and values above the norm. The USAFWS has translated these objectives into an exemplary standard that pervades the institution and its graduates, and thus the CAF itself.

During this period of transformation and global war (circa 2005), the CAF is continually seeking ways to "do more with less." This thesis provides a framework for assessing whether this is possible without adversely affecting the USAFWS's training standard. The graduate can be seen as a product of objectives (ends) plus training concepts (ways) plus resources (means). All three components are rigorously examined. Everything under the USAFWS's control has been optimized, leaving the shrinking pool of resources as a troubling and testing, but reversible problem.

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EXECUTIVE SUMMARY

From a combatant commander to a B-course student, members of the Combat Air Forces (CAF) realize that the Weapons School makes a difference. The result of 100 years of aviation in America, our Air Force is without peer. Even so, emerging militaries are catching up at an alarming rate. Our next confrontation may very well challenge our skills, concepts, and resolve to win in the air and on the ground. As the technology gap closes and political constraints tighten our freedom of action, our Air Force will have little choice but to increasingly rely on its most distinctive advantage—our training. The ways in which we train determine our effectiveness in combat, and this is why every one of us understands the importance of the Weapons School.

In today's world of tightening budgets, global operations, and new weapon systems, every organization in the Air Force continues to try to figure out how to do more with less. In the case of the Weapons School, the stress induced by these factors has resulted in an intense review of all syllabi. However, during my three years as an instructor, I never saw a single phase, much less an entire syllabus, which was repeated intact from one iteration to the next. In an institution that prides itself on learning from its execution, it is alarming that measurement of syllabus performance can't objectively be done. With no two consecutive graduates seeing the same syllabus, it is difficult to know the true quality of graduate being delivered to the CAF.

These facts would seem to imply that the Weapons School is doing too much with too little. If so, what are the effects? This study seeks to answer this question by analyzing: 1) What exactly makes up the standards of the Weapons School? 2) Do the cadre agree that these standards are under siege? 3) What are the consequences for the CAF if the Weapons School produces less than excellent weapons officers? 4) How can the school use its system of objective measurement to make a case for stabilizing its training operations and improving its priority for resources?

A historical review of the Air Force's growth helps us understand how and why the Weapons School is central to the CAF's success. The Air Force established its training priorities early on when it gathered WWII veterans at Las Vegas AFB to pass down their experiences. "Gunnery Camp" was the simplest form of training. Seasoned fighter pilots replicated combat situations and advised their students how to duplicate combat success. After enough students saw enough situations, the cadre realized that specific skills contributed to success and that certain traits fostered those skills. The training methods were formalized in an instructional method, eventually to be named the Building Block Approach by then-Captain Jumper and his generation of WIC instructors. As a center for developing tactics and training, the Weapons School earned respect for its role.

During Vietnam, resources were at a premium, and thus Air Force leadership chose to de-emphasize air-to-air training due to the risk of losing airplanes. Not surprisingly, the Air Force's kill ratio sunk to 2:1 by the end of the conflict compared to the Navy's 6:1. The resulting lessons-learned from Vietnam were that the Air Force was deficient in its formations and tactics. Since the Weapons School was responsible for tactics and training, reform was inevitable. The Weapons School's emphasis on instructorship is a direct result of inadequate training methods during the Vietnam years.

The CAF's rise to preeminence has clearly defined the Weapons School's role: demonstrate leadership in tactical and, increasingly, operational matters. The Weapons School additionally contributes an "operational conscience." Credibility is achieved, partially, through superior skills. Those skills are a subset of certain traits, and those traits are duplicated by training concepts. The overarching idea is a system of institutional values and, for the Weapons School, one of those values is resolute leadership. The school's ideal of humble, approachable, and credible instructors is fundamental to its idea of leadership. The CAF has invested heavily in the Weapons School as a "Center of Excellence" that develops and sustains the value system that defines our Air Force. Without it, excellence would quickly erode into mediocrity.

In a simple framework for analysis, the graduate can be seen as a product of “Ends (objectives toward which one strives) plus Ways (courses of action) plus Means (instruments by which some ends can be achieved).” The CAF specifies the ends, or the standard of the overall graduate (further defined as core skills). The school creates training concepts (ways) to achieve those ends. The CAF contributes the means, or the resources. Jets, airspace, time, instructors, and students are all part of the equation. In the spirit of the Weapons School’s operational conscience, it seeks to refine its objectives and optimize its ways in order to maximize the use of resources. Since these components must be balanced in order to achieve the desired effect, a reduction of one results in a reduction of all. If the objectives decline, then there is less need for particular resources. Likewise, if resources are withdrawn, then the standard of objectives—“the bar”—must also drop. There is limited room to work around resource deficiencies and, as the cadre has acknowledged, that margin was actually erased long ago.

The bar is a contentious issue in an institution that passionately defends the value of its training. If a lower standard is out of the question, yet evidence shows that the bar is insidiously lowering, what can result? Similar to the effect of induced drag on an airplane at slow airspeeds, if the pilot fails to correct with a rapid application of power then the aircraft will quickly stall and lose altitude. If the standard is the Weapons School’s altitude, the numerous distractions and disruptions to the syllabi its induced drag, and the flow of resources its power, then the school must recognize itself as being behind the power curve: The cadre works harder but with less effect, the school’s standard struggles to match expectations, and each syllabus is frayed with compromises. As in the case of the power curve, the Weapons School can 1) increase the work effort, 2) increase the resources to make current work more effective, 3) maintain the standard but decrease output, or 4) keep the same level of output but reduce the standard. Both CAF commanders and the Weapons School cadre agree that lowering the standard is not an option. Nor is decreasing the output. And

instructors already work at maximum effort. That leaves as the only solution an increase of resources—or else a stall of the standard is unavoidable. An increased supply of resources, of course, is currently being employed in reverse.

This presents us with a veritable Catch-22: we need stability in order to objectively measure changes to the standard over time, yet without being able to objectively demonstrate that the standard may be slipping we can't guarantee ourselves the resources necessary to ensure stability. In order to "stop the madness," the Weapons School must first raise the concern of detrimental effects—the induced drag—caused by disruptions and distractions to the syllabus. A system is presented in this thesis for how to measure the effects of such things as airshows, short notice airspace/munitions/aircraft changes, and personnel distractions. Data to be gathered from student waivers and a commitment to precise and unhindered grading standards will allow the school to pave the way toward objective measurement. With clarity on the performance of its syllabi, the school should then be able to make a convincing case to reverse the decline in resources and secure the standard of its graduates and, more importantly, the CAF.

If the school fails to recognize and communicate its predicament the danger is profound. The Weapons School is charged with developing a weapons officer who is responsible for training his/her unit and who dutifully passes on the learned training concepts and values. Since the school is potentially unaware of its paradox, each graduate carries forth not only a less than desired standard of training, but also the damaging idea that doing too much with too little is acceptable. Unfortunately, the CAF has allowed resources to shape its training concepts and thus its combat readiness, instead of the reverse. Correcting our course on this slippery slope is a matter of committing to the overall objective—air and space dominance—by shaping the appropriate ends, ways, and means. My argument is that resource deficiencies at the Weapons School result in deceptive and corrosive effects that could cost our Air Force its preeminence. If the primary advantage over our next opponent is the way in which we train, then

the CAF should easily understand the dangers inherent in compromising training at the Weapons School. To voice the sentiments of the cadre and presumably all members of the CAF: if our aim is to enter battle and dominate our enemies, then let us train as we wish to fight.

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I. INTRODUCTION AND ANALYTICAL FRAMEWORK

You never get good enough...a complacent pilot gets killed.

LtCol Robbie Risner

Walking into the United States Air Force Weapons School, you are greeted by a floor mat emblazoned with the words **The CAF's Center of Excellence**—no small statement for any organization, but one that is well deserved and defended. It is, in fact, a label that has been bestowed upon the Weapons School by the Combat Air Force (CAF) itself.

The product of a century of aviation, Nellis Air Force Base is the center of airpower. All that has been collected in the art and science of air combat, all that is theorized and proven in modern combat aviation, everything the United States Air Force is designed to do, passes through this single nucleus. For thousands of frontline airmen in the CAF, Nellis is the Mecca of their culture. A pilgrimage here is an opportunity to see where it all happens—tactics development, the most advanced training in the world, and flying ranges that are unparalleled. While several major units operate at Nellis, arguably none is more pivotal than the USAF Weapons School. Here, America's best fighter pilots, weapons systems officers, helicopter and bomber crews, intelligence officers, weapons directors, and space officers, are engaged in the tactical world's most demanding training process—the creation of a Weapons Officer.

This thesis intends to capture that process, validate its importance to the CAF, and assess whether the Weapons School's and the CAF's standard of excellence is at risk. By taking the cadre's opinions seriously, this thesis ties to an analytical system designed to elicit hard data in order to compel the CAF to take action.

A. THE CENTER OF THE UNIVERSE—NELLIS AFB

In the words of the former USAF Chief of Staff, General John Jumper, "As goes Nellis, so goes the CAF." This is true partly because Nellis is blessed with

everything an aerospace warrior could dream of—thousands of square miles of airspace, a staggering array of live weapons ranges, ideal flying weather, and an infrastructure designed to capitalize on collective learning. Of course, none of it is relevant without truly impressive people to synthesize these elements into tools of airpower. These people are selected from the best the USAF has to offer, and nearly all are graduates of the Weapons School.

Of the operational organizations at Nellis, the Weapons School stands out as the conduit through which all others must pass—if not directly given the Weapons Instructor Course (WIC) prerequisite for assignment, then indirectly as a consequence of the Weapons School's immense influence in devising the CAF's training. Units at Nellis conduct a variety of leading edge missions, including operational testing, adversary replication, developing the CAF's most important large force training exercise (Red Flag), and others. Not only does the Weapons School train the officers who man the majority of the billets in these units, but the school also supports and augments their activities through liaisons, coordination, and implementation of their work. In one form or another, the Weapons School is in the thick of everything the CAF does.

The Weapons School's primary mission "is to teach graduate-level instructor courses, which provide the world's most advanced training in weapons and tactics employment to officers of the combat air forces."¹ Taking the most highly qualified instructors in each combat platform, the Weapons School develops unparalleled expertise in that weapon system by teaching highly refined skills of instructorship, problem solving, and tactical mission integration. These officers are drawn from the CAF at large, but possess distinguishing qualities that reflect the school and its history. They are chosen based on their ability to instruct in their weapon system, which implies a high standard of credibility, integrity, and affability. The product of the school is a weapons officer who is finely tuned in the skills of communication, integration of joint forces, large force

¹ Nellis Air Force Base, USAF Weapons School web page; available at <http://www.nellis.af.mil/usafws/default.htm>; Internet; accessed 19 Aug 2005.

mission planning, training plan development, and tactical leadership.² The CAF relies on these graduates to head “weapons shops” in each unit that manage that unit’s tactical training and combat preparation. Additionally, the weapons officer is the chief instructor in that unit, responsible for the quality of training, guidance, and mentorship of unit instructors, and is a direct tactical advisor to the leadership. In war time, the weapons officer can be expected to lead the unit’s first combat mission after the commander or deputy, as well as oversee a mission planning cell, or otherwise perform functions that are pivotal to mission success. You will never find a weapons officer idly waiting for direction—instead, the weapons officer demonstrates leadership and initiative. The CAF relies heavily on its weapons officers to do expertly what others cannot. The weapons officer’s qualification, experience, and character contribute in ways that are indispensable to an air force that operates at a redline pace during peace and war.

The Weapons School is divided into Weapons Squadrons (WPS) according to major weapon system. There are fourteen weapons squadrons executing eighteen syllabi spanning five fighter types, three bomber types, direct-support intelligence, as well as Intelligence, Surveillance and Reconnaissance (ISR) experts, command and control, space operations, combat rescue, and special operations forces (fixed and rotary wing). While each of these squadrons has a different legacy and different missions in the CAF, they all work toward a common goal of instilling the school’s graduates with the skills, traits, and values expected of combat leaders.

Given the responsibility of its graduates, the Weapons School is committed to providing the absolute best training opportunities possible. The standards for receiving “the patch” are realistically high—attrition naturally occurs, but to the credit of the Weapons School instructors, all graduates find themselves learning to overcome personal limitations to demonstrate their value to the school and the CAF. Through highly developed syllabi, they are given

² John R. Carter, “The Weapons School in a Post-9/11 World,” *USAF Weapons Review*, Summer 2004, 4.

problem solving skills and tactical proficiency that marks them as the best. Each WIC syllabus includes fundamental training in the weapon system, progressing to advanced levels of execution and missions, and finally culminating in the highest tier of airpower employment during platform integration and the Mission Employment phase (ME). Because the teaching method focuses on *the student's* performance, elements such as hardware, software, and support assets are extremely important to provide superior functionality. An aircraft with a malfunctioning radar, for example, invalidates the student's performance in significant ways.

The USAF as a whole is undergoing significant transformation. Since 2002, the F/A-22 has been introduced to operational testing and is now being fielded, several new and complex weapons have entered service, weapon systems are undergoing rapid upgrades in software, and the United States is engaged in global combat that stretches every resource to its limit. Because of its central role to the CAF's progress, the Weapons School is responsible for setting the pace and thus feels every bit of strain on the system. From manpower shortages to aircraft repair, the Weapons School constantly suffers from resource deficits. Instructor manning and qualification continues to be an issue for nearly every commander. Additionally, the CAF itself is undermanned in certain weapons officer positions, requiring a higher output from the school. Nellis' precious airspace and ranges are occupied almost twenty-four hours a day, with daylight usage at its absolute maximum. The aircraft that bring the syllabi to life are struggling to keep pace. Units providing adversary support (aircraft and surface systems) are predictably unpredictable since they also suffer from reduced resources. This all amounts to incredible stress on a machine designed to operate in a highly synchronized and standardized manner. Worse, while the Weapons School is experiencing higher stress, it is being supplied with less fuel.

Not to be deterred, Weapons School instructors and commanders diligently streamline the process. They creatively "work around" problems, and share their solutions in order to maintain as sharp a cutting edge as possible. Without question, the problems posed, and even some of the solutions,

challenge the school's ability to maintain its standard. With the strains only likely to increase in the future, at what point will doing too much with too little jeopardize—and no longer just challenge—the Weapons School's standard of excellence?

This is a difficult question to answer, as the tools for measuring the stress and its effects on the graduates are skewed by inconsistent execution of the syllabi. Each Weapons Squadron deliberately compares the expected performance of its syllabus with the actual performance. Statistics regarding such things as mission attrition rate, unaccomplished tasks, non-delivered mission requirements (weapons, airplanes), skill proficiency level, and the ever-important instructor's "gut feel" should be components of the measurement system. Evaluation should point to deficiencies as well as excesses. Unfortunately, with the current state of fluctuating resource support, the syllabi and their subset phases are so heavily modified that comparing the standard from class to class is far from the objective measurement that is desired. As will be discussed, the *consistent* repetition of successful performance is key to generating the data with which to assess the standard.

B. THESIS

The Weapons School is often accused of having set "the bar" too high—too high for normal students to reach, too high for an institution that serves a large air force, maybe even too high for the school itself. Unquestionably, those associated with the Weapons School take pride in the fact that they either reached the same high standard themselves or are contributing to the school's cutting edge. The Weapons School's leadership is constantly assessing the extent to which it is "in touch with reality" by soliciting feedback from the CAF. This feedback plays an important role in reevaluating the standard. The Weapons School also sees itself playing a critical role in the development of the CAF—it is the keeper of an attitude that continues to define the air force which it serves. The questions to be answered here are:

1. What Exactly Makes Up the Standards of the Weapons School?

The question of standards is complex. First, envision the Weapons School's grand objective—producing a weapons officer—specified by a standard. Then consider the sub-objectives used to form the overall product, each with its own individual standards. The development of standards is an iterative process that combines yesterday's lessons, today's demands, and expectations about tomorrow. Additionally, standards cannot be evaluated by as objective a measure as a written exam. Most skills are learned in an audition of sorts, where the student and instructor are both participants in a very long and complex performance. The performance is often measured against the performance of previous classes and with a degree of subjectivity made slightly differently by each instructor. One aim of this thesis is to extract and analyze the standards used in order to gauge their importance to the Weapons School.

2. Are these Components Truly Under Siege?

Emotions run high when intense effort is expended to achieve such ambitious goals. The focus here is to tie the emotions of the workforce to the product of the school. Do emotions indicate something significant? Is the school able to objectively evaluate its performance?

3. What are the Consequences if the “Center Of Excellence” Changes Its Attitude?

While assessing the health of the Weapons School, this thesis also considers its future options: should it continue on the current course and hope the standard is maintained? Should it accept a lower standard and its consequences? Or, take a methodical approach to improving all the components of the system and firmly control the standard of training? Given a shift in standards, intentional or not, there are undoubtedly consequences for the CAF.

4. What Measurements Can Provide Evidence of Slippage?

A necessary tool for the decision-maker is a feedback system that can provide actionable evidence. A scheme for objective data collection will be presented based on the suggested findings of my research.

C. FRAMEWORK

The WIC syllabus offers a useful framework for answering these questions. As pointed out by the Weapons School Commandant (from 2003-2005), Colonel John Carter, the graduate reflects the syllabus, and that syllabus is a strategy.³ A simple way to view strategy is as a product of “**Ends** (objectives toward which one strives) plus **Ways** (courses of action) plus **Means** (instruments by which some ends can be achieved).”⁴

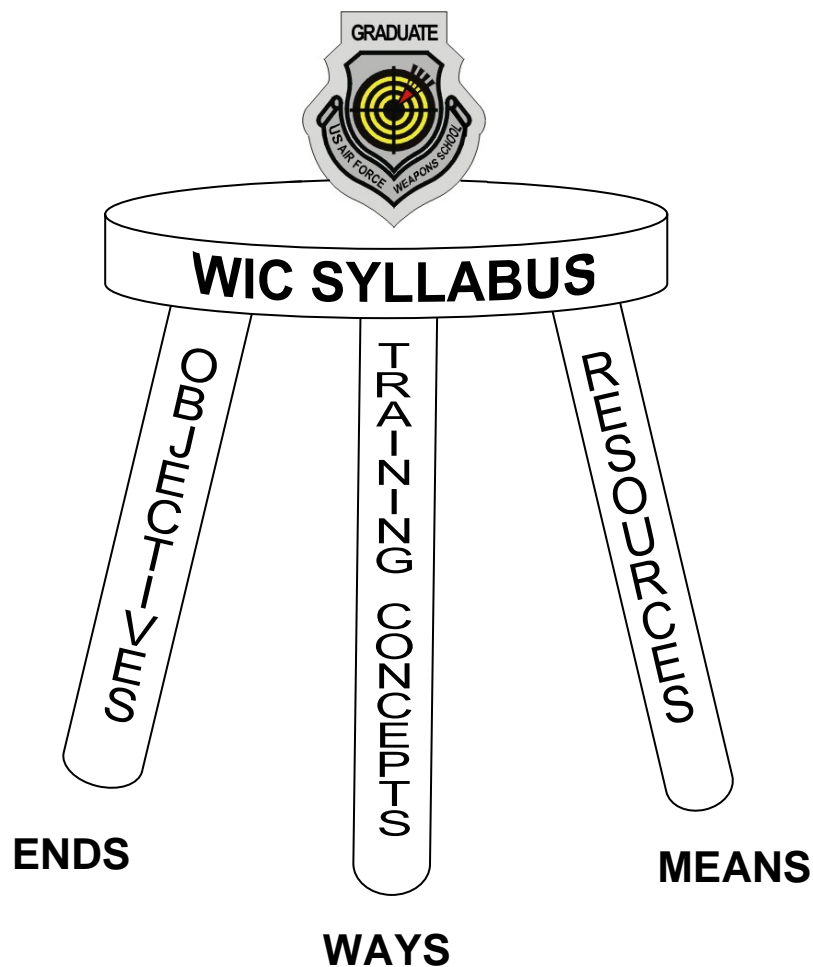


Figure 1. WIC SYLLABUS STRATEGY. (Adapted from Lykke)

³ John R. Carter, Personal Interview, 17 May 2005.

⁴ Arthur F. Lykke Jr., "Toward an Understanding of Military Strategy," in Col Arthur F. Lykke Jr., editor, *Military Strategy: Theory and Application* (Carlisle Barracks, PA: US Army War College, 1989), 3.

Essentially, the Weapons School devises *ways* to employ *means* to achieve *ends*. Applying such a strategy requires identifying what role the weapons officer is expected to fulfill (or identifying what *effects* are desired). This determines how the graduate would look in terms of skills, traits, and values. Understanding the vehicle for achieving the effects, the Weapons School devises a strategy to incorporate the three components. Sub-objectives are designed to give the weapons officer specific capabilities. Desired resources are weighed against available resources then integrated with desired and available concepts. All three legs of the syllabus must be worked and re-worked to achieve balance, else a shortfall leads to failure.

In each weapons squadron, there exists a continual process of evaluating the mechanics of this strategy: a review of expected versus actual performance, a critique of the methods, and a summary of the impact of resources is done to some extent. In the spirit of the school's mantra of self-reflection, this review serves to improve follow-on iterations of the syllabus.

An important dimension of this review process is how these components are shaped and constructed. Never will you find the conclusion, "that's good enough" or "we'll fix it next time." Encoded in the DNA of Weapons School instructors is the unwavering expectation of perfection. If there is time available and the means to improve something, then improvement will occur. The personal commitment displayed by these professionals is truly staggering. The fundamentals of the entire United States Air Force rest on this attitude of "no problem too great" with the aptitude to back it up.

D. RESEARCH METHOD

This thesis draws from three sources of information: interviews and questionnaires of Weapons School personnel and CAF squadron commanders, review of open source historical references, and the author's experience as a Weapons School instructor.

1. Interviews and Questionnaires

The information for this study was collected by permission of the Weapons School Commandant, Colonel John Carter (head of the Weapons School from April 2003 until July 2005). Information was solicited from members of the Weapons School at the levels of instructor and squadron commander. While the squadrons operate from discrete syllabi, they are sufficiently uniform in their methods and goals to allow generalities to be drawn about the Weapons School from the data. Questionnaires were made available to the entire population of fourteen squadron commanders and approximately 200 instructors. Thirty responses were received. Six interviews were conducted selectively.

CAF squadron commanders were likewise solicited, though not all Air Force squadron commanders were contacted. Six responded directly out of forty contacted, and there were no interviews.

2. Open Source and Organizational References

All information gained from open sources is annotated with standard citations throughout the text and referenced in the bibliography.

3. Personal Experience

This study reflects insider and outsider observation methods. The interviews and questionnaires were designed to elicit responses objectively, and were conducted after I left the Weapons School. The insider perspective comes from my two years and nine months spent as an instructor in the 16th WPS, from January 2002 through September 2004 in the F-16 squadron. I have first hand experience of every issue discussed in this study, and it is from this perspective, too, that I write about the school's health and well being.

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II. FROM WWII TO MODERN AIR COMBAT: HOW THE WEAPONS SCHOOL ARRIVED AT EXCELLENCE

The man who enters combat encased in solid armor plate, but lacking the essential of self-confidence, is far more exposed and naked to death than the individual who subjects himself to battle shorn of any protection but his own skill, his own belief in himself and in his wingman. Righteousness is necessary for one's peace of mind, perhaps, but it is a poor substitute for agility . . . and a resolution to meet the enemy under any conditions and against any odds.

Major Robert S. Johnson, USAAF

It is incredible to witness world-class organizations attract the best of their profession and then endure seemingly insurmountable hardships. Likewise, it is incredible to consider that America's military has persisted through centuries of uncertainty to arrive at absolute preeminence. The Air Force is the youngest of the services, but one of the most rapidly growing in capabilities, competencies, and dependability. Clearly, America's global influence is heavily reliant on the logistical and combat presence offered by the Air Force. In the course of 100 years, America's airmen have defined the benchmark of airpower. In its highest form, airpower is epitomized in the Weapons School. The ascent to the top and staying on top in the future is the subject here.

A. FROM GUNNERY TECHNIQUES TO THE INSTRUCTIONAL METHOD

In the late 1940s a group of veteran combat pilots were assembled in the Nevada desert to pass on the lessons learned by themselves and fallen comrades to a new crop of fighter pilots. They called it: Gunnery Camp.⁵

World War Two contributed in incomparable ways to the shape of today's military. In its battle against the formidable Axis air forces, the US Army Air Force (AAF) fielded no less than sixteen different combat aircraft in just four years.

⁵ Rick Llinares and Chuck Lloyd, *Warfighters: A History of the USAF Weapons School and the 57th Wing* (Atglen, PA: Schiffer Publishing, 1996), 110.

Given all the complexity and uncertainty, how an institution could train 80,000 aircrew members in the skills of air combat during wartime is nothing short of inspiring.⁶ The breadth of combat and training experiences provided a firm foundation for the leaner years to follow.

In the years after WWII, the Army Air Force was awarded a seat at the adult table. Granted its own service separate from the Army, the US Air Force (USAF) became clearly responsible for the realm of combat above the earth. This meant it had to harness the experiences of thousands of aircrew members into lessons that would contribute to the jet age. With the re-absorption of these aircrew into the civilian world, many opportunities were bound to be lost. So, as any smart institution would do, the Air Force gathered its combat veterans to devise ways of passing on their lessons. In 1949, the USAF opened Las Vegas Air Base and established the USAF Aircraft Gunnery School. Complete with F-80s, WWII veterans passed on the skills and techniques learned over Europe, Africa, Asia, and the Pacific. During the next year, F-86s were incorporated and the second annual USAF Gunnery Meet revealed serious deficiencies in air-to-ground weapons employment. The Gunnery School began formalizing methods of instruction and published its own *Fighter Gunnery* newsletter (a predecessor to the *Weapons Review* of today).⁷ Here, instructors were able to disseminate lessons taught and learned at the school directly to the field. A profession challenged with high turnover and rapid evolution of its equipment, the Air Force found itself forced to learn and teach quickly lest the next war catch it unprepared.

During the Korean War, the Gunnery School shifted focus and became a much needed supplement to combat aircrew training. Gunnery instruction was set aside to ensure crews bound for Korea were prepared with basic airmanship. The school was working with three types of aircraft (F-51s, F-80s, and F-86s)

⁶ "Army Air Forces Statistical Digest, World War II," The United States Army Air Forces in World War II, on-line database; available at <http://www.usaaf.net/digest/t52.htm>; Internet; accessed 20 Aug 2005.

⁷ Marty Isham, "Chronology of the USAF Weapons School, 1949 to Present," *USAF Weapons Review*, Spring/Summer 1999. 38.

and was charged with graduating 760 pilots a year—not what the Gunnery School had in mind. As such, it was eager to resume its development of fighter tactics. Renamed Nellis AFB, the post-Korean War Aircraft Gunnery School was flying four variants of the F-86, executing both air-to-air and air-to-ground missions. Additionally, the first F-100As were rolling off the assembly line, further challenging the Air Force's ability to keep aircrew on pace with weapon system advancement. Having already consolidated highly experienced combat veterans at the Gunnery School, the Air Force realized the utility of developing tactics across multiple airframes. It was the efficiency and effectiveness of this “schoolhouse” construct that evolved into the Fighter Weapons School. The Fighter Weapons School, as it would be called for the next 40 years, “was further tasked to develop training methods and techniques on all related equipment and training methods focused on solving training problems in tactical units.”⁸

A great problem for the Fighter Weapons School was its lack of control over resources. Fighter aircraft were continually shuffled between bases and commands in the 1950s, a time when the Fighter Weapons School belonged to the Air Training Command (ATC). The result was that this core training unit was often left with resource deficiencies and no control over the basis of its existence—the jet fighter. With Tactical Air Command (TAC) being the primary customer of the Fighter Weapons School's graduates, a competition of interests ensued, and the school was caught in the middle. Stuck with whatever ATC was willing to give it, the school had no choice but to modify its program to fit the resources. In July 1958, the Air Force solved the problem by transferring the Fighter Weapons School to TAC, thus aligning input with output and allowing TAC to control the quality of its school graduates.⁹ This is an important moment in Weapons School history: it gave the combatant command control over its future, which it retains to this day.

The 1960s saw the F-105 and F-4 added to the F-100 WIC, with the F-111 in operational testing. More importantly, the changing of the guard was nearly

⁸ Llinares, 110.

⁹ Ibid., 32.

complete as WWII veterans retired, leaving their protégés with unequivocal responsibility for the future of the fighter force. By now, tactics and procedures had been formalized and new ground was being broken on subjects such as element visual maneuvering, air-to-air missiles, Energy Maneuverability Theory, and Suppression of Enemy Air Defenses.

Vietnam marked a relative low point for the Air Force. As the conflict spun up, the Air Force again needed to train new pilots. In a controversial move, pilots of transport and tanker aircraft were converted to fighters. During the late 1960s, fighter pilots and their weapon system officers (WSOs) became a mishmash of aggressive fighter jocks and newbie aircrews just trying to hang on. The difference in skills and aviation cultures introduced enough challenges that aircrew members required indoctrination in less complicated jets before entering Replacement Training Units (RTU).¹⁰ In addition to learning airmanship at supersonic speeds, those converting to fighters needed to understand the fighter mind-set— “The attitude instilled by RTU instructors into their students was of the ‘sierra hotel’ mentality—aggressiveness. Particularly for the lieutenants, it translated into ‘the fighter pilot desire to excel no matter the odds.’”¹¹

Under intense pressure to produce aircrews, RTUs focused less on dynamic air-to-air training. Risk aversion was cited as a reason to minimize dogfighting. This shift arguably contributed heavily to the lackluster Air Force kill ratios of Vietnam.¹² Despite this, Fighter Weapons School graduates continued to dominate air-to-air performance in the war, due as much to their skill as to their role as flight leaders in combat.¹³ This disparity between Fighter Weapons School graduates and mainstream aircrew led to criticism of air-to-air training. During the nine months of Linebacker I and II, the Air Force had a 2:1 kill ratio compared to the Navy’s 6:1. Many factors contributed to the difference, but the

¹⁰ Llinares, 17-18.

¹¹ C.R. Andregg, *Sierra Hotel: Flying Air Force Fighters in the Decade after Vietnam* (Washington D.C.: Air Force History and Museums Program, 2001), 26

¹² *Ibid.*, 20.

¹³ Marshall L. Michael III, *Clashes: Air Combat Over North Vietnam* (Annapolis: Naval Institute Press, 1997), 282.

one most cited was the advantages that accrued from the Navy's Topgun program, ironically enough, a spin off of the Fighter Weapons School.¹⁴ Topgun was created specifically to fix the Navy's own kill ratio decline in the early stages of Vietnam.

In the years following Vietnam, Air Force leaders pointed the finger at TAC and the Fighter Weapons School, and rightfully so. The school was responsible, after all, for developing formations and tactics, and its graduates performed well in combat. The question was, why didn't the rest of the Air Force crews, and why was the Navy outclassing the Air Force? Weapons and airplanes were part of the issue, but technology was quickly improving in the form of new radar guided air-to-air missiles. Additionally, two new fighters were on the books—the F-15C and the Lightweight Fighter (the future F-16). The disjuncture really lay in training. The Fighter Weapons School recognized its shortcomings in this area and learned a valuable lesson—fighter pilots who were “great sticks” were nothing if their skills were not transferable to the common air force. The mid-1970s thus saw the birth of the Aggressors and Red Flag.¹⁵ Red Flag's attention to realistic training provided the energy to create the Air Force's greatest training asset—the Nellis range complex—and the discrete skills learned in dissimilar air-to-air training are still considered to be of great value today.

Post-Vietnam, the value of focused experiential training and a commitment to passing on lessons—both fundamentals of the instructional method—definitely took hold, though not without some turbulence along the way.

¹⁴ Michael, 277-8.

¹⁵ The Aggressor program was developed in response to the need for realistic air-to-air training. The 64th FWS was initially activated as part of the FWS in 1972. Resources expanded allowing the addition of three more aggressor squadrons, including one for each of the Pacific and European theaters. In 1989, the aggressor program was reduced to a single squadron (64th FWS) stationed at Nellis AFB. Interestingly, the AF is again expanding its aggressor program in 2006. (Red Flag: 414th CTS; available from http://www.nellis.af.mil/red_flag/; Internet; accessed 7 Oct 2005).

Red Flag was also created in the early 1970s to provide realistic combat training for aircrews. The program has evolved a model for large force training that integrates all elements of air power, including allied forces. Red Flag is hosted at Nellis AFB and shares substantial resources with other local units.

The Cold War era Fighter Weapons School was characterized by cocky combat veterans loyal to one thing—each other. “The fighter pilot culture that emerged from the smoke, dust, and blood of Vietnam was multifaceted. The three things that mattered most in fighter squadrons were flying skills, flight discipline, and unit cohesion.”¹⁶ While these qualities were not bad in themselves, the egotistical attitude of the fighter culture was nothing short of unpleasant. This proved a problem for an institution charged with fixing the problems of Vietnam. Maybe as its own way of instilling its dogma throughout the Tactical Air Force (TAF), the instructors ensured the highest standard of training, such that “every ride seemed like a check ride.”¹⁷ Even with such a productive training ideal, the instructors were perceived as overbearing, probably *because* of their superior knowledge and skill. For students with no combat experience, but still with a responsibility for receiving the torch, a contradiction was born.

A turning point occurred in 1974 when Major Larry Keith, a non-Fighter Weapons School graduate, was assigned as operations officer of the F-4 WIC. In an about-face, Keith changed the way Fighter Weapons School instructors approached teaching. In short, instructors were not to be drill sergeants, but teachers. High standards yes, but combat skills must be *taught* as effectively as they were to be *learned*.

B. BUILDING BLOCKS TO THE MODERN COMBAT AIR FORCE

That turning point led the Fighter Weapons School and the TAF to a new way to approach training. The Winter 1976 and Spring 1977 issues of the *Fighter Weapons Review* “outlined a training method and continuum for teaching fighter crews everything from basic aircraft handling to the most complex tactics. The heart of the training system was the ‘building block approach’ (BBA)...The BBA began with the idea that the final objective must drive every aspect of the training program...Each of these missions was a building block upon which more difficult objectives rested...By the time a student arrived at a complex level, he would

¹⁶ Andregg, 45.

¹⁷ *Ibid.*, 51.

have individually experienced each facet of the complexity.”¹⁸ This method remains at the base of CAF training today.

The value of the building block approach is that it resembles a strategy for achieving an end. It requires the assessment of objectives, and then lays the basis for ensuring the ends are met. In the post-WWII era, training was largely experiential trial and error; that is, students were immersed in scenarios that resembled combat, and skills were repeated until proficient. Experience, particularly in combat, is invaluable. Every bit of training conducted today is based on providing experience, whether it is general (“I’ve seen that before”) or specific (“I’ve learned some things from that experience”). However, given the incredibly broad spectrum of tasks, sensors, weapons, and airframes currently in use, it is prohibitive to use purely experiential trial and error instruction—where everything must be learned to an expert level of proficiency—for every airman. The building block approach, tuned to an effects-based variation, is the outcome of 50-plus years of learning about teaching.

With the building block approach, as specified by then Captain John Jumper (recently the Air Force Chief of Staff), proficiency at tiers below defined what could be accomplished in tiers above. The pinnacle in 1977 was to create an F-4 crew that could plan, brief, lead, and debrief a composite force mission.¹⁹ This meant the crew had to be highly proficient in its own aircraft (since a mission commander also flew his own jet) as well as versed in every detail of the mission at hand. The enablers for this superhuman task done with expertise were the most basic flying skills. A crew that was not *great* at handling a fighter under austere circumstances would be of no use leading a package of 100 aircraft. Thus, the school and the syllabus placed a great emphasis on superb flying abilities.

The building block approach and its timing was critical to the 1980s generation of fighters. The F-15C, F-16, and A-10 led to divisions of their own at

¹⁸ Andregg, 54.

¹⁹ *Ibid.*, 54.

Fighter Weapons School during this time. Because the Air Force used experienced pilots from existing platforms to field its new jets, Fighter Weapons School graduates were able to pass on the BBA to the newcomers. With a new generation of aircraft committed to a single role (e.g., F-15C for air superiority, A-10 for close air support), the result was a revealing pursuit of ideals. Air-to-air fighting has always been labeled the purest form of air combat for its valiant pitting of man versus man. In a fighter designed specifically for this purpose, the F-15C community has taken this concept to a new level. Similarly, no other fighter in the world can match an A-10's voracity on enemy ground forces. These elite capabilities have been derived from combat experience, superior training, an attitude of dominance, and a taste of supremacy.

The syllabi used for instruction today are firmly based on the building block approach. There is a more detailed method of instruction, however, that has contributed to the Weapons School and CAF's arrival at such lofty levels of execution.

As alluded to, all learning is based on experience. Given no effort to analyze experiences, we would learn only to the point of recognizing a past occurrence and modify our future actions to model it. The basic idea of experiential *training* is to put students in numerous situations without regard to their actual performance. Experiential training (often referred to as "fam training") has no standard attached. The benefit is exposure to a wide variety of scenarios in the hope that the student will apply some of what s/he learned to future circumstances. At the modern Weapons School, such training occurs at the top of the building block pyramid where **all** the skills are applied to the most realistic and challenging missions conceivable. While this would not be the Weapons School's first choice, the school surely values the benefit to be gained via pure experience, particularly in very complex or unique scenarios that cannot be duplicated on a regular basis.

A step up from the pure experiential method is the concept of trial and error. Now teaching to a *standard* of execution, trial and error requires repeating

scenarios until the student sees it enough times to apply its recall. Given the highly dynamic nature of air combat and the inability to control the innumerable variables, even trial and error is unrealistic, yet it is used particularly in basic skill development.

These experiential training techniques were used by the F-4 WIC even in the 1970s, when these “graduation rides” were reputed to be “the most challenging they ever flew outside of actual combat.”

GAT 5/6 was the culmination of the building block approach. Each block had measurable objectives, but the final objective was measured as well. Such obsession with combat capability was not prevalent in most fighter units, but the students of the Weapons School saw how important it was, and they took what they learned back to their home units. There, they pressed their commanders for more realism in training and stricter accounting of success and failure, so that their home units could improve despite continuing reductions in flying hours and decreasing combat experience.²⁰

Through the efforts of men like Maj. Keith and those who followed, this building block approach has yielded a method whereby individuals draw the salient learning points from *any* situation. Given any experience, the weapons officer is expected to accurately reconstruct what actually happened, assess his/her performance measured against the mission objectives, and draw timeless lessons for better performance. Any time the student sets a plan and acts on the plan, this routine is applied. The result is a convergence on perfection. As such, the Weapons School today is sharpening the building block concept with the notion of *effects-based training* (similar to the operational concept of “effects based operations”). In the spirit of the building block approach where the “final objective must drive every aspect of the training program,”²¹ the Weapons School is in the process of streamlining those objectives and their supporting building blocks.

²⁰ Andregg, 59.

²¹ *Ibid.*, 51.

The instructional method, the building block approach, and an addiction to superlative performance have formed some unique characteristics in the cadre at the Weapons School and in the CAF as a whole.

C. CREATION OF INSTITUTIONAL VALUES

In the course of developing tactical training, the Weapons School strives to instill more than excellent skills. The infinitely greater trait of the Weapons School is its ability to pass on those skills and even improve upon them with every iteration. Consider how any society (in this case, the CAF) passes on the things it values. Since our behavior today is learned from what happened yesterday, it goes without saying that we develop skills from the trial and error of our experiences. As the worth of those skills is proved in related tasks, we then characterize them as traits. In flying terms, decision-making *skill* might be a subset of the *trait* of having high situational awareness (SA). Those with high SA tend to make good decisions regardless of the scenario. Similarly, a fighter pilot is said to have “good hands” if s/he handles the jet well in *any* situation. Superior skill in basic fighter maneuvers or performing a visual bomb delivery is said to be a consequence of “good hands.”

Traits are surpassed by *concepts*. This may seem a big jump, but consider how traits are valued. In the flying community, traits are passed on through training concepts—how to train a person to build and utilize SA, or how to take someone with not such good hands and develop the skills to do what those with good hands do. The building block approach and the instructional method represent ideas and concepts designed to hone traits. Ideally, if we have a good concept, we can then learn or teach any of its subsets.

The leap from training concepts is to *values*. Values pervade **everything** we do. Because our history of combat-learned skills has come at the expense of blood, we tend to not just value, but demand excellence in all we do. While every organization likes to placard this saying in the work place, the Weapons School means it, as evidenced by its reputation. Of course, this is not a one-way street.

There are all sorts of feedback effects. Values are clearly connected to our most basic functions. Our concepts are shaped by values, traits are selected based on concepts (and values), abilities are shaped by traits (and values and concepts), and our actions are ultimately a reflection of all of the above. Meanwhile, once the value of excellence has been encoded in the institution, it drives absolutely everything there. Moreover, this is the biggest contribution the Weapons School makes to the CAF—the value system *is* the CAF’s “operational conscience.” ***The Weapons School passes its values on through its graduates, and because of this, the US Air Force is the most dominant force on—and above—the planet.***

Figure 2 depicts the embedded nature of the echeloned value system.

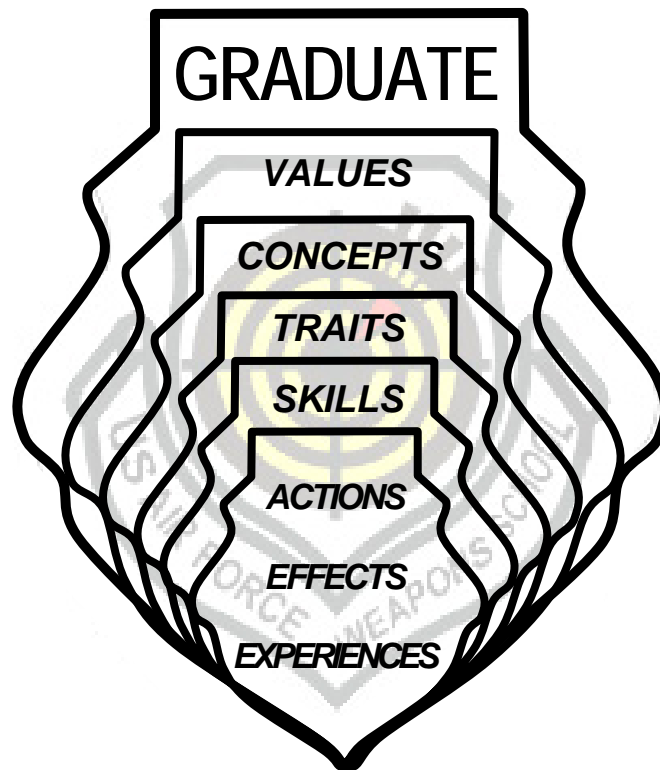


Figure 2. THE VALUE SYSTEM.

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III. CURRENT STATE OF AFFAIRS IN THE USAF WEAPONS SCHOOL

Your task [is] the guardian of the unit's operational conscience, its role model, teaching weapons excellence and leading weapons employment, assisting the commander to ensure the unit can perform its weapons delivery mission, any time, any place.

General Michael P. Carns, former USAF Vice Chief of Staff, 57WG Commander, and Weapons School Commandant

A. TANGIBLE TRAITS AND INTANGIBLE VALUES

In Chapter II, I delineated among actions, skills, traits, concepts, and values. The interesting thing about each of these echelons is what they contribute to an individual or organization's performance. At the most fundamental level, we are concerned about the effect of an action. No matter how good the performance, if the effect is undesirable, then the action (and overriding skill, etc.) must be reconsidered. In addition, if the action is repeatedly performed poorly then the skills are questionable. While actions are clearly measurable, skills are slightly less so, and traits, concepts, and values even less. How does this fact impact an organization's ability to assess its performance? How do we consider indicators that are not easily measurable?

First, as mentioned, a lot of emphasis is placed on the effects of one's actions. In order to produce an effect, a deliberate act must have been employed. In fact, if the desired effects are not achieved, then the action is viewed as a failure. The effect, or end, of our action is thus easy to account for and lends itself to easy measurement. Generally, actions are easily viewed and reproduced. This is why most schools teach abilities (skills) to produce actions. This is the most basic level of reproducing effects.

Measuring the skill of a person is slightly more difficult than measuring his/her actions. Arguably, since skill is integral to any *consistent* action, then skill can be measured by consistent actions. This, in fact, is how the Weapons School assesses a person's skill level. Students are put into scenarios with desired effects. The individual's actions are then compared with normative expectations and, over time, the individual's skill level is measured. Because skills are not directly measurable, the experiment is repeated in order to determine the consistency with which the individual meets the standards set by the syllabus. This, in effect, eliminates the chance of a lucky performance. Figure 3 enumerates the core skills the Weapons School desires in its weapons officers.

Weapons Officer Core Skills

1. Demonstrate the communications skills necessary to teach weapons and tactics as a unit's chief instructor, specifically in:
 - Mission briefing/during-mission instruction/debriefing: expert level.
 - Platform instruction: expert level.
 - Written communication: proficient level.
2. Demonstrate, at the expert level, the knowledge, cognitive skills, leadership ability, and officership traits required to be a commander's primary tactical advisor and problem solver, as well as a mentor to others.
3. Demonstrate an understanding of the primary operations, functions, and missions conducted by joint forces, specifically in the:
 - Weapons and tactics employed by other CAF/joint forces: familiar level.
 - Tactical integration necessary for composite force operations: proficient level.
 - Role and mission of the Air and Space Operations Center (AOC): familiar level.
4. Demonstrate, at the proficient level, the knowledge, organizational skills, and leadership abilities necessary to lead an organization's weapons and tactics function.
5. Demonstrate, at the proficient level, the ability to organize, plan, and execute composite-force mission planning as a mission planning cell chief or key member of a mission planning cell team.

Definitions

Expert: Exhibiting special skill or knowledge; performance indicates mastery of the subject.

Proficient: Well-advanced in skill; performance indicates understanding of important details of the subject.

Familiar: Well-acquainted with the material; performance indicates understanding of the major elements of the subject.

Figure 3. WEAPONS OFFICER CORE SKILLS.

(From John R. Carter, "The Weapons School in a Post-9/11 World," *USAF Weapons Review*, Summer 2004. 4.)

It should be noted that this list represents a synthesis drawn from all of the weapons squadrons. Each squadron is then responsible for developing its own platform-specific skills in order to fulfill its specific mission goals. Essentially, the Weapons School's core skills form a parent list from which all WIC syllabi are derived.²² In other words, the school is set up so that each syllabus and its resident phases perform to a similar routine. In order to validate a syllabus's ability to produce a weapons officer to the prescribed standard, it must demonstrate its effects consistently and over time. Anything less could be passed off as conditional, unpredictable, and unmeasurable.

The further we move from effects and actions, the less and less measurable each echelon becomes. One might well counter, who cares if all we are really concerned about is effects? Just to bring the argument back into focus, our pursuit of ends can have some interesting results if the ways and means are not considered. In the history of the Weapons School, effects were produced early on with highly undeveloped methods. With no real consistency in the techniques of training, individual instructors were left to their own devices to pass on their knowledge. As the instructors learned that some skills were better than others and some traits contributed more effectively to those skills, and, in fact, some teaching methods were superior, a value system did begin to take shape. Had the Weapons School failed to learn from its experiences, then presumably it would still be entrenched in hard-nosed, effects-only learning. Presumably, such an institution would rest on its laurels instead of continually breaking new ground in tactics, teaching, and training. The fact is, for the Weapons School, learning very deliberately is a core value, and because of this, efforts are made to see and measure these less visible echelons. This standard of excellence is self-sustaining, that is, if it is rewarded and encouraged.

It is often said that a weapons officer must be approachable such that, as an instructor, s/he can be accessible to anyone who wishes to learn. This is not a skill or ability, but a trait. If someone is easy to talk to, even about contentious

²² John R. Carter, "The Weapons School in a Post-9/11 World," *USAF Weapons Review*, Summer 2004. 4.

issues, then s/he can be freely engaged on any level. Not only is this critical to effective instruction, but it is very contagious. The more modest, amicable, and credible an expert is, the more willing people will be to partake of his/her expertise. It is no coincidence that the pronounced desired traits of a weapons officer are to be:

1. Humble
2. Approachable
3. Credible ²³

The first two are generally integral to one's personality, but slightly modifiable. Credibility, however, is where the Weapons School invests the majority of its effort. For an instructor to influence his/her squadron, a level of expertise is expected that surpasses that of others in the unit.

B. CORE VALUES

During my tour as an instructor and given my relationships with existing cadre, there was and is a distinct sense that that things are not as they should be. A driving question for this thesis is: is this merely a consequence of the infallible standard or is it a consequence of actual slippage? Among the instructors who execute the syllabi (planning and instructing missions), the predominant feeling is one of frustration. We always wished we could execute our Air Combat Command (ACC) approved syllabus as it was intended, never mind reaching above and beyond. Yet, it seemed a relentless battle to execute just one mission as it was forecast. This resulted in a constant shuffling of resources, modifying of profiles, compromising of learning objectives, and even writing off some experiences altogether. The collective perception, up through at least September of 2004, was that the Weapons School was insidiously sliding from excellence to mediocrity, and the very impassioned reaction to this by instructors was, I now believe, the best indicator of an attack on something very

²³ "Humble, approachable, credible" is a catchphrase used in the Weapons School to identify the most highly valued traits of a weapons officer.

difficult to measure—the Weapons School’s value system. My intent in interviewing and surveying the cadre of the Weapons School was to drive to the bottom of these emotional issues. The questions asked of the participants were thus intended to gauge whether my suspicions were correct.

Before looking at the Weapons School’s performance, it is necessary to consider the qualities it values. These values are implicitly reflected in the skills/traits/concepts conveyed. In the interviews and questionnaires, respondees considered the following qualities to be most important.

Valued Qualities:

1. Credible tactical expert and leader
2. Humble and approachable teacher
3. Comprehensive and authoritative knowledge
4. Exemplary leader and decision maker
5. Trained problem-solver
6. Keeper of the tactical standards
7. Warrior attitude
8. Innovative thinker

The attributes described here point to enviable professional qualities. Certainly, if something is worth doing, it is worth doing right. And since leadership is inherent to military roles, it’s worth doing this as well as possible. The Weapons School doesn’t just lead the CAF, but its graduates are designated leaders in CAF units. Leadership pervades everything the Weapons School values. In a phrase, ***the Weapons School believes in resolute leadership in everything it does.***

The self-described qualities of humility, approachability, and credibility support this statement. Credibility can be easily viewed as the cornerstone of the weapons officer’s leadership. As one commander commented, none of the weapons officer’s roles is possible without his/her being an undisputed expert in his/her weapon system. All of the skills required to teach a new operator, run a

unit's training program, integrate joint forces, lead a combat mission, etc., must be performed at the highest level. If not, then the weapons officer loses his/her centrality as a leader and quickly loses effectiveness. When the same question was asked of the CAF commanders—the end-users of the weapons officer—they all highlighted credibility: the weapons officer “provides a PhD in fighter tactics,” “maintains high tactical standards,” is an “example of [the] highest standards of performance.”

Clearly, the Weapons School is aligned with its customers in terms of the importance of credibility. The school's reputation, created over decades of trial, has led to the Weapons School being the most influential entity in the CAF. Also at the top of the list is the importance placed on the people who make it all happen. It is important to the school and to the CAF that the cadre remains the vehicle for connecting the past to the present to the future. Without the cadre, the school has no basis for credibility and no hope of approachability. With them, it stands to change its world.

Approachability, when combined with credibility, is one of those characteristics that grants an instant aura of leadership to those experts who possess it. Compared to someone who is egotistical or closed-minded, the approachable leader instills confidence and followership. This trait was exemplified in 1974 when Maj. Larry Keith snapped the F-4 WIC out of its swaggering trance and demanded affability from his instructors.

Humility seems to be extremely difficult to find in those who are experts at their craft. The Weapons School tends to recruit this trait instead of create it, but without question, it can be taught. A student's experience at the Weapons School is, after all, a humbling experience. One student commented, “I didn't realize how much I didn't know until I went through the Weapons School.” For those who embrace the mantra of self-improvement, this remains true despite ever improving abilities. As important as is an unassuming attitude is the sincere mutual respect for others. This is typically developed through earnest self-reflection and an intimate knowledge of others' capabilities and intentions. The

more a student learns to trust his/her peers, the more a sense of mutual respect is fostered which dampens arrogance.

C. RESOLUTENESS OF THE SYLLABUS

In a system where specific training events are carefully crafted and uncompromisingly tested, the outcome of those events should reflect the Weapons School's performance. As described, the most effective form of measurement is at the effects/action level of performance. These snapshots offer an incredibly useful perspective and, taken together, should contribute to valid assessment. The further we move from objective measurement, however, the more difficult it becomes to accurately describe the performance. Such is the case when arriving at issues involving values, where dissatisfaction is invariably expressed in emotional terms rather than via metrics. Why not measure effects, then, and consider the rest of the value system intact? In these days of turbulence, *the syllabi have been disrupted such that the consistent measurement of effects and skills are highly questionable.*

To illustrate what I mean, consider an example. In any number of training sorties conducted in the F-16, one or more aircraft would suffer from a radar warning receiver (RWR) malfunction or failure. This was a symptomatic problem of aircraft maintenance at Nellis AFB. Since most training sorties were conducted against enemy forces employing radar-guided weapons (surface-to-air missiles or fighters), this often resulted in a dilemma for the instructor evaluating the mission. If the student was "killed" during the mission (because he was unaware of being targeted), he would be removed from the scenario for a period of time, in some cases permanently. This of course, prevented any consistent assessment of the student's skills and, depending on the training objective, might result in a failed or "maintenance non-effective" sortie. After suffering from repeated issues like this (and there were many), the student would have to play catch up with the syllabus. There was limited room for repeating missions, and each successive scenario built on the demonstrated skills of the sortie before. The result has been groups of students who, through no fault of their own, have found themselves

under pressure to make up for performance lost, possibly distracting from the task at hand. Likewise, to cope with this has required instructors to creatively adjust the syllabus missions to ensure satisfactory completion of tasks that weren't previously evaluated. What this means is that in no time the syllabus winds up altered so much that it can no longer serve as a standard method of feedback.

Another example of the importance of accurate and consistent performance is how we validate tactics. Tactics development is based on the expectations of our enemy and how we might exploit their behavior through deliberate actions. After developing the actions and decisions to be employed, we test the tactic against a simulated adversary who behaves in accordance with our assumptions. If we call the "fight's on" and the training adversary ignores all of our instructions, then our tactics experiment is likely to be marked "fun, but inconclusive." Surely, there are things to learn every time we conduct training, but in terms of formalizing tactics, **only consistent success in realistic scenarios validates our plan**. Syllabus validation is no different, other than it is far more complex and, in many ways, more important.

In any strategy that relies on equal contributions of ends, ways, and means, there must be constant adjustment and readjustment of all components. By definition, the ends cannot be achieved without adequate ways, and if the means are reduced, then the ends must follow suit. A shortening of one leg of the strategy stool results in it tipping over. This is the reason why, given the extreme complexity of measuring individual effects/actions/skills across *eighteen* syllabi, this study has focused on assessing the strategic components of just the weapons officer.

1. Resources

When presented with this same strategy framework and asked which element was the limiting factor, in every case but one the Weapons School commanders and instructors answered "resources." In fact, in many cases resources—airplanes and personnel—was considered *the most significant issue affecting their squadrons*. In addition to what we traditionally think of as

resources, respondees and interviewees also cited time available to execute the syllabus, airspace, weapons, and their budget.

More importantly is how these respondees felt this limiting factor of resources affects the quality of the graduates. In one instructor's opinion, which summarizes many others, "When you stand down for a week in the middle of the Weapons Phase for an airshow, and waive rides due to [maintenance] factors, that graduate is a lesser product than someone that went through the whole syllabus. It's phased flying training with specific skills/experiences imparted during specific sorties. You miss one, you've missed something we, and the ACC/DO by extension, thought was important enough to put in the syllabus of the most comprehensive flying training the Air Force has."

Similarly, the resource issue has a very direct effect on the core traits of its graduates. "Without the proper resources, not only experience is impacted, but also basic (experiential) knowledge which affects credibility. Without all the resources necessary to instruct a WS grad, the fabric of the basic WS grad quickly begins to unravel, starting with experience." Experience is the foundational method and means of instruction at the Weapons School. Without realistic, accurate, and purposeful scenarios, the whole course becomes an exercise in theory.

The resource problem has all sorts of effects. For instance, as one Weapons School squadron commander summarizes:

Lack of adequate training days means we squeeze 10 lbs into the 5 lb bag. That means we rush things, don't take enough time to instruct to the exact level we need to, or we do go to the exact level we need to and it turns into a 75 hour week plus weekend duty for instructors and students. [It] doesn't create the best learning environment and students often just want to check off their objectives and move to the next one without fully digesting the [mission]. When their post-graduate assignment also demands this amount of time, it really puts a burden on weapons officers both before and after graduation.

This drag effect tends to make desired objectives more difficult to obtain, which in turn requires more effort, which is why chasing objectives through a maze of

distractions and unanticipated obstacles is simply detrimental. Unfortunately, the tempo of Weapons School operations leaves little room for detours.

2. Training Methods

The approach taken under Col. Carter's leadership was to validate every bit of training as to its contribution to the desired skills. If the cadre determined that an event had a negligible or redundant contribution, then it was a candidate for removal from the syllabus. This was a crucial step—the complexity of weapon systems is increasing rapidly, and with capabilities being continuously added to the platforms, the syllabus and cadre struggled to accommodate the growing pyramid required by the building block approach. The challenge this creates for the school is a rapidly increasing “cost of production” agitated by shrinking resources.²⁴ In an effort to focus on the *ends*, the syllabi are being scrutinized for efficiency and effectiveness. This is the notion of “effects based training,” similar to effects based operations. Even so, the *ways* are being heavily influenced by the *means*, as noted over and over by the cadre.

The cadre were asked what type of training concept they use, and whether it is optimal. There were a variety of answers, and all respondees acknowledged that their individual syllabi were undergoing constant revision. Interestingly, one respondee noted that based on the availability of resources (aircraft) his/her training concept was not optimal. Because his/her squadron's aircraft can't meet mission requirements, it must borrow aircraft from other units (something that is done routinely among the units stationed at Nellis). This factor contributed enough instability that the standard of training fluctuated with the performance of the maintenance squadron and the availability of the jets. Graduate quality was thus at the mercy of aircraft maintainability in this case.

If the training concept were truly optimized, then it should maximize the use of resources in support of the objectives. Availability of resources should not be the determining factor in and of itself. Instead, how best to create the desired attributes of a weapons officer should drive the training concepts.

²⁴ Clayton M. Christensen, *The Innovator's Dilemma* (Boston: Harvard Business School Press, 1997). Also, Carter (2004), 4.

One course of action taken by squadrons is to incorporate more integration into their syllabus (usually this has been done adhoc, but is increasingly planned). “Integration” is an employment concept by which multiple platforms organize to achieve an array of effects, much as in actual combat operations. While integration trains an important core *skill*, increasingly it is being used as a *training concept* to satisfy a resource problem. One instructor remarked, “The largest impact [of organizational change on our standards] is through the necessary use of sister squadrons to integrate training. The impact is loss of certain specific objectives until both syllabi can be matched to maximize training objectives for all. This lowers the training standard as we have less time to give another attempt at an engagement to ensure the instruction was received.”

The fact that a lack of resources is moving the squadrons to more integration is being rationalized away by the thought “we should integrate more anyway.” However, without the fundamental skills being met prior to integration, and with the subsequent competition over training objectives, what occurs over time is an erosion of skills preceding integration skills. It is difficult to argue against the need for greater integration skills, but before continuing on this dangerous course, the following question should be answered: which serves the CAF better, a weapons officer with excellent platform skills who is capable of integrating, or an excellent integrator with more limited individual capabilities? Regardless, careful attention needs to be paid to how we get there and the extent to which this might be costing graduates in other areas.

3. Objectives

The final category to consider is the ends themselves. I have made the argument that the overall strategic objective *is* the graduate. As such, all individual objectives should support this. The question I posed was this: “Are the standards of your objectives too high, too low, or appropriate given the desired quality of the graduate?” In every case, Weapons School commanders felt their standards were not too high. Two responses, however, shed further light on the dilemma that the Weapons School faces. In one multi-disciplinary squadron, the

standard might actually be too low. This is due to the varied backgrounds of students and a wide range of expectations upon graduation. In the commander's opinion, time (a resource) influences his/her objectives and renders them lower than desired.

As to how objectives might change in response to the environment, one commander commented, "In the end, if our objectives don't change to meet the shrinking budget, the quality of graduate may decline because they won't be able to achieve what we now think they need to achieve." Indeed, what the commander points to here is the crux of the problem as far as this thesis is concerned: a decline in any one component of strategy results in the decline of all others. Once the training method has been optimized, if the flow and quality of resources declines—for any reason—the Weapons School must either intentionally lower standards, or allow them to insidiously decay.

D. FROM ACTIONS TO RESOLUTENESS

This chapter has carried us from why the Weapons School exists to how we have developed a clearly identified set of skills, traits, and values that can be measured. With the Weapons School, a case has been made that values and skills are inextricably tied together. When one changes, so will the other. Meanwhile, experiences contribute to actions and skills all the way up to the level of institutional beliefs. These subsequently affect how the group thinks, trains, and ultimately acts. In an ideal world, the Weapons School would operate in an environment the Air Force would keep stable, so that effectiveness could be measured reliably and consistently. Over the past four years, however, objectivity has been increasingly tempered by a "that looks about right" mentality, suggesting that either a sense about the importance of maintaining the standard has been lost, or that compromise is subtly taking hold. The cadre themselves talk about turmoil that results from resource inconsistencies and, in the strategy framework, there can be no disguising the importance of resources to meet an objective.

IV. THE WEAPONS OFFICER'S DILEMMA

Watch your thoughts, for they become words.
Watch your words, for they become actions.
Watch your actions, for they become habits.
Watch your habits, for they become character.
Watch your character, for it becomes your destiny.

Unknown

A. TYING EMOTION TO OBJECTIVITY

The genesis of this study was to determine the cause of an unquantifiable sentiment and to link it to something that could be adjusted by the school. Since the Weapons School is tied to its history *and* its mission, and has demonstrated the unparalleled effectiveness of its methods, it will likely continue to esteem its own value system. For those directly responsible for passing the torch to new generations of weapons officers the biggest challenge, given their determined passion for keeping “the bar” high, is how to keep it high. The resource problem highlighted in Chapter III is a major factor in the greatest threat to the Weapons School—that threat being denial.

In a complex system, which is what any one of the WIC syllabi represents (never mind all eighteen being coordinated at once), there will be unavoidable glitches and compromises. No system can be operated flawlessly. Where the Weapons School should exercise ultimate caution, however, is to guarantee that its values remain intact and that the cadre who nurture them are reassured that their contributions are not in vain. The instructor cadre provides an invaluable window on the state of operations. In a shared environment where they live and work together, rarely would cadre members display “unprofessional” emotion unless a trend of violations insulted their beliefs. Threatening people’s values typically provokes conflict, which is why consistent emotional responses should be investigated to gauge whether and the extent to which values might be under attack.

B. EVIDENCE OF DETERIORATION

The Weapons School's position is that "lowering the bar' is not an option."²⁵ When asked the contentious question, "how do you perceive the risk of the Weapons School lowering the bar?" Weapons School commanders staunchly denied the possibility of lowering standards: "I don't think we should even discuss the notion of lowering the bar. Maybe we should change the lateral location of the bar, but lowering it is not an option. The warfighting commanders (squadron, group, wing, and combatant commands) have come to expect a certain level of individual when it comes to putting a grad to work, and if we change this, their baseline expectations may not be met."

WIC instructors, when asked this question, admitted that the standard fluctuates, although their basic attitude was to always try to maintain the highest possible ideal. One response indicated that the standard should reflect the horsepower of the school—more capability should equal a higher level of training, "Our job is to produce the best, most lethal [weapons officers] possible." Insightfully, one instructor noted that "as an instructor I have to be able to still make the highest caliber leader and instructor. [Students] now have to be able to do more than when I was a student due to mission changes, so the fact they might not do something as well as we did does not always insinuate that the bar was lowered." The opinions reflected in answers to this question are firm evidence that "resoluteness" exists. Between the lines, however, lurks the slippery slope that the Weapons School must avoid at all costs.

"Tactical formation, Energy Maneuverability, etc., were born [at the Weapons School] because someone had the vision to recognize that tomorrow will not always be like today. That's our legacy, and we're forsaking it for expediency. That's a...crime." These were the words of a single instructor in response to the question of standards—an emotional but gripping response to the effects of resource constraints on standards of training. As described in the previous chapter, there is an incontrovertible link between the quality of the graduate and the inputs to the system. This undeniable linkage combined with a

²⁵ Carter, 2004. 3.

steadfast strength to hold the line means that something has to give when inputs fall short. In a simple analogy that all aviators can appreciate, the Weapons School is flying precariously on the “power curve.”

C. THE POWER CURVE AND THE WEAPONS SCHOOL

The Weapons School, as an institution, is in a dynamic environment that challenges its ability to conduct its mission to the prescribed standard. External influences, such as scheduling and resources, limit the school’s output. Internal factors, such as the syllabi and its components, are being modified to optimize operations with those external influences in mind. The school’s rate of output and standard of output are seeking a state of equilibrium with its environment, much like an aircraft flying at a constant altitude. Remember from elementary aerodynamics how an air-breathing craft remains in level flight. The aircraft’s weight must be matched by the wing’s lift. To remain at a constant speed, the aircraft’s drag must be matched by its thrust, or power. Drag changes depending on velocity and angle of attack (AOA). As the aircraft increases its velocity, aerodynamic obstructions (such as inherent skin drag, external stores, etc.) cause parasite drag to increase. The top speed of an aircraft is typically restricted by parasite drag. As the aircraft slows down, the wing’s shape produces less lift requiring an increase in AOA to maintain level flight. The pilot pulls back on the stick to accomplish this, and consequently, the wing produces induced drag. The two drag curves together (Figure 4) describe the “power required” curve shown in Figure 5.²⁶

On the slow side of the minimum thrust required point (the bottom of the curve), as velocity slows and induced drag increases then power must *increase* to keep a certain altitude—this while the aircraft is actually flying *slower*. If the pilot fails to apply power commensurate with the onset of induced drag, the aircraft will continue to slow down, the wing will rapidly lose lift and will eventually stall. This phenomenon is referred to as “falling behind the power curve.” An

²⁶ Charles E. Dole and James E. Lewis, *Flight Theory and Aerodynamics* (New York: John Wiley & Sons, Inc., 2000), 70-90.

option to applying more power is for the pilot to release the backpressure and decrease altitude in order to gain airspeed. This is how the power curve works for aircraft.

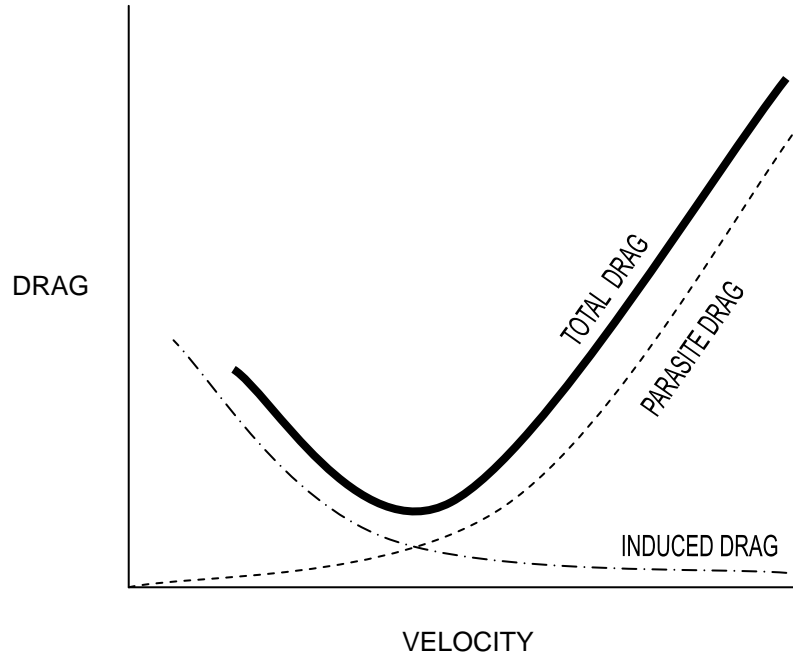


Figure 4. DRAG CURVE.

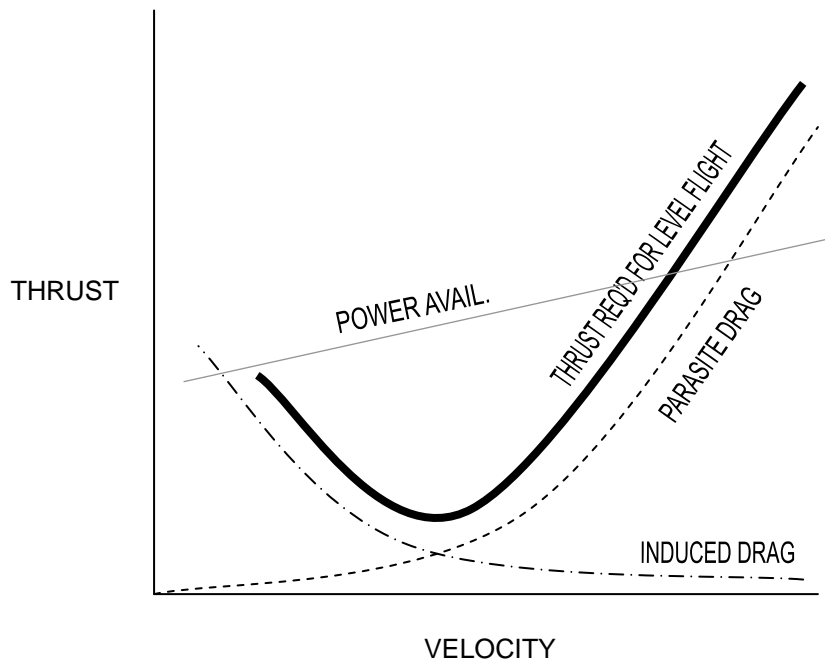


Figure 5. THRUST REQUIRED CURVE.

Now consider the Weapons School. The standard—the bar—is the Weapons School’s altitude. Through continuous feedback with the CAF and endless debate over how and why, the bar has been set with great care and pride. Given all the reasons why we need the bar set high, the school’s altitude must not change. Now, consider the Weapons School’s ability to maintain operational performance to be its thrust; this is the power available (straight line on Figure 6). The instructor cadre comprises the largest component of the organization’s power. They have the ability to mutually adjust, learn from inefficiencies, and ramp up their effort when required. Fueling the cadre are resources, such as time available, unit manning, support assets, etc. Opposing the school’s thrust is drag. In everything we do, we try to minimize those things that resist our efforts. Factors that limit our maximum effort can be thought of as parasite drag. These include the environment and the inefficiencies of the organization’s structure (airspace, scheduling timelines, aircraft turn times, etc.). At high output (velocity), no amount of power will be able to overcome certain limitations of the system. At lower output, however, the organizational drag becomes less significant and less effort is required to produce the same result. At this point we could say the organization is optimized for its mission. Meanwhile, organizational drag’s counterpart can be thought of as those things that *disrupt* the organization’s effort: an unexpected change to the airspace, inconsistent aircraft availability, or instructors called to perform extraneous duties are all disruptions that cause the cadre to “pull back on the stick” in order to maintain the standard. Disruptions can happen anywhere on the performance scale with varying effects.

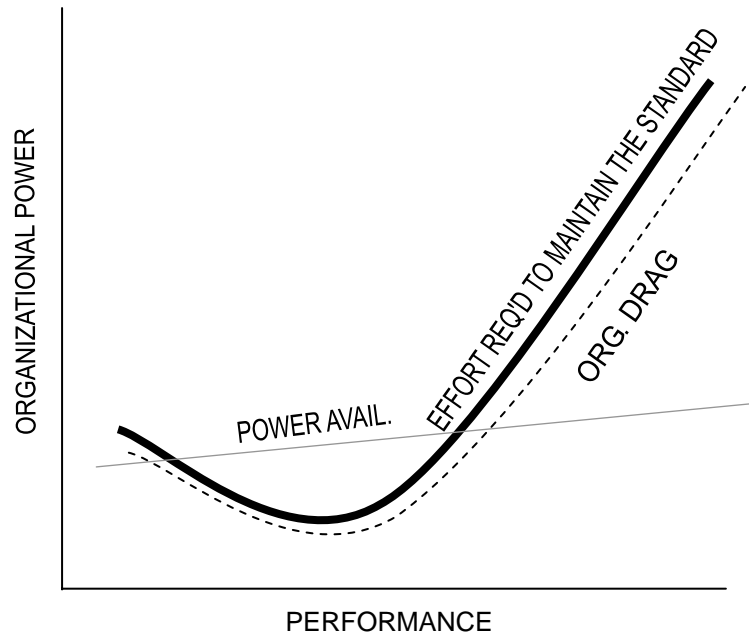


Figure 6. ORGANIZATIONAL POWER CURVE.

While induced drag doesn't have an exact equivalent, there is a similarly corrosive effect when distractions and inefficiencies are combined with other factors. Take, for instance, a squadron trying to accomplish its syllabus when suddenly required resources are removed from use. A typical example cited in interviews was the trend of unpredictable aircraft availability due to maintenance problems. This yields a direct reduction in the "power available," which correspondingly reduces performance. Since the squadron is already at its maximum effort but realizes the danger of lost training, it scrambles to improvise—a distraction. In the process, anything that caused resistance beforehand (other disruptions) becomes a multiplicative factor, exasperating the effort. Just as with increasing AOA on a wing, operational distractions and disruptions rapidly agitate an already compounding problem.

This situation should sound familiar. At some point, everyone has felt unable to complete his/her tasks or to do as good a job as s/he had hoped. If asked to explain how such shortfalls occur, any aviator might reply, "I'm behind the power curve!" This is a way to describe having too much to do with too little

time, energy, or capability. What do we when we fall behind the power curve? Everyone has his/her own solution, but typically solutions fall into one of the following categories: we a) work harder; b) find help; c) do less work at the expected level; d) do all the work to a lower standard of quality. **Every** weapons officer faces these options on a regular basis. The significance of thinking through the implications of this analogy is profound, because when the Weapons School itself falls behind the power curve, it is also forced to make a decision—a decision that affects its identity and its future value system.

As one instructor commented, “From the time I arrived until the time I left [Jan 2005], I definitely felt like it took more effort to accomplish the same task. Then we added more tasks with the introduction of the Lightning Pod and laser guided bombs. All the distractions and greater complexity of the mission required much more work.” Although it is sometimes not very noticeable (as with the onset of induced drag), the required-effort curve can sneak up while valuable indicators are hidden from the institution. Because of the work ethic of weapons officers, there is always a willingness to work harder before relaxing the standard. In many cases, though, the increased effort might hide or even aggravate the true nature of the situation. As one phase manager put it, there were so many destructive inputs to the implementation of his phase (significant adversary fallout, unrecoverable range changes, airshows) that the final execution resulted in severe compromises in the standard of training. The tasks of re-planning and feverish readjustments caused details to be lost, which in turn resulted in more inefficiency, all taking effort away from the training goal. The loss of time available as a result eliminated any chance of re-accomplishing the training. Nonetheless, the team worked even harder though the gold standard had already been lost. In other words, this phase manager and others could not work hard enough to deliver the power required to counter the rapidly mounting drag. The consequence was none other than a lower standard.

The importance of recognizing this phenomenon cannot be overstated. Remember what one Weapons School commander said:

Lack of adequate training days means we squeeze 10 lbs into the 5 lbs bag. That means we rush things, don't take enough time to instruct to the exact level we need to, or we do go to the exact level we need to and it turns into a 75 hour week plus weekend duty for instructors and students. [It] doesn't create the best learning environment and students often just want to check off their objectives and move to the next one without fully digesting the [mission]. When their postgraduate assignment also demands this amount of time, it really puts a burden on weapons officers both before and after graduation.

As pointed out here, weapons officers carry their experiences into the CAF and dutifully replicate them. An example of this same problem recurring in operational units is the trend of double turning to satisfy flying hour programs. In flying training, the training benefit of hot pitting or double turning is very discrete. It allows an effective doubling of experience in a slightly shorter time, but steals important debriefing time from aircrew. In a system where learning has far transcended raw experiential knowledge, the debrief is the most valued part of training when combined with actually flying airplanes. A high tempo, particularly in training, results in debriefs that are cut short. Added to this, of course, are the ever-present non-mission related distractions, manning issues, etc. The drag caused by flying hour programs and influences outside the purity of mission readiness easily outstrips the power available to many CAF squadrons.

Indeed, one CAF commander remarked that his biggest challenge was overcoming resource and training limitations to meet Air Expeditionary Force (AEF) tasking. In his view, low experience levels combined with an assignment length of thirty months or less puts an exceptional burden on the individual and the squadron to accomplish two AEF deployments during his/her one assignment. Particularly where the stakes are very high (urban CAS), it seems contradictory that our training methods would not be optimized for more complex missions being flown by less experienced crews.

Since experience translates into values, and those values guide our actions, it should not be a surprise that the CAF is slowly sliding off the back of the power curve as well; after all, the CAF's weapons officers are learning to deny compromise by pulling back on the stick unwary of the impending stall. In fact, *what should be happening instead is that we recognize the problem for what it is and choose the most effective course of correcting it.*

D. COURSES OF ACTION

This power curve paradox is both difficult to recognize and deceptively hard to correct. Just by looking at the evidence provided in this study, most respondees flatly deny that the Weapons School's standards are in jeopardy. This is indicative of the fact that the bar is extremely difficult to measure from class to class and that the thought it might actually be compromised is unacceptable. As one instructor put it, "The 'bar' has never been consistently in the same place for the last 50 years. In fact it is rarely the same place in any two consecutive classes in a row." In some cases, there has been ample justification for modifying the standard. When 9/11 occurred and several squadrons were called to action, the Weapons School acknowledged the loss of training and marched on, having fulfilled a higher duty. But when squadrons are repeatedly called to backfill operational tasking (such as Operation Noble Eagle) due to what appears to be routine lack of consideration for the importance of syllabus stability, this assaults the principles of the school.

The first step in determining how much slippage does occur is to make consistent and measurable comparisons of student performance class after class. Proficiency of actions remains the proof of choice in this regard. Ideally, this measurement would be as standardized as possible over each syllabus; that is, each squadron would measure the same level(s) of training (experiences, actions, skills, etc.) and categorize them in terms of the core skills of a weapons officer. Preferably, the school would formalize its core traits and values, and analyze skills under those categories as well. As analysis moves from skills to traits to concepts to values, the more subjective assessment becomes, but at

least there would be deliberate and clear evidence supplied from lower echelons of examination. With an objective effort like this we would possess a truer reflection of our efforts and we would always know where we are in terms of the power curve. A suggestion for such data collection is presented in Chapter V.

Just as when a pilot recognizes his/her predicament of being behind the power curve, prompt action is currently a must. As alluded to, there are four options to correct the problem:

1. Increase the work effort
2. Increase the resources to make current work more effective
3. Maintain the standard but decrease output
4. Keep the same level of output but reduce the standard

Since Weapons School personnel already work in excess of seventy-five hours a week at full stride, Option 1 seems to have already been implemented. Option 2 is currently being employed in reverse, and Option 3—decreasing output—is not an option given current CAF demands. That leaves the declining quality of the Weapons School's graduates as the only likely possibility—it's the only area in which there's any give left—whether the cadre openly admits it or not. At this point, a prudent pilot would wish for a more powerful motor, understanding the undesirable option of trading altitude for airspeed. In the eyes of the Weapons School, reducing the standard is not an alternative. Thus the only sensible choice is to go back to Option 2 and reverse the trend of diminishing resources.

This is easier said than done to be sure, but consider the opinions of those commanders who compete for the same resources. The CAF commanders who responded represent a mix of fighter and bomber squadrons, and every one regards the Weapons School as the CAF's Center of Excellence. Through their comments, it is clear the extent to which they value the contributions of graduates, the amount of tactical development conducted by the Weapons School, and the traits and values passed down by the world's finest tacticians. Even with their own concerns about readiness and training, they concluded 2-to-

1 that they would increase their investment (people, support, etc.) to maintain the same high quality of graduate. The minority were happy with their graduates, but were not able to invest more. When asked how less-than-excellent weapons officer skills would affect their squadrons, they responded with comments such as, “[The] entire [squadron’s] skills would decline. [The] weapons officer leads the development of all IPs, multi-FLs, etc.,” and “Training is becoming the single force-multiplier we enjoy over our adversaries.” Here the CAF commanders stand firm with the Weapons School in demanding that the world’s premier institution of air combat development remains intact. As one instructor put it, “we may be the last school in the world that has a standard and sticks to it—if we lose that, we might as well close the doors for good.”

From heritage to values to impending stall, the Weapons School *must* pay close attention in order to make an important choice. As during the years following Vietnam, the CAF will hold the Weapons School responsible for the ways in which it trains. If this is done in an effective and responsible manner, then tomorrow’s combat tacticians will indeed continue to reign supreme.

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V. OBJECTIVELY ASSESSING THE GRADUATE

A. STEP ONE TOWARD OBJECTIVENESS

Since this study has focused on the path toward achieving a strategic goal—the graduate—it makes sense to make use of a system to objectively assess the syllabus. This system is already in place for each syllabus, but, as this thesis has argued, the output is only as good as the input. The inputs (including resources) have been changed and disrupted to the point of making objective analysis questionable. If the power curve analogy is correct, then these disruptions are actually making the numerical analysis misleading. In order to answer the overarching question, is the quality of the Weapons Officer decreasing, we must first make that objective system truthful. This chapter seeks to solve two inherent problems: 1) How can the Weapons School make use of current objective indicators in its case for syllabus stability? 2) What system of analysis best describes the standard of graduate being produced?

The first order of business is to show that the syllabi **are** affected by resource decline and inconsistency in support assets. The school already began to compile such data in 2004, but should go further to include any and all disturbances, such as: airspace changes inside the planning cycle, deviations in the maintenance contract, adversary support fallout, extraneous duties or personnel shortfalls, lost time due to airshows, munitions fallout, alert tasking, etc. With the occurrence of **any** such event, the impact would be assessed by the primary instructor, phase manager, and/or DO, as to the numerical impact on the quality of training. It is important to include not only the first order effect, but also the second and third order effects. For example, when a higher priority agency injects a late notice airspace restriction, the primary instructor might conclude that his/her training quality went from a 10 to a 9. But also, when a certain event is not accomplished, the phase manager might also degrade the quality of the phase since follow-on events must be compromised in order to make up the lost training. The DO might even take this a step further if maintenance is unable to provide the requisite spares based on the new configuration requirements. In a

truly comprehensive assessment, even the maintenance units (and others) would conduct such analyses. The accumulation of penalties would indicate *the depreciation of the standard based on the original design of the syllabus*. That delta is roughly equivalent to the induced drag on the syllabus.

With data such as this the Weapons School would be armed with evidence of its predicament. Using this thesis's argument as to the school's role and responsibility in the CAF, the next step would be to seek a commitment from its parent and other support agencies to a period of absolute stability. The purpose here would be to determine whether the syllabus without perturbations performs to the level expected by the CAF. If so, then we will have determined our "control" for future comparisons. In order to establish this baseline for measurement, the period of unhindered operation would be approximately three iterations. The first execution would work out unforeseen issues, the second would secure the baseline, and the third would cinch the objective measurement that we all seek.

B. CATEGORIES OF MEASUREMENT

Only once we have granted the syllabus an opportunity to objectively prove its worth as it was designed to do can the Weapons School then conduct a comprehensive assessment of its performance. The graduate as an individual is the most fundamental level of analysis. The syllabus, though, must perform effectively for however many graduates it is responsible for and, moreover, must be able to do this consistently from class to class. Thus, one good class does not render it successful—it must be able to operate consistently. The basic framework for analyzing syllabus performance is similar to the framework presented in this thesis: the *components* of analysis are the ends, ways, and means. The *levels* of analysis are those found in the value system: effects, actions, traits, concepts, and values.

1. Define the Target and the Desired Effects

The strategic goal is to produce weapons officers. The quality of the weapons officer should be objectively specified by the CAF commanders and

accepted by the Weapons School commanders. The subjective responses by CAF commanders in this thesis are a starting point (pp. 25-27).

The following steps are iterative and interdependent:

2. Extract the Value System that will Form the Graduate

These are the *ends*. The Weapons School has already identified “core skills” and their corresponding standards (p. 24). The CAF commanders are, again, active participants in specifying the skill level. This thesis recommends going above and beyond skills by recognizing the traits, concepts, and values that fully embody the quality of the graduate. Using the value system construct (p. 20), we can derive a path that contributes to resolute leadership (and/or other values). The suggested WIC value system is found in Figure 7 on the following page.

3. Determine the Best Way to Achieve these Skills

The Weapons School excels in this regime—since it is the founder of the CAF’s training methods, the school’s ability to choose the best training concept is implicit.

4. Establish the Resources Required to Implement the Training and Reach the Goal

The school proposes the means required to execute its plan through the ACC syllabus approval process. From the ACC/DO level, the syllabus is approved or modified based on command priorities. This thesis argues that the Weapons School deserves significant consideration in the apportionment of these resources given its role and responsibility.

C. INSTRUMENTS OF MEASUREMENT

With any of the Weapons Squadrons’ best syllabus set forward, and with a commitment to execute as purely as possible, the cadre now has a chance to validate their ability to train a candidate to be a weapons officer *at the standard set by the CAF*. As described in Chapter III, not until there is a controlled environment in which to execute the syllabus can metrics be compared and thus measured.

VALUES

Persistent learning
Pursuit of perfection
Dominant performance } **RESOLUTE LEADERSHIP**

ELEMENTS OF TRAINING CONCEPTS

Individual performance Team performance
Leadership opportunities Followership opportunities
Peer assessment Hardship
Non-standard problems with atypical solutions

TRAITS

Humble Team player
Approachable Followership
Credible Open minded
Social connector Leadership
Persistent Thinker

CORE SKILLS

Communication for mission briefing / instruction / debriefing
Academic communication of platform expertise
Written communication
Cognitive skills
Leadership skills
Tactical advisor to the commander
Problem solver
Mentor skills
Knowledge of dissimilar platforms and joint forces
Tactical Integration
Interface with Air and Space Operations Centers
Knowledge of an organization's weapons and tactics function
Organizational skills to manage the weapons shop
Mission planning chief or team member skills

Figure 7. WIC VALUE SYSTEM.

The good news for the Weapons School is that most of the tools for measurement already exist and the data is already being collected. With consistent repetition, that data would provide meaningful feedback to support this thesis.

Similar to the power curve analogy, the Weapons School can observe “control instruments” and “performance instruments.” Control of the Weapons School is simply the vector imparted by the leadership—changing the attitude of the cadre through the mission statement or “commander’s intent.” The control mechanism is thus measurable via the amount or type of effort directed and the azimuth of that effort. A simple statement from the commandant and each squadron commander would provide a way to link values to concepts, traits, and skills.

The performance instruments indicate exactly how well the school is responding to the vector.

Areas of measurement include:

1. Rate of Output

This is the graduation rate based on the needs of the Air Force. Deviations here indicate deficiencies in either training effectiveness or the capacity of training. This is not to ignore the quality of candidates—reasons for wash-out should reveal the point of failure, such as lack of ability, determination, or poor judgement.

2. Capabilities of the Graduate

Measured are the actual capabilities of the graduate as compared to what is desired by the CAF. These are yes/no answers. If the Intelligence community demands a list of capabilities, does the 19th Weapons Squadron (Intelligence) deliver those capabilities at the desired proficiency? These capabilities should link directly to the Weapons Officer Core Skills and any of the adopted traits and values. Measurement is tied to the standard of training measurements in the next paragraph.

3. Quality of Capabilities—The Standard

The Weapons School's standard, or altitude, is what we all wish we could see on a scale of 1-10. Since turbulence has precluded the accurate reading of this instrument, this thesis has taken the "gut feel" of the respondees and translated it through a framework of strategy. The anticipated result is that the school's standard is in jeopardy, which respondees *feel*, but cannot readily see.

Measurement here comes from tying specific training objectives to respective skills, which then tie to traits, etc. Subjective evaluation is important—fundamental to this thesis is the notion that subjective assessment should match the numbers; if not, *then the disconnect must be found and corrected before insidious decay sets in.*

Figure 7 is used to give an example: a desired value is dominant performance in the graduate's primary mission, Combat Search and Rescue (CSAR) for instance. The value (dominant performance) would be measured by tracing a path through the traits and skills. Dominant performance in CSAR is a result of effective training through techniques involving team and individual performance, and leadership and followership opportunities. The traits fostered are leadership, followership, team cohesiveness, thinking, and persistence. These are readily identifiable in an individual, yet difficult to measure. The skills that measure these traits might include cognitive skills, leadership skills, problem solving, knowledge of dissimilar platforms and joint forces, tactical integration, interface with Air and Space Operations Centers, and mission planning skills. **Each of these skills correlates to graded items on the student's gradesheet.** Since an objective value is assigned to these tasks, the black and white standard should be apparent here. Repeated deficiencies in these skills should directly identify deficiencies in the traits, etc. *Consistently* acceptable scores in these categories should directly translate into approvable traits, concepts, and values. To re-emphasize, if the pressure of environmental distractions causes those scores to be waived, delayed, or otherwise modified, then objectivity is reduced.

A tool readily at hand to measure the Weapons School's performance is the waiver process. If a student fails to accomplish a task or meet the required proficiency level, then s/he must graduate with an approved waiver. This is the school's most immediate basis for argument, since *a waiver indicates capabilities or performance not accomplished through no fault of the syllabus*. If waivers are accomplished wholly and accurately, then the numbers would immediately highlight the extent to which the standard is being depreciated due to disruptive resource issues.

A previous dilemma for instructors was the need for a student to have a particular grade in order to progress. It was often the pressure of the timeline that caused instructors to “give” the minimum grade required in order to keep the phase/student moving, even though the student's performance might not merit it. This inaccurate measurement skewed the unit's ability to objectively gauge what was the consequence of disruptive factors and who might actually be substandard students. The 16WPS in 2004 began scoring the students as truthfully as possible—if s/he ended the phase with a 1 (substandard), then s/he would be sent to the next phase with increased supervision and **documentation**. Even if these scores don't warrant an end-of-course waiver, they could be used to point to disruptions. The fact that the waiver process records deficiencies in the student's abilities and opportunities is the most effective means of showing the CAF that it is not getting what it expects.

The school's vector is important because where the Weapons School leads the CAF will follow. The cadre is already diligently trying to implement a concept of optimized skill-based training. By attempting to extract data regarding the value system as well, the Weapons School would have yet another tool for ensuring that the hard work of the cadre is achieves its desired end, and helping protect the entire school from unrecognized decay. Ever important is understanding that every syllabus's measurement instruments are sensitive to their environment. Turbulence and other disruptive factors can easily deceive the observer. Hence the need to establish a baseline for measurement.

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VI. LESSONS LEARNED

Aerial combat is brutally unforgiving. To come in second place is to die, usually in a rather spectacular manner...There is nothing sophisticated about sneaking up on someone and killing him. Aerial combat is a blood sport, a knife in the dark. Winners live and losers die.

Robert Coram from *Boyd*

Combat of any sort is a powerfully revealing experience. It exposes every emotion and brings to the fore the very best and worst of human beings. None of us would voluntarily prepare for this role if we did not expect to be the best. To be the best, however, means there can be only one. In the realm of air combat, none stands above the United States Air Force and this is due in large part to the tenacious leadership of the Weapons School. As our nation becomes increasingly engaged and warfare becomes more mobile, the USAF will be called upon with greater frequency and with higher expectations. As Robbie Risner said, complacency kills: the CAF's standard of excellence cannot afford compromise.

A. SUMMARY OF FINDINGS

My argument has been that when it comes to determining the maintenance of standards, there is no question that comparing objective data are critical. The Weapons School machine is complex, however. Since the environment is fraught with instability, syllabus assessment does not lend itself to easy comparisons or measurement. With syllabi being routinely modified on-the-fly in response to changing support assets, measuring the standards becomes a subjective interpretation of variable snapshots. A community of proud professionals such as the Weapons School cadre has a difficult time approaching a complex issue without first exhausting all mechanisms under its control. Thus, while it is clear that making measurement tools more effective is important, valid measurement itself requires a commitment to stable execution. This presents us

with a veritable Catch-22: we need stability in order to objectively measure changes to the standard over time, yet without being able to objectively demonstrate that the standard may be slipping we can't guarantee ourselves the resources necessary to ensure stability.

In the background, the instructor corps is working so hard to preserve the value of excellence that it becomes nearly impossible to step away from the madness and see the problem for what it is—a paradox of working harder but with less effect, mostly due to depleted and ever diminishing resources.

Using the framework of viewing the syllabus as a strategy, the strategic goal (the graduate) can be seen as a product of *objectives* (measured by standards) plus *ways* (training concepts) plus *means* (resources). A well-developed strategy integrates the three components evenly and efficiently. In the course of my research, I posed four questions about the health and future of the Weapons School's strategy.

1. What Exactly Makes Up the Standards of the Weapons School?

In their most viewable form, standards are related to objectives. Each WIC has a syllabus that describes specific training objectives that are tied to actions to be completed by the student. Each event is graded according to an experiential standard established by the instructors. Over repeated demonstrations of these actions, the student is easily evaluated as to his/her skill in a certain type of event. These abilities contribute to a set of core skills held by the entire school. As described earlier, the core skills are: communications, integration of joint forces, large force mission planning, training plan development, and tactical leadership. Mastery of these skills is measured by consistent accomplishment of actions. A step above skills is a person's traits. In the Weapons School's view, a weapons officer should be humble, approachable, and credible. Although traits are less measurable than skills, they are certainly evaluated and measured by the instructors. The most widely held standard, meanwhile, applies to the Weapons School's values. The value system has been constructed through decades of trial and via the intellectual pursuit of ideals. The school's most

significant contribution to the CAF is its highly valued standard of *resolute leadership*. Resolute leaders have all the necessary qualities the CAF needs in its instructors and thereby help fulfill the Weapons School's role as a leader in the CAF.

2. Are these Components Truly Under Siege?

Unfortunately, as this thesis reveals, many of the scenarios designed to teach requisite skills and traits to the students are disrupted by changes to key resources such as airplanes, hardware, airspace, instructor manning, training days, etc. The ability to fairly measure skills thus becomes questionable. Some WICs will be able to measure their effectiveness better than others, but based on interviews and surveys, there is an undeniable problem with consistency. In every response, there was mention of resource deficiencies despite all the efforts made to streamline the syllabus requirements. The Weapons School is hard at work analyzing objectives and improving training concepts. In fact, a class doesn't go by when this formalized analysis doesn't happen.

When looking at the three components of syllabus strategy, just given realities, there can be no denying that the quality of each Weapons School graduate must also be adjusted to the resource problem. In terms of objective measurement, simply looking at the decline of resources and/or the quantity and types of waivers indicate that standards are under siege or, in keeping with the syllabus strategy identified in this thesis: it is apparent that the *ways* and the *ends* are giving in to match the *means*.

3. What are the Consequences if the "Center Of Excellence" Changes Its Attitude?

Are the ways and ends being flexed too far? Without acute awareness, the subtle experiences of compromise will affect the value system to the point of affecting the CAF. Just as the Weapons School's values are built on experience, so will they be reflected. If the CAF's Center of Excellence slowly slips into mediocrity, it will be infinitely more difficult to attain success against the next adversary to challenge our supremacy.

4. What Measurements can Provide Evidence of Slippage?

The assumption beneath being able to measure the true effect of the Weapons School's training methods is that the syllabi can be executed as designed, without turbulence. Otherwise, we have no reliable points of comparison over time. Compelling CAF decision-makers to avidly support the school's cause requires presenting them more than just a feeling. They will also need to see conclusive evidence in the form of objective data. This thesis has provided a convincing **subjective** argument about the effects of turbulence, and goes further to suggest how the school's quandary can be objectively communicated to the decision makers.

B. CONCLUSION

In the words of one CAF commander, training is becoming the only advantage we have over our enemies. The USAF invests more heavily in training than does any military service in existence today. From the infrastructure that provides realistic scenarios to the exercising of its combat machines, and the learning that is squeezed from each experience, the CAF is unparalleled in training. Yet, if one looks at the CAF's crown jewel, one can't help but note the degree to which those training opportunities are being starved of the resources needed to fuel them. For the CAF, training as a *way* of reaching an *end* is at the mercy of *means*—when, in fact, the strategic goal should define whatever resources are required to ensure success. For the Weapons School, and likewise for the CAF, the answer to what should be the driver—means or **strategic end**—seems obvious. Yet, all indications point to a state of denial that can only result in failure.

It is remarkable that the choice facing America's Air Force is to increase thrust or depreciate its standard of excellence. Yet, ironically, it is thanks to that standard of excellence that Weapons School Instructors and squadron commanders have flexed the system as far as possible. This thesis aims to provide recognition, but without action, stall is inevitable. The Weapons School is absolutely integral to the CAF's pre-eminent status, and its system of training and

learning is the foundation for modern air combat. The CAF should easily understand the danger inherent in compromising training at the Weapons School. To voice the sentiments of the cadre and presumably all members of the CAF: *if our aim is to enter battle and dominate our enemies, then let us train as we wish to fight.*

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