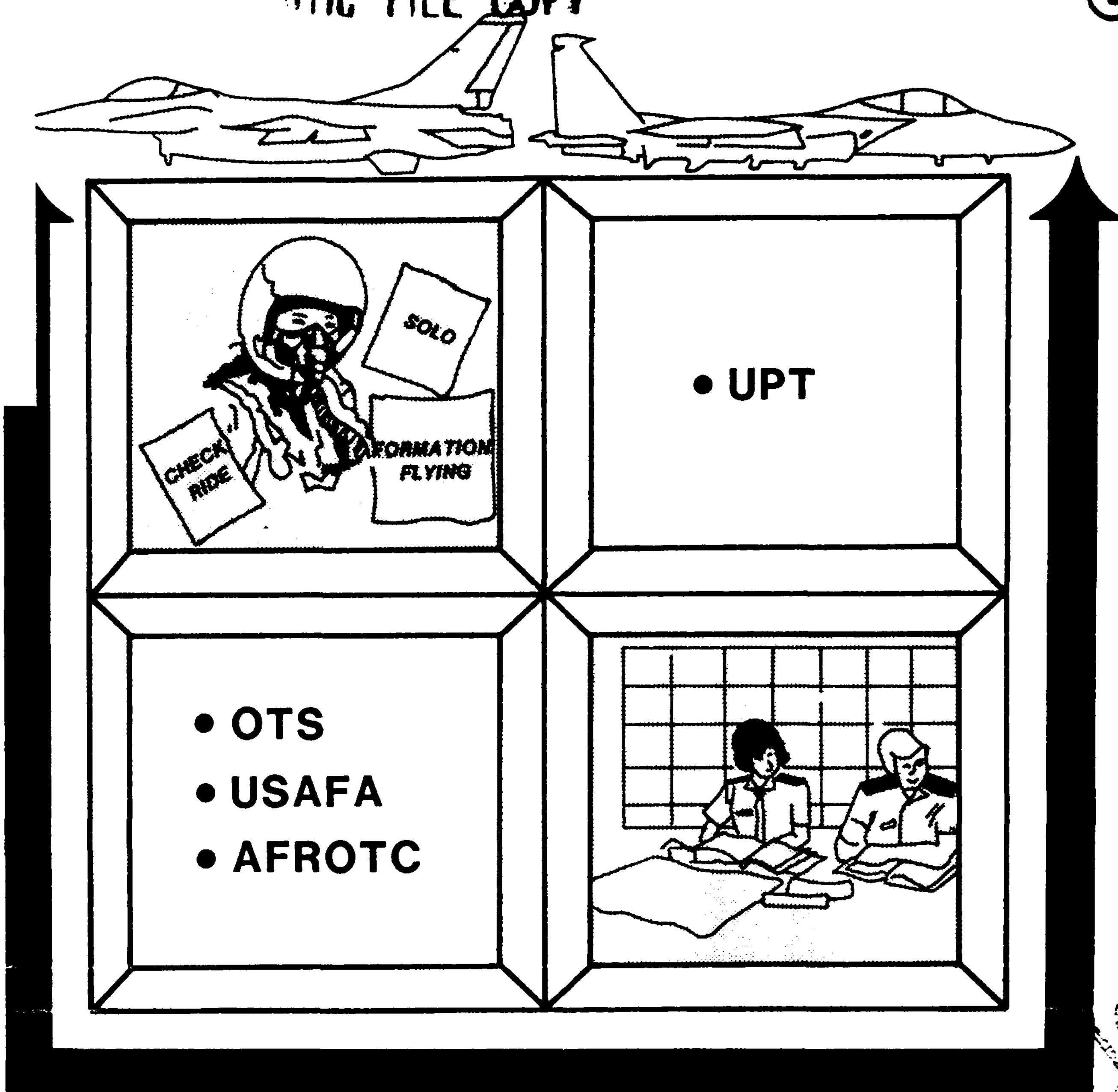

THE BRANCH POINT STUDY: SPECIALIZED UNDERGRADUATE PILOT TRAINING

AIR UNIVERSITY
MAXWELL AIR FORCE BASE, ALABAMA

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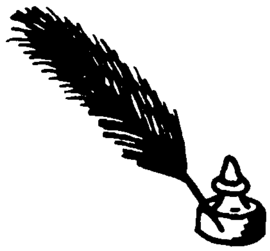

Thank you for your assistance

Cut Along Dotted Line

Research Report No. AU-ARI-86-5

THE BRANCH POINT STUDY: SPECIALIZED UNDERGRADUATE PILOT TRAINING

by

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DISCLAIMER

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FOREWORD

Our next air battle may be in the hands of young men and women currently being trained as Air Force pilots. Properly classifying them as single-seat or multiengine pilots could give us the competitive edge in a future conflict and guarantee the air victory.

This study examines the current Air Training Command pilot classification process and the outlook for the future. Before addressing future methods, Major Dorfler develops a historical perspective on pilot selection and classification with a concise outline of Air Force pilot accession programs. A detailed account of the advanced training recommendation board process sets the stage for his analysis of current and future pilot classification methods. A realistic description of effectiveness versus economy adjusts the reader's perspective for specific, goal-oriented recommendations.

Today's student pilot is a new breed of flier with different views and motivations--old classification methods must be tailored to meet future Air Force needs and to guarantee future air victories.

Donald D. Stevens

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Colonel, USAF
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Research, and Education

ABOUT THE AUTHOR

Maj Joseph F. Dorfler conducted this study while serving as the 1985-86 Air Training Command-sponsored research fellow at the Air University Center for Aerospace Doctrine, Research, and Education (CADRE), Maxwell Air Force Base, Alabama. Major Dorfler began his military career as a computer repairman for ballistic missile systems. While in technical school, he received acceptance into the Officer Training School program as a pilot candidate and completed undergraduate pilot training at Webb AFB, Texas, in 1971. His first three flying assignments were with the Air Training Command where he served as a T-38 instructor pilot at Webb AFB and Randolph AFB, Texas, and as an instrument flight instructor at the USAF Instrument Flight Center (IFC), also at Randolph AFB. While at the IFC, he was selected for further education and attended the University of Texas at San Antonio where he completed the master of science degree program in mathematics, computer science, and systems design. From 1979 to 1983 Major Dorfler worked in the resources and systems directorate at the Defense Intelligence Agency. Returning to flying duty in 1983, he became a T-37 instructor pilot at Laughlin AFB, Texas, and held positions as the chief, Simulator Branch and chief, Student Branch. Currently assigned to the Directorate of Operations, Headquarters USAF, Major Dorfler, his wife, Lecia, and his two children, Katie and Joey, live in Virginia.

ACKNOWLEDGMENTS

Enthusiasm and visions of greater glory, the by-products of research normally lead to frustration and disillusionment. During the bad times, the support and character of those you work for and work with often become apparent. I was lucky during the past 12 months at the Air University Center for Aerospace Doctrine, Research, and Education because when experiencing a bad time, I would receive a boost of encouragement or a pat on the back from those around me. Without the support of the following outstanding professionals, the research study you are now holding would not be: Col Patrick McCaslin, Lt Col Roger Matson, Mr Thomas Lobenstein, Mr Charles Locklin, 1Lt Jennifer Jacobson, Dr Jeff Kantor, Maj John Quebe, 1Lt James Revetta, Jr, Dr Connie Devilbiss, Col Robert DeSanto, Jr, Maj Timothy Preach, and, of course, my wife, Lecia Nan, who has the unique quality of being able to find the good side of almost any situation.

INTRODUCTION

Before dawn, Lt Joseph Gambino acknowledged the gate guard's salute and entered Ellis Air Force Base, Florida. He had always wanted to be a fighter pilot and today would mark the end of his F-16 training. The flight briefing began at 0500 hours and everything seemed perfect: the instructor pilot (IP) was in a good mood, the weather was clear, and the air-combat maneuvers to be practiced were straightforward. The last maneuver, a neutral fighting scenario, would be entered from formation--both aircraft would fly line abreast before making a slight turn away from each other, fly outbound on this track for 45 seconds, then turn 120 degrees back towards each other. Maneuvering would begin when they passed wingtips.

After becoming airborne, Gambino completed a G-tolerance and weapons check and confirmed he had accurate heads-up-display symbology. The first maneuvers were flown without incident and the IP had few, if any, comments. The neutral fighting scenario was entered at 15,000 feet above the ground. When they passed wingtips, both pilots delayed slightly and then each one made a climbing 180-degree turn in an attempt to gain an advantageous fighting position. In a desire to get into a good position, both flyers made continuous climbing turns. On one such turn, the IP lost contact with Lieutenant Gambino's aircraft and, according to the rules of engagement, told the young pilot to "knock it off." There was no reply. The IP repeated the command--again silence.

An accident investigation revealed that all aircraft systems were operating normally, all rules and regulations were strictly observed, and Gambino was in excellent physical condition at the time of death. The cause of the fatal accident was determined to be pilot error--the pilot flew the aircraft into the ground and did not attempt to eject.

This story is fictitious. Annually, thousands of hours are flown in high-performance aircraft where young pilots like Lieutenant Gambino successfully complete combat training. However, aircraft mishaps often lead to the compelling question surrounding this type of accident: how could someone fly a perfectly good aircraft into the ground? There are as many answers to this question as there are pilots. A more fundamental question for which there are fewer answers is: How does the Air Force currently assign pilots to operational aircraft? The answer to this question is the first step in achieving the goal of this research effort--to determine the most effective and economical point in undergraduate pilot training (UPT) where individuals would be identified as either a fighter, attack, reconnaissance (FAR) or tanker, transport, bomber (TTB) pilot under a <u>future</u> pilot training program.

The Air Force's undergraduate pilot training (UPT) program will undergo a drastic change within the next few years. Because of the rising pilot training costs, the complexity of the newer weapon systems, and the increasing need for specialized flying skills, the Air Force will convert from producing "universally assignable" pilots to training pilots in specialized tracks for their preselected follow-on assignments. Currently the 49-week UPT program produces one pool of pilot candidates, all of whom are recommended for future flying assignments just prior to the end of flying training. These recommendations are made by a board of senior officers based on the preferences of each student pilot and his or her demonstrated officer and flying capabilities. All graduates are recommended for either a FAR or TTB training assignment following graduation from UPT.

Under the proposed new pilot training program, to be called specialized undergraduate pilot training (SUPT), student pilots will receive specialized (FAR or TTB) training long before graduation from UPT. Hence, a board of senior officers will have to meet much earlier in the flying training process in order to determine a specialized training track for each student pilot.

This conversion to SUPT raises a fundamental question for the Air Training Command (ATC): Where is the most effective and economical point for making this decision? This is the goal of this research project. This question raises several others. Can ATC use the same criteria for making the FAR-TTB recommendations under SUPT that it now uses for UPT? By making the FAR-TTB decision much earlier, can the board of senior officers making the recommendations have the same confidence it now has, or will it lose too much information about student performance to make this recommendation with a degree of certainty? Does the Air Force collect information about pilot candidates during the recruiting process and early military training phases that it does not now use in the training recommendation process but which would improve its ability to select student pilots for FAR or TTB training?

Answers to the research goal and the ancillary questions it raises require a thorough analysis of pilot training. The first two chapters show how the Air Force has faced the challenge of who to select for pilot training. Chapter 1 reviews the history of pilot training and describes how the current UPT program evolved. Chapter 2 examines the recruiting process to illustrate how potential pilot candidates are screened and how quotas for UPT are allocated among the different sources of pilot trainees. This chapter reveals a data base of information on student performance and personal qualifications that might be useful to current and future decision makers.

The third chapter analyzes the advanced training recommendation board (ATRB) process in-depth. It shows how the Air Force decides whether a student pilot will be recommended for a FAR or TTB assignment upon graduation from UPT. Chapter 3 also describes the data the ATRBs now collect and use in making these training recommendations.

The information in these three chapters provides the foundation for chapter 4. The goal of chapter 4 is to define a set of selection criteria that future ATRBs in the SUPT program could use to determine with confidence whether to place a student in a FAR or TTB training track. Chapter 4 relies on regression analysis to examine the personnel data from 1980-85 records of pilot training graduates, all 1985 student flying training records, and first quarter 1986 pilot training performance statistics. Chapter 5 lists the recommendations and other comments that this research suggests as being ways to both improve current pilot training methods and prepare for specialized training. Whether or not the recommended selection criteria and selection points are accepted, earlier classification of students for FAR or TTB training is an integral part of specialized pilot training.

CHAPTER I

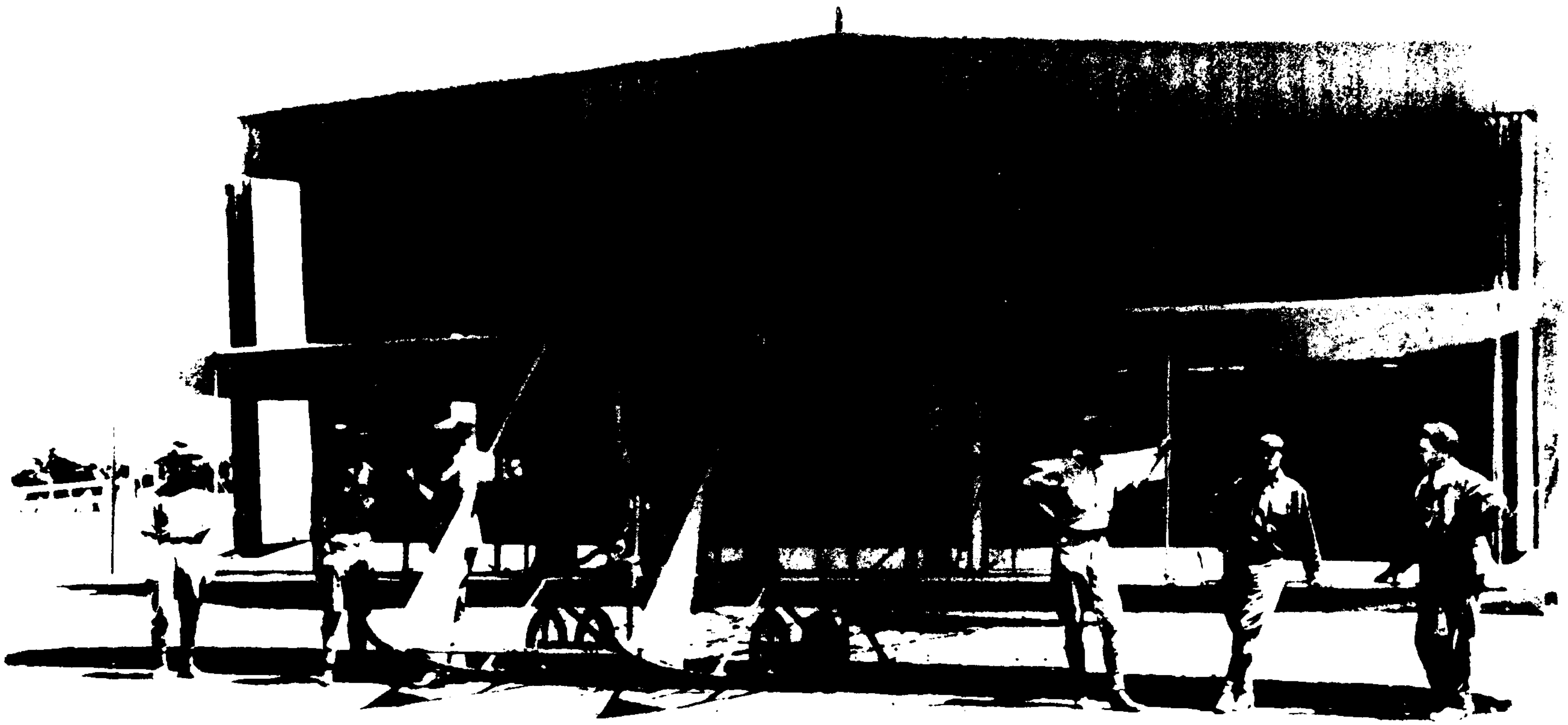
HISTORY OF PILOT SELECTION AND ASSIGNMENT

Accurate identification and selection of individuals for pilot training has been a concern since the beginning of heavier-than-air training. Moreover, the distinction between those best suited to single-seat flying and those who would perform [illegible] role is as valid a problem today as it was during World War I. A historical look at this problem reveals that past solutions depended upon peace or war, political climate, and the needs of [illegible].

The Air Force can trace the beginning of its [illegible] heavier-than-air aircraft to a small airfield near College Park, Maryland. The Wright brothers were under contract to [illegible] craft and to train two military officers to fly. The [illegible] test of the Wright Flyer was completed on 30 July 1909 [illegible] with Wilbur assuming the training responsibility. Lt Frank P. [illegible] Lt Frederic E. Humphreys were the first two officers destined to receive flying training. Having soloed both officers and fulfilling their contract, the Wright brothers were ready to depart College Park when Lt Benjamin D. Foulois arrived from Europe. Lieutenant Foulois, an old acquaintance of the Wright brothers, persuaded Wilbur to give him [illegible] minutes of flight instruction before leaving College Park. On [illegible] November 1909 Lieutenant Foulois was planning his first solo when Lieutenants Lahm and Humphreys decided to go for a short flight. During the landing they crashed Signal Corps Airplane Number 1. That ended flying training at College Park. Lieutenant Lahm was ordered back to the cavalry and Lieutenant Humphreys returned to Washington Barracks to attend Engineer School. Lieutenant Foulois was ordered to pack up the airplane, get plenty of spare parts, and go to Fort Sam Houston, Texas, to teach himself how to fly.[1] Following his solo flight on 2 March 1910, Lieutenant Foulois routinely corresponded with the Wright brothers and received advanced flying lessons. The first pilots received informal training. They had no rigorous formal syllabus to complete and the first student pilots were strictly volunteers. They did not have to meet any well-defined selection criteria.

At the time, military and public opinion were harsh and generally viewed Lieutenant Foulois and the Wright brothers as candidates for the government insane asylum. Nevertheless, Lieutenant Foulois continued experimenting with the Wright Flyer and established the [illegible] future US military aviation.[2]

As 1916 came to a close, World War I had been underway for more than two years; the Europeans were actively training pilots. At home, however, the attitude towards flying remained skeptical and overall public opinion was focused on defense of the Western Hemisphere. The United States was not going to get involved in World War I. It was that simple. Nonetheless, on 6 April 1917 the United States declared war and involvement in World War I was a reality.



US Army's First Airplane
Wright Type B
Fort Sam Houston, Texas - 1910
Lt B. D. Foulois, Pilot (second from right)

Now, public opinion supported the formation of five US Army flying schools.[3] When the United States declared war, it had only 65 Army officers trained to fly. Lack of instructors and machines and the nation's general ill preparedness for war necessitated moving US flying training to the European theater, where flying training was far more advanced and available. The United States established schools in France, Italy, and England; each school had to overcome significant obstacles and initially had only limited success. Through perseverance on the part of both the United States and foreign governments, 1,674 fully trained pilots had graduated by 11 November 1918.

During this intense training process, the Army documented several important findings for future reference.

1. Based on their performance while in the service, some enlisted personnel were given the opportunity to attend flying training. Since these pilot candidates normally did so well, it was concluded that it might be advisable to withhold both wings and commissions from aviation students until they had fully completed training. Upon completion of training they were awarded both a commission and aeronautical rating.

2. The most important element in the success of flying training was morale. An individual could not be taught how to fly against his will and, in fact, satisfactory results could not be obtained unless students had a high desire to succeed.

3. The officers in charge of the students should command respect and confidence.

4. To maintain the requisite esprit de corps, the elimination of undesirable and unfit students had to be prompt and rigid. During training a pilot had to be treated as a man and not a school boy. It was easier to treat him as a school boy, but that action tended to produce an irresponsible and worthless officer.

5. The glamour and importance of pursuit duty proved a serious handicap to the development of other branches of the Air Service. Airplanes designed for pursuit duty were, in general, more difficult to pilot and a tendency to select the best pilot for pursuit duty developed. Until the truth was revealed through active service, observation pilots and observers lost caste among their fellows and tended to resent assignment to this duty or to regard such assignment as proof of their own lack of ability.

6. The greatest possible care had to be given to the selection of instructor pilots. Being a good flyer or having experience on the front did not mean that the individual would be a good instructor, but having experience added a great deal of credibility to his words.[4]

The emphasis on flying training dwindled with the signing of the armistice on 11 November 1918. The Army once again returned to a peacetime scale of operations and the immediate need to train large numbers of pilots disappeared. Military leaders could afford to be highly selective in choosing those men who received flight training.

From 1923 to 1939 the Army Air Forces (AAF) produced only 3,505 rated pilots. During most of this period the pilot selection criteria were relatively constant. The AAF recognized that aircrew duties placed unique demands upon the human body and mind and, consequently, only the most qualified could succeed. To qualify for aviation cadet training the prospective pilot had to complete at least two years of college successfully or pass a special written exam covering nine basic college subjects. A rigid physical examination and a comprehensive interview by an experienced flight surgeon or aviation medical examiner rounded out the screening process.[5]

After the outbreak of war in Europe in 1939, and particularly after the collapse of France in 1940, the Army Air Forces' need for aviation cadets grew by leaps and bounds and it quickly realized that not enough college trained men were available. Hence, a better screening process was desperately needed.[6] The Army Air Forces looked to the scientific community to provide an efficient approach to pilot selection. Overall responsibility for developing a comprehensive test was given to the Office of the Air Surgeon.

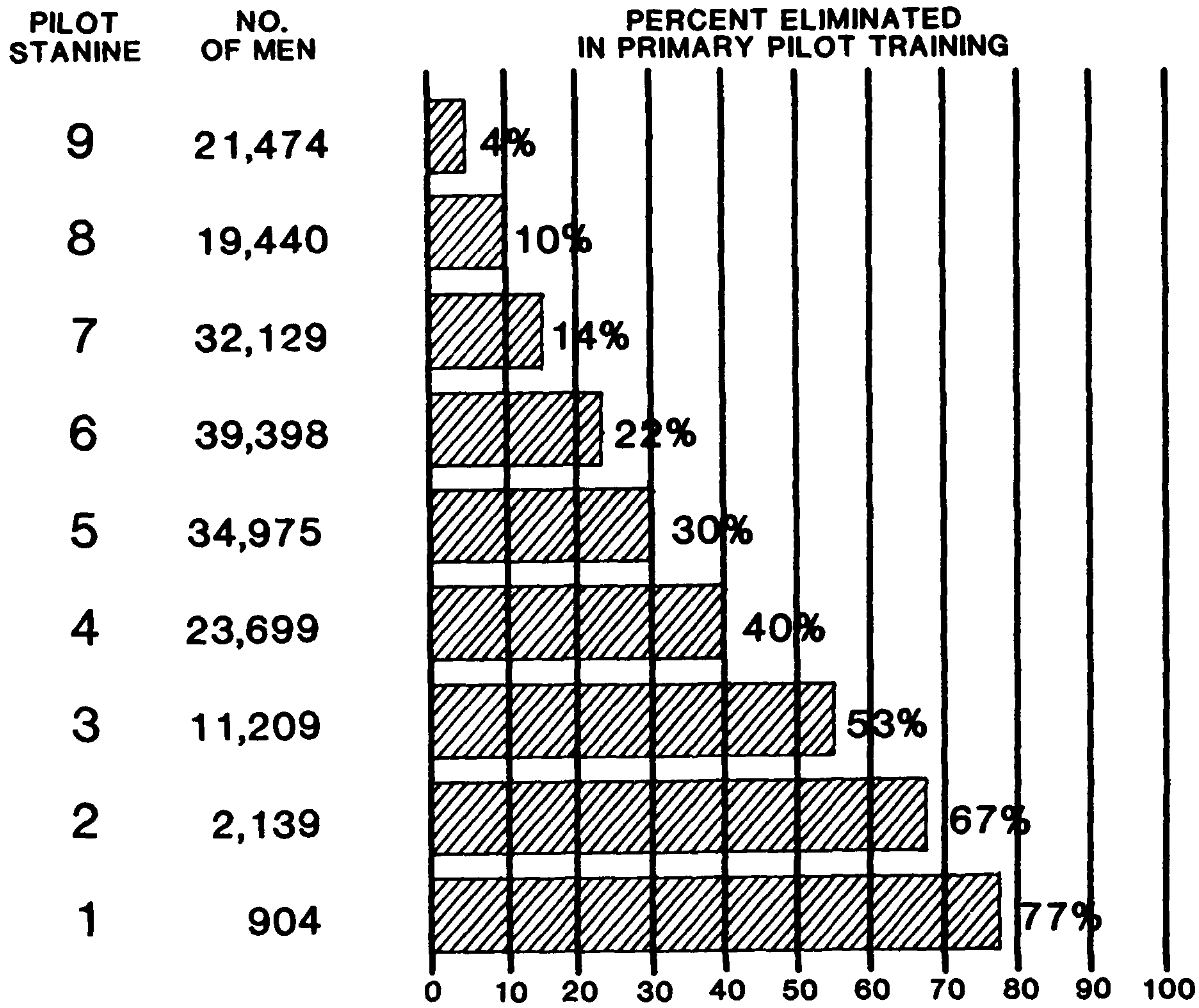
The Army Air Forces considered several new designs and evaluation methods were considered during this period. One of the frontiers explored, the Merton method, was an attempt to put physiognomy to practical use. The theory was that the face is the index of the individual--mentally, physically, and emotionally. A person's mental and physical aptitudes and abilities were thought to be indicated by the size of specific regions of his face. By analyzing and charting the faces of 20 or more outstanding flyers and drawing a composite picture of the group, a role model or "working equation" could be obtained. This equation was then matched to photographs of pilot candidates to determine if they could complete pilot training. This selection method looked promising and it was field tested, but the results obtained indicated that the test was definitely of no value.[7]

Through a diligent design and testing process, the Office of the Air Surgeon eventually developed the aviation cadet qualifying examination. Adopted on 15 January 1942, this three-hour examination was designed for maximum ease of administration and scoring so that it could be used by hundreds of aviation cadet examining boards scattered throughout the United States and its overseas bases. Seventeen different forms of the test were published during the war years; in 1942 alone, 563,916 applicants were screened for training. The aviation cadet qualifying examination provided the essential screening tool necessary to satisfy aviation cadet training requirements.

The problem then facing the Air Surgeon was what to do with all the aviation cadets who passed the qualifying test. More than half the applicants (52.1 percent or 293,588) passed the initial screening in 1942 and were ready for aircrew training. The obvious solution was to develop some other method to measure the potential of each candidate and to place him in a job where his talents could be best used. The aircrew classification battery was designed to satisfy this requirement. It consisted of several written and apparatus tests that measured mental and psychomotor ability. After completing the apparatus tests (complex coordination, finger dexterity, aiming stress, and rudder control among others) the aviation cadet was assigned a stanine. The stanine--a contraction of standard score, nine-point scale--was the predictive aptitude score for each aircrew speciality, which was derived from the aggregate of the weighted scores on the battery. The stanine ranged from 1 (poorest) to 9 (best).[8] Typical ratings might be: bombardier--05, navigator--06, and pilot--07. The Army Air Forces would then establish a minimum passing score based on the needs of the service. If more pilots were needed, then the qualifying stanine was lowered; if less, the stanine was raised. Figure 1 illustrates how reliable the aircrew classification battery was in predicting the successful completion of training.[9]

A natural extension of the aircrew classification battery was to look for a method of discriminating between fighter and bomber pilots. In hopes of finding the right type of men, the Army Air Forces' research psychologists examined the similarities and differences between fighter and bomber pilots. Their general findings were as follows: overall, both pilots had to think and act in a positive manner but a bomber pilot, at times, could be more deliberate in his thinking. A similar difference was found to exist with regard to speed of action. A bomber pilot's actions needed to be highly characterized by reliability and dependability. Both pilots needed to show good judgment but a bomber pilot was expected to be more mature. The bomber pilot had more things to do in the cockpit and the order in which they were done was of great importance. The fighter pilot had to be far more alert to what was going on around him. He had to be aggressive but not lose control of his emotions. A trait common to both pilots was the ability to work as a team. The bomber pilot had to inspire his crew, give them a feeling of confidence, and develop a spirit of cooperation. The fighter pilot had to cooperate frequently with others; he could not function as a "lone eagle." Fighter and bomber pilots alike had to possess the ability to orient themselves geographically. These general findings were derived from aviation training programs, operational flying units, and combat flying teams. Specific combat traits rated among the most important for both fighter and bomber pilots were: judgment, motivation, speed of decision and reaction, emotional control, and division of attention (fig. 2).

However, World War II research psychologists never found a satisfactory test battery for fighter or bomber pilot selection. Several interesting examinations were developed and tested but their usefulness was never proven.[10] The big push to streamline flying



TOTAL 185,367 -- 24% ELIMINATED

THE BARS INDICATE THE PROPORTIONS ELIMINATED AT EACH PILOT STANINE. ELIMINATION WAS FOR FLYING DEFICIENCY, FEAR, AND OWN REQUEST. FLYING EXPERIENCE CREDIT IS INCLUDED IN THE STANINE SCORE. THE DATA ARE FROM CLASSES 43-F THROUGH 45-H. MEN WITH LOW STANINE SCORES ARE NOW DISQUALIFIED FOR TRAINING; MOST OF THE MEN WITH LOW STANINES INCLUDED IN THE CHART ENTERED PRIMARY SCHOOLS EARLY IN 1943.

SOURCE: STANINES, SELECTION, AND CLASSIFICATION FOR AIR CREW DUTY, REPORT BY THE AVIATION PSYCHOLOGY PROGRAM (WASHINGTON, D.C.: OFFICE OF THE AIR SURGEON, HEADQUARTERS ARMY AIR FORCES, US GOVERNMENT PRINTING OFFICE, 1946), 9.

Figure 1. The Higher the Pilot Stanine the Greater the Chances of Success in Primary Pilot Training.

CATEGORIES	RATINGS BY SUPERVISORS OF COMBAT TEAMS	
	FIGHTER PILOT	BOMBER PILOT
SPEED OF DECISIONS AND REACTION	8.0	7.2
JUDGMENT	7.7	7.3
MOTIVATION	7.7	6.4
EMOTIONAL CONTROL	7.6	7.3
ESTIMATION OF SPEED AND DISTANCES	7.5	6.1
DIVISION OF ATTENTION	7.5	6.8
LEADERSHIP	7.4	5.9
DEPENDABILITY	7.2	6.5
ORIENTATION AND OBSERVATION	7.2	5.5
VISUALIZATION OF THE FLIGHT COURSE	6.7	6.4
MEMORY	6.6	6.4
COORDINATION	6.1	6.0
MECHANICAL COMPREHENSION	6.0	6.0
SERIAL REACTION TIME	5.9	5.9
READING COMPREHENSION	5.6	5.7
ARITHMETIC REASONING	4.8	4.7
DIAL AND TABLE READING	4.8	5.6
FINGER DEXTERITY	4.2	5.0
ARITHMETIC CALCULATIONS	4.1	4.5
MATHEMATICS	3.3	3.9

RATERS OF FIGHTER-PILOT REQUIREMENTS WERE 30 SQUADRON COMMANDERS AND SQUADRON OPERATIONS OFFICERS IN THE EUROPEAN THEATRE OF OPERATIONS. RATERS OF BOMBER-PILOT REQUIREMENTS WERE 117 SIMILAR OFFICIALS.

SOURCE: ***PRINTED CLASSIFICATION TESTS, REPORT NO. 5, ARMY AIR FORCES AVIATION PSYCHOLOGY PROGRAM. RESEARCH REPORTS, ED. J. P. GUILFORD (WASHINGTON, D.C.: GOVERNMENT PRINTING OFFICE, 1947), 10.***

Figure 2. Average Ratings of Importance of Psychological Categories for Combat Pilot Positions.

training and handle large numbers of cadets with minimum attrition wound down as the war effort came to a close. The aircrew classification battery was discontinued in October 1947 and aviation cadet training was significantly reduced.[11] In the immediate postwar period (1947-51), the newly created Air Force was concerned with stablizing operations on a peacetime scale. On 1 January 1951 the aviation cadet qualifying test was revised. The new test required higher educational achievement in mathematics, physics, and other academic subjects, with the minimum qualifying score being raised from 59 to 79. The aircrew classification battery was resurrected, revised, and administered to aviation cadets. The battery was improved and revalidated. The Air Force felt that by using this system, it could measure the principal aptitudes necessary for success in pilot training. Initially, a stanine score of 6 was necessary to enter training, but with the outbreak of war in Korea, it was lowered to 5 in an effort to offset a predicted shortage of aviation cadets in the spring of 1952. As the Korean conflict slowed, the view of aviation cadet training once again turned to the peacetime mode.[12]

Minor changes occurred in the training program. But not until 1954 was a major policy change made. The cost of training and retention were the concerns that year. Only 30 percent of those pilots who were commissioned through the Air Force Reserve Officer Training Corps (AFROTC) remained in service after completing their obligatory three-year tour of duty. In response to this low retention rate, the Air Force directed that combat training be provided only to those cadets who agreed to serve for four years beyond the date of graduation from basic flying training.[13] Volunteers eagerly made the four-year commitment and both expense and retention concerns were relieved.

With retention no longer a problem, the Air Training Command (ATC), in December 1957, asked Headquarters United States Air Force (USAF) to revise its cadet assignment methods. Up to that time, basic students were given a choice of assignments according to their class standing. ATC desired that assignments be made in accordance with recommendations of supervisors who would consider flying proficiency and personal characteristics; student desires and class standings would be given secondary consideration. The Air Staff did not concur with ATC's proposal. Nonetheless, ATC implemented the change. In August 1958, Headquarters USAF restated its position that assignments be based on class standing and reported that queries indicating variance in this method had been embarrassing to the Air Force. ATC changed its assignment policy.[14]

Through 1958 pilot candidates normally received basic flying training in a small single-engine trainer before advancing to more demanding aircraft. In the advanced phase, a pilot candidate would be trained as either a "single-seat" or "crew" pilot. This dual-track training system had been the Air Force standard. By 1959 the all-jet program loomed on the horizon and generalized undergraduate pilot training (UPT) producing "universally assignable" pilots would be the new training standard. The World War II vintage B-25s had outlived their usefulness and "crew" pilot training was soon to be a thing of the past.

The main concern during this era was low aircrew production rates. Pilot production would not meet the goals for fiscal year 1959 and 1960 and the prospects for meeting the fiscal year 1961 goal was not assured. ATC conducted a study to determine the cause of the low production rates and found that self-initiated eliminations (SIEs) accounted for more than half of the attrition problems. ATC training officials believed that the existing policy of allowing individuals to enter aircrew training without incurring a service obligation was being used to escape from the draft under the Universal Military Training and Service Act. Since pilot candidates did not have a service obligation, they could drop out of the program early without penalty. Consequently, the four-year commitment, which had earlier been deleted, returned to the program and the attrition rate declined.[15]

Better pilot production rates and an emphasis on improving the overall pilot training program continued to be ATC's goals. Training personnel routinely followed UPT graduates into the operational arena to obtain feedback on their performance. During a 1962 pilot training evaluation it was note that a direct correlation existed between the students class standing and the number of flying deficiencies detected in the field. In general, graduates from the lower 10 percent of the class averaged two deficiencies, the middle 10 percent of the class averaged one deficiency, and the top 10 percent of the class averaged zero deficiencies.[16]

Flying assignment selection for graduating students continued to follow the 1958 Air Staff guidance and was determined by class standing and the needs of the Air Force. Distribution of flying deficiencies in the operational arena was not considered a problem by ATC personnel so there was no need to change the flying assignment process. However, ATC's position changed in 1973 when the Strategic Air Command (SAC) requested graduates by class standing be equally distributed among the using commands. Headquarters SAC believed that the current class standing assignment system caused an unequal distribution of quality graduates because top-ranking graduates preferred fighters and transports over bombers and tankers. The Air Training Command responded to SAC's request and modified the assignment process. But the change had a negative impact on the student population since it reduced the importance of class standing. Consequently, the Air Force Manpower and Personnel Center (AFMPC) assumed responsibility for assigning graduating pilots. The AFMPC system was straightforward. The top 10 percent of the class received their choice of assignments (if available), ATC then selected those best suited for instructor pilot duty, and AFMPC equitably assigned the remaining students based on the needs of the Air Force and the graduates' preferences. This system satisfied the Strategic Air Command, but the Tactical Air Command (TAC) and the Aerospace Defense Command (ADC) experienced some serious problems. An increasing number of UPT graduates newly assigned to the latter two commands required more flying time to complete follow-on training in fighter aircraft. Per capita training costs were sharply increasing and the number of flying evaluation boards being convened to evaluate the deficient flying skills of recent UPT graduates were on the rise.

In August 1974 Headquarters USAF initiated a quality control inspection of UPT graduates and follow-on assignment procedures to analyze these problems. In turn, the ATC commander, Lt Gen George H. McKee directed his inspection group to examine the same matters. As a result of these efforts, both the Air Staff and ATC concluded that the assignment system required further refinement to ensure that the graduates best qualified to be fighter pilots were assigned to fighter aircraft. This finding spawned the advanced training recommendation board (ATRB). Jointly developed by AFMPC and ATC, an ATRB would convene at each UPT base to identify graduates for ATC instructor duty and to make recommendations concerning which graduates were best qualified for fighter aircraft assignments and for bombers and other crew aircraft. Each board would be chaired by the UPT wing deputy commander for operations (DO) and include key supervisors who were most knowledgeable of a student's performance. Recommendations would then be forwarded to AFMPC, which made assignments based both upon the needs of the Air Force and the graduates' preferences. All references to numerical grades and class standing were to be removed from the selection system.[17] The ATRB assignment system was implemented with UPT Class 75-06 and is still being used today.

Chapter 3 contains a detailed discussion of the current ATRB process and includes a summary of how it is conducted at each UPT base. But before reviewing this recommending process, the basics of today's pilot training program and the proposed dual-track system must be understood.

NOTES

CHAPTER 1

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15. Headquarters ATC, History, July--December 1959, Randolph AFB, Tex., 85-6.

16. Headquarters ATC, History, January--June 1962, Randolph AFB, Tex., 104.

17. Headquarters ATC, History, July--December 1975, Randolph AFB, Tex., 103-5.

CHAPTER 2

CURRENT PILOT TRAINING AND THE PROPOSED DUAL-TRACK SYSTEM

Air Force plans to adopt a dual-track or specialized undergraduate pilot training (SUPT) program which will force the flying training wings to convene earlier advanced training recommendation boards (ATRBs). To appreciate how earlier ATRBs will influence actual training recommendations, we must first understand how pilot candidates are identified, recruited, and trained in today's pilot training programs. Knowledge of the basic criteria used during these initial stages of a pilots career will provide a data base of information that may prove useful in evaluating whether a pilot candidate is best suited for fighter, attack, reconnaissance (FAR) or tanker, transport, bomber (TTB) duty.

An individual seeking to become a pilot in the Air Force can gain entry into a pilot training program through one of four channels: the Air Force Reserve Officer Training Corps (AFROTC), the US Air Force Academy, active duty, or Officer Training School (OTS). The number of aspiring pilots admitted to pilot training from each of these sources depends on the quota established by the Air Staff. Each fiscal year the Air Staff determines the total number of pilots the Air Force needs to fulfill its rated missions and how many new pilots it will need to offset projected pilot losses.

To identify accurately the total number of pilots needed, the Air Staff considers such factors as the number of flyable airframes and the related crew requirements (crew ratio), rated supplement requirements, number of pilots in training, rated staff requirements, and the number of pilots taking professional military education courses. Once it determines the total pilot force required, the Air Staff calculates the expected pilot loss rate for that fiscal year. This loss rate is a statistical projection based on historical data and includes elements such as retirements, attrition, and civilian job opportunities. By subtracting the loss rate from the fiscal year pilot force, the Air Staff obtains an indication of the actual number of pilots available for that fiscal year:

Pilots available = pilot force--expected losses
Total number needed--pilots available = number of new pilots needed

To determine the number of new pilots that must be scheduled for training the Air Staff compares the total number of pilots needed to the number available. This pilot training requirement is then entered into the Air Staff board process for final review and approval. Adjustments may be made at this point to offset last minute changes in force requirements and budget allocations. Following final approval, the Air Staff forwards the number of new pilots needed to the Air Force Manpower and Personnel Center (AFMPC) for accession planning.[1]

AFMPC's goal is to ensure that a sufficient number of pilot candidates have been placed in training to produce the required number of new pilots by the end of the fiscal year. AFMPC, working closely with the Air Training Command (ATC), analyzes historical data and predicts the fiscal year attrition rate for each pilot training program. A usable prediction of attrition for each training program might be as follows: undergraduate pilot training (UPT)--22 percent, Euro-NATO Joint Jet Pilot Training (ENJJPT)--15 percent, and undergraduate pilot training-helicopter (UPT-H)--10 percent. The next step is to consider the pilot production capability of each pilot training program and compare it with the new pilot requirement. Assuming a new pilot requirement of 1,800, a possible pilot production goal for each training program might be as follows: UPT--1,590, ENJJPT--110, and UPT-H--100. Based on the aforementioned attrition rates and the 1,800 requirement, the total number of new pilot candidates that must be accessed in time to complete training by the end of the fiscal year is 2,278.[2] (Refer to the pilot training section of this chapter for additional information on UPT, ENJJPT, and UPT-H.)

The long lead time required by the USAF Academy and the AFROTC program to admit candidates necessitates that their quotas for pilot candidates be reasonably stable. Historically, the Air Staff decisions on pilot candidate quotas have assured that at least 65 percent of the students graduating from the USAF Academy will go to pilot training. Because of fairly fixed quotas for the USAF Academy and AFROTC, OTS is the flex point for expanding or reducing the number of candidates entering pilot training. Thus, a possible distribution of graduating pilot candidates among each possible source that would produce the 1,800 new pilots needed in the above example would be as follows: AFROTC--1,000, USAF Academy--659, active duty--160, and OTS--459.[3]

Air Force Reserve Officer Training Corps Program

College students interested in earning an Air Force commission may enroll in either a four- or two-year Air Force Reserve Officer Training Corps (AFROTC) program. Cadets normally enroll in the four-year program as freshmen or the two-year program as juniors (fig. 3). For the four-year program, an entering freshman attends the introductory Air Force course (AS-100, Air Force Today), which provides one hour of classroom and one hour of laboratory instruction each week. Following completion of AS-100 and the freshman year, the student becomes eligible for the second introductory course (AS-200, Development of Air Power), which is also one hour of classroom study and one hour of laboratory per week.[4] Whether or not they have had the benefit of AS-100 and AS-200, all interested students may request a regular AFROTC cadet position during their sophomore year. Following guidance from the AFROTC detachment office, the hopeful cadets will complete the application process, which includes specifying their career fields of interest. At this point the interested students can request pilot candidate status. Cadets in the four-year program and those entering at the two-year point

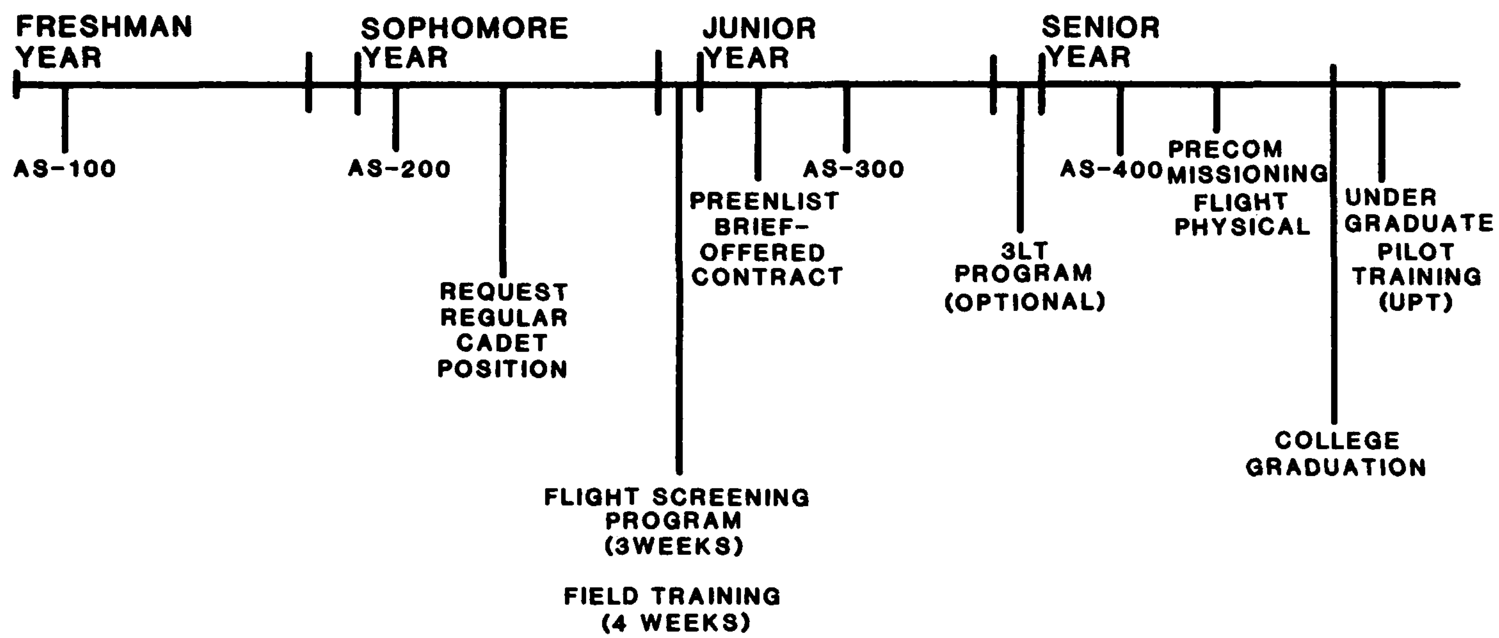


Figure 3. Steps in Becoming a Pilot Candidate Through the Typical Four-Year AFROTC Program.

are equally considered for a pilot training slot. Some two-year pilot scholarships are available, but they are closely controlled and selection is very competitive.[5] The entire application package will then be forwarded to AFROTC headquarters for selection consideration.[6] Normally, the applicants have already completed a physical examination, but since medical certification is not a prerequisite for acceptance into the program, an applicant can be awarded a pilot slot without taking a flight physical.[7]

In the past, the AFROTC detachment allocated a majority of the pilot slots. But under this method, the varied backgrounds of the officers in charge, their personalities, and their personal assessments figured heavily in determining who would receive a pilot slot. After a careful analysis of this problem, Headquarters AFROTC personnel decided that the central selection of pilot candidates would provide a more equitable method of choosing the best candidates from across the country, standardize selection procedures, and reduce the attrition rate for AFROTC graduates in pilot training. Currently, a central selection board convenes once a month from November through May at AFROTC headquarters to select the best qualified applicants for the available positions and designates a career field for each applicant accepted.[8] During each selection board the members have a quota or target for that month.[9] However, if not enough minimally qualified candidates are available, then the target can be lowered. The net effect is that the target will be raised for the following month. A critical element of the selection process is the Weighted Professional Officer Course Selection System (WPSS) worksheet (fig. 4). The weighted scores of rating blocks A-G provide an easy method of determining the minimum qualifications of each pilot applicant. If the applicant is accepted by the board, the AFROTC detachment is notified and the student is allocated a pilot slot.

Between their sophomore and junior years pilot candidates are scheduled for field training. Beginning with a test program in 1984, AFROTC has made a concerted effort to send pilot candidates to Lackland AFB, Texas, for field training because of the base's proximity to the flight screening facility located at Hondo.[10] Field training for four-year cadets is a four-week program. If they are also pilot candidates and have not completed the flight instruction program (FIP) or do not possess a private pilot's license, then the cadets will complete the three-week flight screening program (FSP) at the Hondo facility after completing field training. Field training for two-year cadets is a six-week program. If these cadets are also pilot candidates and have not completed FIP or do not possess a private pilot's license, then they will have to wait until the summer between their junior and senior year before they can complete FSP.[11] In addition to FSP, both the four- and two-year AFROTC pilot candidates will receive psychomotor testing. Currently, psychomotor testing for student pilots is being validated at FSP, but it is projected to be an important part of the equation used to determine whether or not a pilot candidate should be continued in training. (FSP and FIP are outlined in a separate section of this chapter and a description of psychomotor testing is contained in

WPSS WORKSHEET					
LAST NAME	SSAN	DATE OF BIRTH: YR / MO / DA		SEX: MALE / FEMALE	
DETACHMENT NUMBER	COLLEGE		RACE	CAUC / BLACK / OTHER	
AFOQT: PILOT / NAVIGATOR	ACADEMIC MAJOR		ACADEMIC SPECIALTY CODE	CATEGORY PREFERENCE: 1ST / 2ND / 3RD	
PRIVATE PILOT LICENSE *(For Pilot Applicants Only)*				CSP CAT	

☐ NO

☐ PURSUING Date Expected Completion ____________

☐ YES Date Completed ____________ Addl Ratings ____________

Number of Hours

Total ____________

Last 12 Mo ____________

A. Det Commander Rating (Cadet Rank: ________)	☐☐	X 3.8233 =							
B. Cumulative GPA (Last Term GPA: ________)	☐☐☐	X .0719 =							
?AT or Equivalent (Circle One Used)	☐☐☐☐	X .0187 =							
D. AFOQT Academic Aptitude	☐☐	X .1293 =							
E. AFOQT Quantitative	☐☐	X .1125 =							
F. AFOQT Verbal	☐☐	X .1189 =							
G. TOTAL QUALITY INDEX SCORE		=							

NARRATIVE *(Optional)*

TYPED NAME AND RANK OF UNIT COMMANDER	SIGNATURE

HQS USE ONLY

AFROTC FORM 1000, REVERSE, MAY 85

Figure 4

chapter 4.) Following field training the cadets' performances are assessed to determine whether or not they should be accepted into the Air Force and continued as pilot candidates. If accepted by the review panel, the cadet will be given preenlistment briefings and be offered contracts with the Air Force after returning home. Up to this point the cadets are under no legal obligation to continue with the AFROTC program. They may exit the program without any action being taken by the Air Force. However, if they choose to continue, then the next step is to enlist.[12] After enlisting, they will continue with the AFROTC program and their college education. Before graduating, the cadets will take AS-300, Air Force Leadership and Management--a three-hour course which is completed during their junior years--and AS-400, National Security Forces in Contemporary American Society--another three-hour course. Both courses have one hour of laboratory instruction.[13]

Other than being exposed to other cadets in the classroom and officers in their detachment, these cadets have little contact with the active duty Air Force following completion of field training and, where applicable, FSP. To fill this gap, the Air Force offers a third-lieutenant program between the junior and senior years. This optional 10-day program gives cadets a chance to visit an active Air Force installation, learn more about their career fields, and be exposed to the Air Force way of life.[14] During their senior years, the pilot candidates will complete a precommissioning physical and be medically recertified for flying training. If the cadet does not pass the flight physical portion successfully, he or she normally will be offered another career field.[15] Assignment to pilot training must be accomplished within one year following completion of the precommissioning physical.

United States Air Force Academy

The United States Air Force Academy appointments are primarily intended for young men and women who want to pursue a career in Air Force aviation. At least 65 percent of all graduating seniors have the opportunity to earn their silver wings.[16]

Initial contact with admissions personnel normally begins with an inquiry from interested high school students. Each year as many as 30,000 students request information about the USAF Academy and each one receives a reply. They are informed that they must be nominated before they can be considered for appointment as Academy freshmen and all nominations are equally considered, irrespective of the source.[17] A nomination or recommendation to attend the USAF Academy can come from several sources some of which include senators and representatives. Of the 12,000 nominations received, admissions personnel have the responsibility of selecting 1,500 new freshmen.[18] Several aspiring cadets may have nominations from two or more sources so the first step is to eliminate all duplications, which narrows the field to about 8,000-9,000 nominees. Verifying that all of the physical, medical, and academic qualifications have been met, to include an interview from an academy liaison officer for all potential candidates, further reduces the pool of qualified applicants to approximately 3,500. Since at least 65 percent of all graduates will go to pilot training, a minimum of 65 percent of all entering freshmen (about 1,000) must be medically certified to fly. When the physical examination results are scrutinized for flight eligibility, normally about 1,200 of the 3,500 candidates qualify. Consequently, 1,200 candidates are competing for 1,000 flying appointments; the 200 not selected as potential pilots compete with the other 2,300 candidates for the remaining 500 nonflying appointments (see fig. 5).

Another composition factor is charged appointments. Senators and representatives are authorized to have as many as five students from their respective state or district at the USAF Academy at any one time. Normally, they will have one, possibly two vacancies per class. Appointments charged to congressmen historically account for about 50 percent of all appointments. Of course a charged appointee may be flight qualified and thus satisfy a flying appointment requirement. But the significance of this factor is that one congressional district may have 15 highly qualified nominations but only one appointment available while another district may have 2 minimally qualified candidates for the same number of appointments. In addition, other composition factors, such as minority representation and athletic skills, are considered prior to final appointment.[19]

Once the 1,500 candidates have been appointed, they are notified and prepared for their freshman year. Civilians entering the USAF Academy have to take an oath of allegiance and assume a six-year military obligation.[20] The main thrust of the four-year program of study is to graduate a capable, career-minded Air Force officer. Upon graduation, if a cadet is medically qualified, has completed successfully the pilot instruction program (PIP), and wants to be a pilot, then he or she will go to pilot training. (PIP is covered in a separate section of this chapter.)

Active Duty

Entry into a pilot training program from active duty applies only to commissioned officers, since a prerequisite for pilot training is commissioned officer status. Noncommissioned active duty personnel desiring to be pilots must first complete a commissioning program such as OTS, AFROTC, or the USAF Academy for acceptance into pilot training.[21]

Eligible officers on active duty status applying for a pilot slot are screened by a selection board. Three or more senior ranking officers sit on the board and review and score all the applications, similar to the promotion board process. Competition is keen and quotas are limited so the board members consider all available data when determining an applicant's potential. Selection occurs twice a year, in April and October, and normally one half of the annual quota set by the

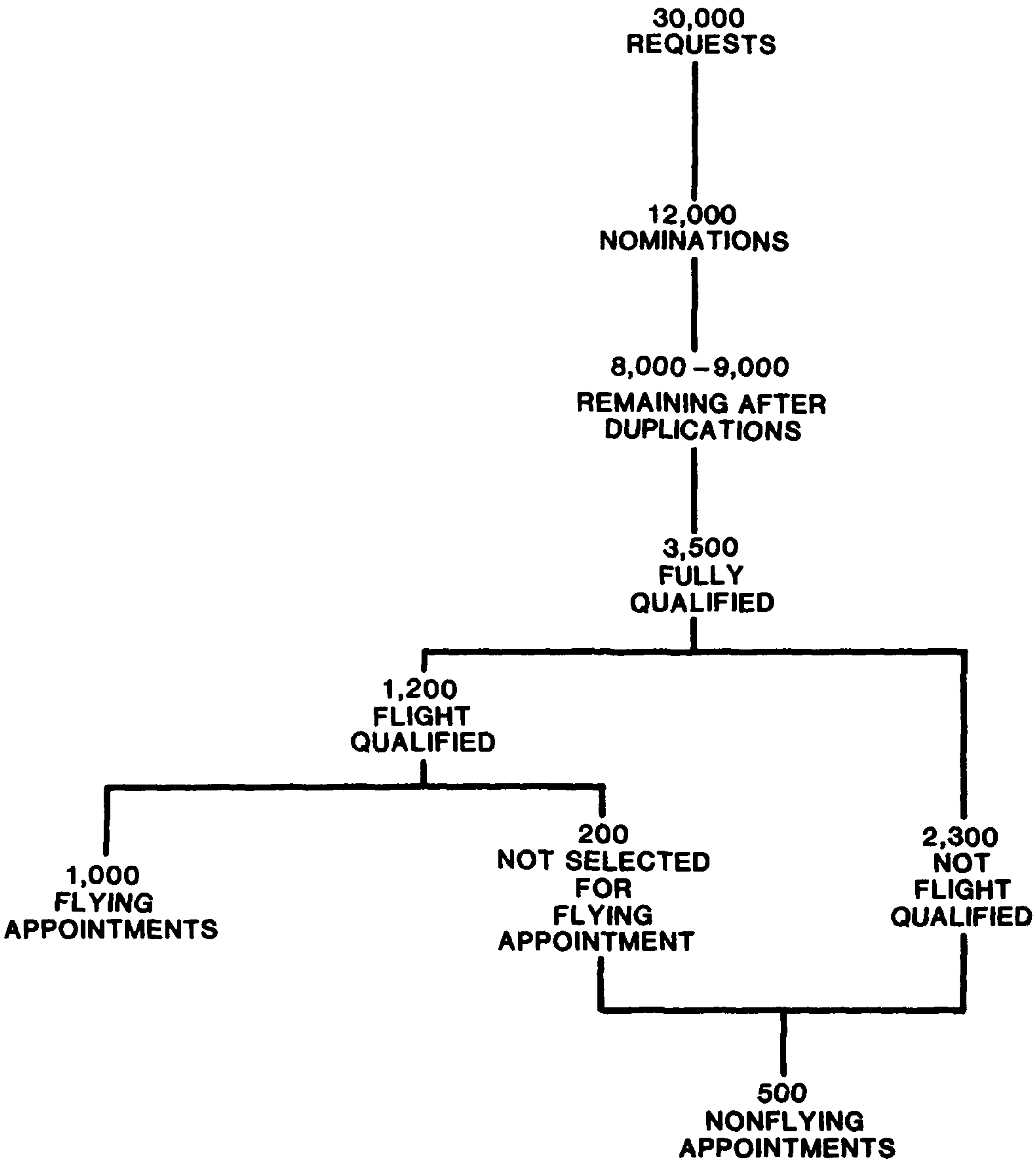


Figure 5. The Yearly Admission Process for Selecting Freshmen Cadets at the US Air Force Academy.

Air Staff for this category is selected during each session. In addition to the overall quota, the Air Staff will specify the number of navigators and nonrated officers that can be selected for pilot training. A board may screen 200-250 highly qualified applicants and select only 90 for future pilot training classes. If an applicant is not selected but still wishes to be considered, his or her application will be reviewed by subsequent boards until he or she becomes ineligible (exceeds the age limit, fails to meet physical standards, and so forth). If an applicant is selected, he or she will be notified through the servicing consolidated base personnel office (CBPO) and be readied for the pilot training experience.[22]

Officer Training School

Officer Training School (OTS) provides a relatively rapid channel for meeting time-sensitive pilot needs. This program is the quickest way for a civilian to become an active duty Air Force pilot. To become a pilot, an individual entering the service from civilian life must complete OTS successfully and commit to seven years of active duty service.

The potential pilot gains his or her first exposure to the Air Force flying program through visual displays, informational pamphlets, or oral presentations by recruiters. Recruiters are the Air Force to a large segment of the population and as such are sought out for advice and counseling on Air Force programs. When a prospective pilot candidate first makes contact, the recruiter must promote Air Force career opportunities enthusiastically. The recruiter must delve into the candidate's background to determine basic eligibility requirements, interests, prior experience, and motivation for becoming a pilot. If the initial screening looks promising, the recruiter will schedule the applicant for the Air Force officer qualifying test (AFOQT) and will complete the necessary paperwork.

Next, the recruiter completes a Pilot Selection Opportunity Worksheet (fig. 6) to determine if the applicant has a chance of being selected as a pilot candidate. If the applicant scores above 16, a commissioned officer interviews the potential recruit. Interviews vary, a standard format is not used; but generally the interviewing officer looks for potential leadership, dedication, integrity, and motivation. If the individual does well on this interview and the supporting paperwork is solid, the interviewer may recommend the applicant for pilot training and forward the entire application package to the OTS central selection board, which meets regularly to select future pilot candidates. The competing applications are scored individually and rank ordered, similar to the promotion board process. An appropriate cutoff is made based on the quota set by the Air Staff. The hopeful applicants are notified and, if selected, they are scheduled for a flight physical to be certified medically for aviation duty prior to entering the training cycle. Time delays between completing the physical and attending OTS vary depending upon processing time and available training

PILOT SELECTION OPPORTUNITY WORKSHEET

APPLICANT: ______________________ SSAN: ______________________

1. AFOQT COMPOSITE (TOTAL OF ALL 5 SCORES)

P ______ + N ______ + AA ______ + V ______ + Q ______ = ______

IF TOTAL IS	THEN SCORE
400 OR ABOVE	5 POINTS
350 TO 399	4 POINTS
300 TO 349	3 POINTS
200 TO 299	2 POINTS
BELOW 200	1 POINT

AFOQT POINTS ______

2. GRADE POINT AVERAGE (ON 4.0 SCALE) *

IF GPA IS	THEN SCORE
3.0 OR ABOVE	5 POINTS
2.7 TO 2.9	3 POINTS
2.4 TO 2.6	1 POINT
BELOW 2.4	0 POINTS

GPA POINTS ______

* IF GPA WAS COMPUTED ON OTHER THAN 4.0 SCALE, CONVERT TO 4.0 SCALE BEFORE SCORING.

3. TYPE DEGREE

ENGINEERING OR TECHNICAL*	4 POINTS
NONTECHNICAL	2 POINTS

DEGREE POINTS ______

* MUST INCLUDE CALCULUS AND PHYSICS – 6 HOURS OF EACH WITH C OR BETTER

4. AGE (AT TIME APPLICANT WILL MEET BOARD)

UNDER 25 YEARS	2 POINTS
25 OR OVER	1 POINT

AGE POINTS ______

5. PRIVATE PILOT'S LICENSE

YES	2 POINTS
NO	0 POINTS

PPL POINTS ______

6. AFOQT VERBAL SCORE

IF VERBAL IS	THEN SCORE
60 OR ABOVE	2 POINTS
20 TO 59	1 POINT
BELOW 20	SUBTRACT 3 POINTS

VERBAL SCORE POINTS ______

TOTAL POINTS ______

Figure 6

slots, but training must begin within one year after completing the flight physical. If not accepted, the applicant may elect to reapply at a future date or look into another career field.[23]

To Fly

The first military mission flown by an aspiring pilot will probably be behind the controls of a T-41 or a similar single-engine propeller-driven airplane. The T-41, like its civilian counterpart the Cessna 172, is the aircraft most often used to expose new pilot hopefuls to the adventures of military flying.

USAF Academy Pilot Indoctrination Program

USAF Academy cadets realize the "air" in the Air Force when they make their first takeoff in the T-41 during the pilot indoctrination program (PIP). PIP is conducted year round at the Academy airfield to motivate all physically qualified cadets to pursue a rated flying career and to identify those cadets who have the basic aptitude to become Air Force pilots, thereby minimizing cadet attrition at follow-on pilot training. Cadets can enroll in the course during their fall or spring semesters or elect to take it during the summer months. The 21.2-hour flying course is limited to students between their sophomore and senior years.

PIP is similar to other Air Force flying training programs in that it is a structured course. The syllabus outlines the training program, establishes course training standards, specifies the amount of time allowed for course completion, provides instructions for conducting training, and defines the minimum proficiency levels for all flight and ground training items the student must meet to complete the course successfully. In addition, the syllabus prohibits the instructor from introducing any training which has not been approved formally by appropriate headquarters personnel. The PIP syllabus specifies that formal ground training will consist of completing a four-part programmed text that requires approximately 7.5 hours to complete and students must pass the associated airmanship examination. The 21.2 flying hours are broken down into 1 solo and 15 dual flights or sorties. Sorties are planned under visual flight rules (VFR) conditions and are referred to as contact flights. Instrument, navigation, and formation flights are not part of the PIP syllabus.

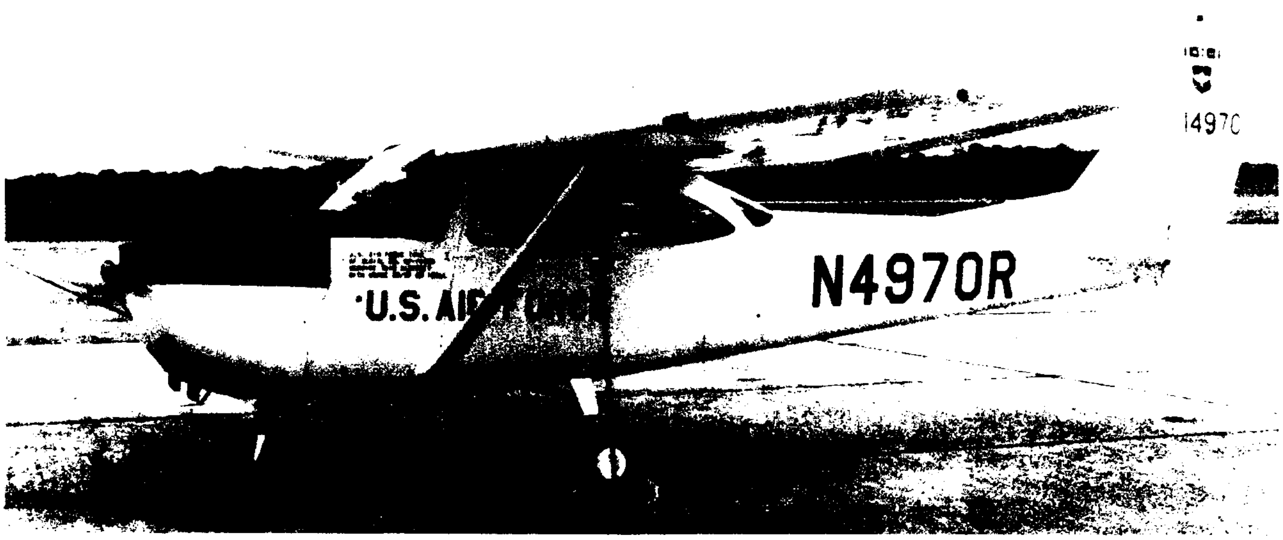
Before flying, cadets are briefed on PIP policies and procedures and are exposed to the course objectives, as is typical of most Air Force flying training courses.[24] The first 12 flights in the T-41 are normally flown with an Air Force instructor pilot. During these dual sorties the cadets practice and have to become proficient in fundamental flying maneuvers such as takeoffs, stalls, and landings. The 13th sortie is usually a solo flight, which is preceded immediately by a supervised flight. The instructor first goes up with the cadet and observes his or her traffic patterns and landings from inside the cockpit. If the cadet meets the course training standard, the instructor gets out of the aircraft and lets the cadet fly the airplane alone in the vicinity of the airfield. While the cadet is solo in the aircraft, the instructor observes and critiques the cadet's performance from the ground. Normally the cadet must accomplish at least 3 safe traffic patterns and landings while flying solo. The cadet then flies 3 more sorties: 2 review flights to allow the cadet to practice and improve his or her proficiency on the flying maneuvers previously introduced and a final evaluation flight or check ride. During the check ride, the cadet must demonstrate his or her proficiency in performing a cross section of the syllabus-directed flying maneuvers.[25] If the cadet passes the check ride, he or she is awarded a certificate of training and is eligible to volunteer for pilot training upon graduation. If the cadet does not pass the check ride successfully, then the instructor recommends that he or she be eliminated from PIP. In these cases, a faculty board normally convenes to consider all circumstances relative to a cadet's training and to arrive at a specific recommendation regarding retention in training, elimination from training, and future training.[26] Successful completion of PIP is required before a cadet can be considered for a future pilot training course.

Officer Training School Flight Screening Program

Officer Training School-bound pilot candidates complete their first flying mission in the T-41 while going through the flight screening program (FSP). FSP is different than PIP in that the students enrolled in FSP already have made the decision to pursue a pilot career in the Air Force. Consequently, FSP focuses on identifying the students who possess the potential to complete an undergraduate pilot training program successfully. As mentioned earlier, this program is designed for pilot candidates who do not possess a private pilot's license.[27]

Civilian pilot candidates, now called flight screening program officer trainees or simply OTs, spend their first 9 days after arriving at Lackland AFB, Texas, in in-processing activities, such as getting uniforms, receiving physical checks, getting living quarters, and similar in-processing requirements.* One entire day is devoted to psychomotor testing by Human Resources Laboratory personnel (see chap. 4). On the 10th day the trainees will be transported to Hondo and officially begin the flight screening program.

*The flight screening program (FSP) is commonly referred to as "fish pot," derived from the acronym FSPOT (flight screening program officer trainee).



Flight Screening Program
Cessna T-41

Flight instruction at Hondo is primarily conducted by civilian flight instructors; military personnel at Hondo act primarily as quality control monitors and certify that the student receives the type and amount of training prescribed by the FSP syllabus.[28] Flight screening is conducted like a military flying operation and supervisory personnel routinely review operational policies to ensure that formal procedures are observed strictly. During the 16-day course, the OTs receive 18 hours of ground training, 4 hours of T-41 policies and procedures, and 14 hours of flying time in the T-41. The syllabus addresses the specific items to be covered during each training hour. In general, the 18 hours of ground training consist of 8 hours of classroom instruction in airmanship, 1 hour of safety, and 9 hours of physical training.

The 14 hours of flying time are divided into 1 solo and 11 dual sorties. As in the pilot indoctrination program, all FSP sorties are planned as contact flights and the solo flight is a supervised turnaround flight. The dual flights focus primarily on fundamental aircraft maneuvers and the OTs complete 9 of them prior to their solo sortie. The remaining 2 flights consist of a flight with an instructor and a check ride in which the cadet must demonstrate proficiency in specific flying skills. If an officer trainee successfully passes the check ride, he or she will be awarded a certificate of training and be enrolled in OTS as pilot candidates. FSP check rides are normally administered by civilian flight instructors.[29] If the OT does not pass the check ride initially, he or she will have the opportunity to fly with a military pilot before any administrative action is taken. If this latter flight also goes poorly, a faculty board normally will convene and make a decision regarding the OT's training status. A negative decision by the the faculty board means that the OT will be removed from pilot candidate status. At this point the trainee can either be sent home or be considered for another Air Force career field. If a position is available and the OT has desirable officer qualities and the necessary educational requirements, then he or she will be offered another career field and be eligible for continuation in OTS. Otherwise, he or she will be returned to civilian life.[30]

Flight Instruction Program

Until 1980, AFROTC cadets who did not have a private pilot's license and who desired to be pilot candidates took to the air in a light, single-engine aircraft as part of the Air Force's flight instruction program (FIP). FIP normally was conducted under contract at a civilian airfield near the college campus. The purpose of the program was to attract more qualified applicants to enroll in the professional officer course as pilot candidates, screen all eligible applicants, eliminate those who failed to meet the aptitude and attitude requirements for further pilot training programs, and motivate qualified applicants toward a rated career in the Air Force.[31] The FIP syllabus authorized the AFROTC cadet to fly 12 sorties for a total of 14 hours. Ground training consisted of a minimum of 5 hours of formal instruction taught by detachment personnel. The FIP classes and training sorties were offered regularly three times a week. Cadets had up to 60 calendar days to complete the program.[32] FIP was a seemingly successful program under this format and it motivated many young men and women to pursue pilot careers in the Air Force.

However, beginning in 1980 the Air Force observed that AFROTC cadets were steadily having more problems in follow-on pilot training programs. In fact, attrition of AFROTC student pilots was on the rise and the primary cause for failure was flying deficiencies. By the end of 1983 the attrition of AFROTC graduates in pilot training rose to an unacceptable level and the Air Force focused attention on how to better select and screen AFROTC pilot applicants.[33]

As mentioned earlier, Headquarters AFROTC adopted centralized pilot selection and explored the possibility of conducting FIP in conjunction with field training. During the summer of 1984, approximately 400 AFROTC pilot candidates were sent to Lackland AFB for field training and flight screening at the T-41 facilities at Hondo. The AFROTC test course at Hondo was structured like the OTS flight screening program: 16 days, 12 sorties, and 14 flying hours. The attrition rate for the AFROTC cadets going through the Hondo program was approximately three times greater than for the AFROTC cadets who completed FIP under the old program.[34] Thus, Headquarters AFROTC concluded that the FIP program should be modified and staff personnel immediately began working the problem. As a result of their efforts, the FIP syllabus has been rewritten. The course name has been changed to the consolidated flight instruction program but is still referred to as FIP.

The new syllabus is similar to the flight screening program syllabus and allows the cadet 16 days to complete 12 sorties with the same type and amount of flying as in FSP. Ground training has been expanded to 9 hours--8 hours of classroom instruction and a 1-hour written examination.[35] Since the physical facilities at Hondo are limited, the current plan is to phase in consolidation of the flight instruction program by training between 360 and 370 cadets at Hondo during the summer months and identifying one or two additional sites for training the remaining AFROTC pilot candidates.[36] As with the other light airplane programs, PIP and FSP, cadets enrolled in FIP must complete the program successfully before being eligible to attend a follow-on pilot training program.

Pilot Training

Earning a pair of silver wings and being recognized as an Air Force pilot is the goal of every US student entering undergraduate pilot training (UPT), Euro-NATO Joint Jet Pilot Training (ENJJPT), and undergraduate pilot training-helicopter (UPT-H). Each of the three pilot training programs is specifically tailored to satisfy a particular Air Force requirement. The Air Training Command (ATC) has overall responsibility for all three programs.

All individuals identified as pilot candidates from any accession source are selected for the undergraduate pilot training (UPT) program. A special selection board convened by each accession source evaluates all pilot candidates in the pool to determine which of its pilot candidates will attend ENJJPT. In general, these selection boards place an emphasis on overall candidate performance and motivation. Since the ENJJPT program is geared for training fighter pilots, a strong desire to fly fighters figures heavily in the selection equation. Similarly, the USAF Academy and AFROTC use a special selection board to pick candidates for helicopter or rotary-wing training.[37] Pilot candidates must volunteer for rotary-wing training during their senior year to be considered by an annual board. Once selected, the aspiring pilot will be notified and scheduled to attend UPT-H.[38] An individual desiring to fly helicopters and applying through the OTS route must specifically request rotary-wing training upon applying for OTS. Consequently, an OTS pilot candidate will be designated specifically for UPT-H before beginning the flight screening program.[39]

Undergraduate Pilot Training

Undergraduate pilot training (UPT) is the program most frequently thought of when discussing pilot training in the Air Force. Currently, five active wings produce new pilots in support of the overall flying training mission. They are, in numerical order, 14th Flying Training Wing (FTW), Columbus AFB, Mississippi; 47th FTW, Laughlin AFB, Texas; 64th FTW, Reese AFB, Texas; 71st FTW, Vance AFB, Oklahoma; and 82d FTW, Williams AFB, Arizona. UPT is an intense, 49-week flying training program; 12-hour days are the norm. Too little time and constant pressure are the standards but when it is all over, the graduates know that they are the new members of an elite group. Arriving students are normally anxious to strap on a jet and go supersonic but they soon discover that the actual flying portion of the program is a few weeks away.

The first order of business is to take care of in-processing and find out who is in charge.[40] The commander of the flying training wing is at the pinnacle of the command chain and is ultimately responsible for all activities conducted by base personnel. The wing commander reports directly to Air Training Command headquarters. Assisting the wing commander are the deputy commanders. They report to the wing commander and are delegated a specific area of responsibility, for instance, maintenance, resource management, or operations. The deputy commander of operations has jurisdiction over the flying operation which includes three squadrons: the primary jet training squadron (T-37 squadron), the advanced jet training squadron (T-38 squadron), and the student squadron. All UPT students are assigned to the student squadron until they graduate and receive orders to report to their first duty station. So, the "in charge" question is normally answered by the first link in the students chain of command, the class commander (fig. 7). The class commander is a highly motivated instructor pilot and is responsible for leading the new pilot candidates through the first 17 days of training, the preflight phase.

An average UPT class contains 60-65 students. They often have similar problems and questions, so in-processing and introductory briefings are normally done in mass. Academic training may be part of the preflight phase, but mass classroom instruction is neither effective nor practical. Consequently, the class is divided into two equal sections and each section is given a separate training schedule. Section integrity is normally maintained throughout the UPT program. Section one may have academics in the morning and spend the afternoon on the flight line while section two does just the opposite. Each week the schedule rotates, so students flying in the afternoon this week can plan on having a morning takeoff next week. This rotating training schedule continues throughout most of the 49-week program with academic subjects

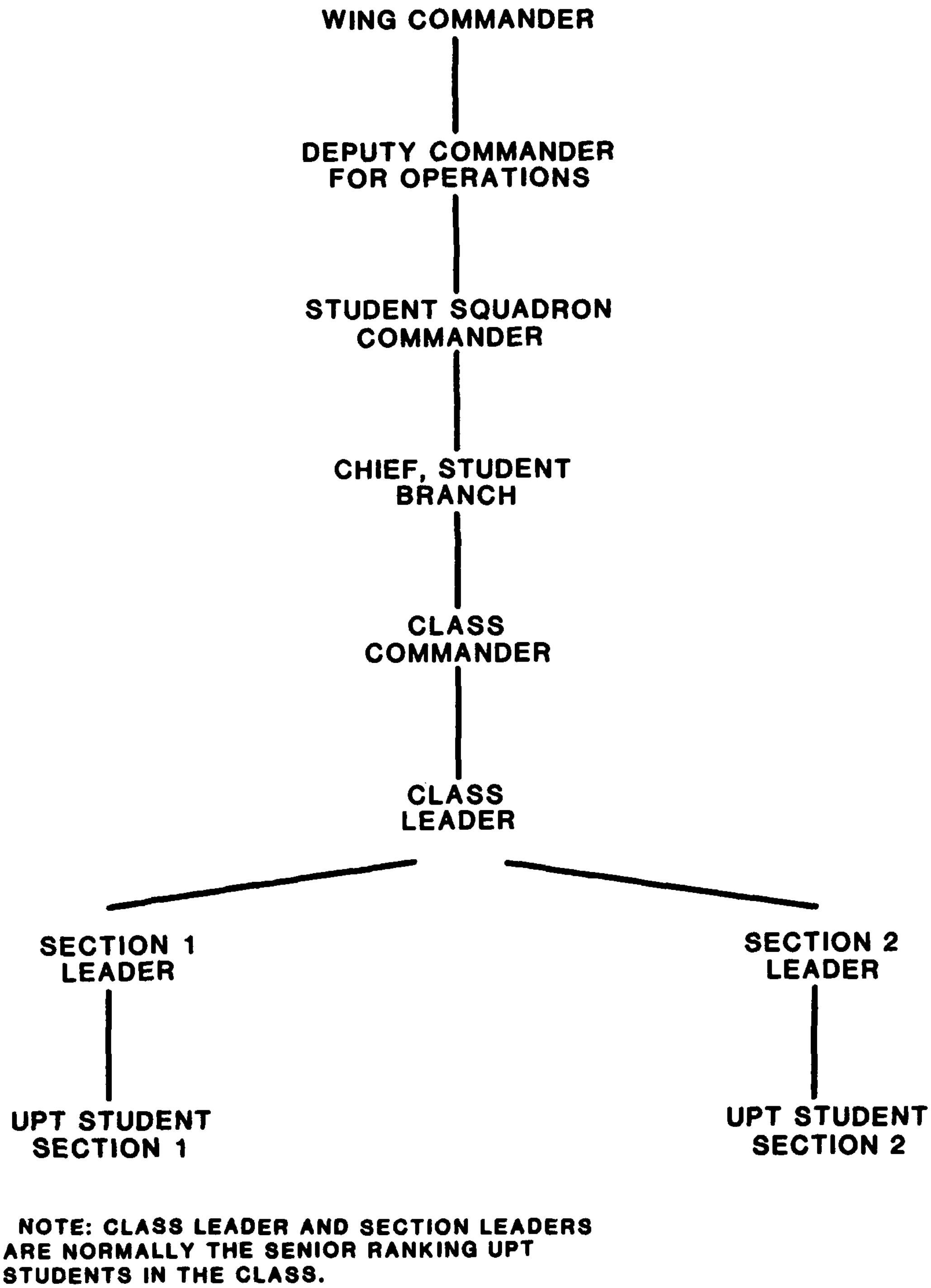


Figure 7. Undergraduate Pilot Training
Student Chain of Command.

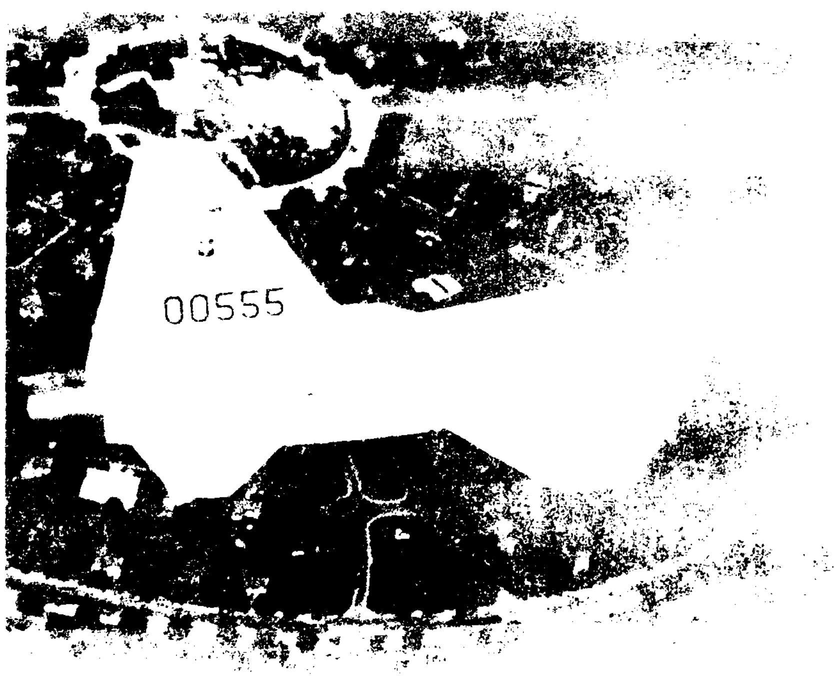
being introduced in the classroom before these skills are practiced on the flight line. When the preflight phase is over, the students report to the flight line for 81 days of primary jet training. By this time they have a good basic understanding of the T-37 or "Tweet," but must complete flight-line ground training before becoming airborne.

Each student is assigned an instructor pilot who manages the student's training while on the flight line. Normally assigned two or three students, instructor pilots (IPs) develop a rapport with their students, discuss flight-line policies and procedures, ensure that ground training is properly completed, and make outside study assignments. Since T-37 instructor pilots are the first Air Force pilots to make personal contact with the student, they serve as role models for the cadet.

Finally, it is time to take to the air and the IP and student are scheduled for the first flight, the "dollar ride." Beginning with this sortie the average student receives more than 75 hours of flight instruction in the T-37 with at least 12 hours being solo. The course syllabus mandates specific flight maneuvers and the student must perform a cross section of them during each sortie: the student must show proficiency before being advanced in training. Contact, instrument, formation, and navigational flying are taught during the primary phase and the student receives check rides in both the contact and instrument blocks of training.

Each hour of flight instruction is accompanied by a formal prebriefing and debriefing that lasts for about two hours. Prebriefings and debriefings are also an essential element of the more than 20 sorties flown in the T-37 flight simulator. The simulator is controlled electronically and actuated hydraulically to provide full motion for practicing contact, instrument, and navigational flying. The simulator provides an excellent medium for practicing both normal and emergency operations. An instructor pilot may cause an engine to fail or to start a fire during a critical phase of flight to challenge the students procedural knowledge and operational skills. Quite often these emergencies are ended by a sudden impact with the ground, with the only casuality being the student's pride. After a thorough debriefing, the likelihood of the student making the same mistake in either the simulator or aircraft is considerably less.[41]

By the end of primary jet training the student has proven himself or herself able to handle a jet aircraft and has shown the basic abilities required of an Air Force pilot. The next hurdle is to refine those skills in a high-performance jet aircraft--the T-38. As with the T-37 program, advanced jet training begins with a comparable series of ground training classes. These skills must be mastered before the pilot candidate can climb into the jet with his T-38 instructor and experience the thrill of stroking the afterburners and being two miles away from the runway before realizing what has happened. An average student will have the opportunity to fly more than 80 sorties in the T-38 for more than 100 hours of flying time. He or she will receive instruction in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both the aircraft and T-38 flight simulator and must demonstrate a specific level of proficiency in all phases of flight: contact, instrument, formation, and navigation. Academic training is completed prior to the end of T-38 flying; when it is over, the student will have spent more than 740 hours in the classroom.

As graduation draws nearer, a decision must be made concerning the type of follow-on training the student will receive. Will he or she be a multiple-place aircraft pilot (tanker, transport, or bomber) or be a single-seat (fighter, attack, or reconnaissance) driver? A key factor in making this decision is the recommendation made by the advanced training recommendation board (ATRB). (The ATRB process is thoroughly addressed in the next chapter.) The board recommends the type of training the student should receive, with the final assignment being made by the Air Force Manpower and Personnel Center (AFMPC). The final flights in the T-38 are based on the type of follow-on training the student is projected to receive. The last scheduled event is the graduation ceremony where the student walks across the stage, receives his or her silver wings, and becomes the newest pilot in the Air Force.[42]

Euro-NATO Joint Jet Pilot Training

Euro-NATO Joint Jet Pilot Training (ENJJPT) is, as the name implies, a specialized form of undergraduate pilot training specifically tailored for the unique flying requirements found in the European-NATO theater. Since military aviation in the participating countries is based on the employment of fighter aircraft, ENJJPT is designed to produce fighter pilots. This 55-week, fighter-oriented undergraduate pilot training program is jointly operated by both European and US flying personnel at the 80th Flying Training Wing, Sheppard AFB, Texas.[43]

The basic concept of operations is similar to the standard undergraduate pilot training course. There are three phases of training: preflight, primary jet training (T-37), and advanced jet training (T-38); and each phase is mated with the appropriate academic courses of instruction. The ENJJPT syllabus directs both the type and amount of classroom and flying training and requires the student to demonstrate proficiency before being advanced in the program. Being fighter oriented, the ENJJPT student will spend more time practicing formation flying and in general will receive approximately 80 more hours of flying time as compared to the average UPT student. However, a portion of these hours will be spent practicing instrument procedures since ENJJPT does not have T-37 or T-38 flight simulators.[44]

As graduation approaches, the follow-on training decision must be made. The graduates have been specifically trained to become fighter pilots, but an ATRB is still convened for the USAF graduates to determine their training future. Normally all of them will either go on to fighter aircraft or become instructor pilots. However, at the discretion of supervisory personnel, a graduate can be recommended for nonfighter training. In this later case, AFMPC is notified and, in most cases, the graduate is assigned to nonfighter follow-on training.[45]

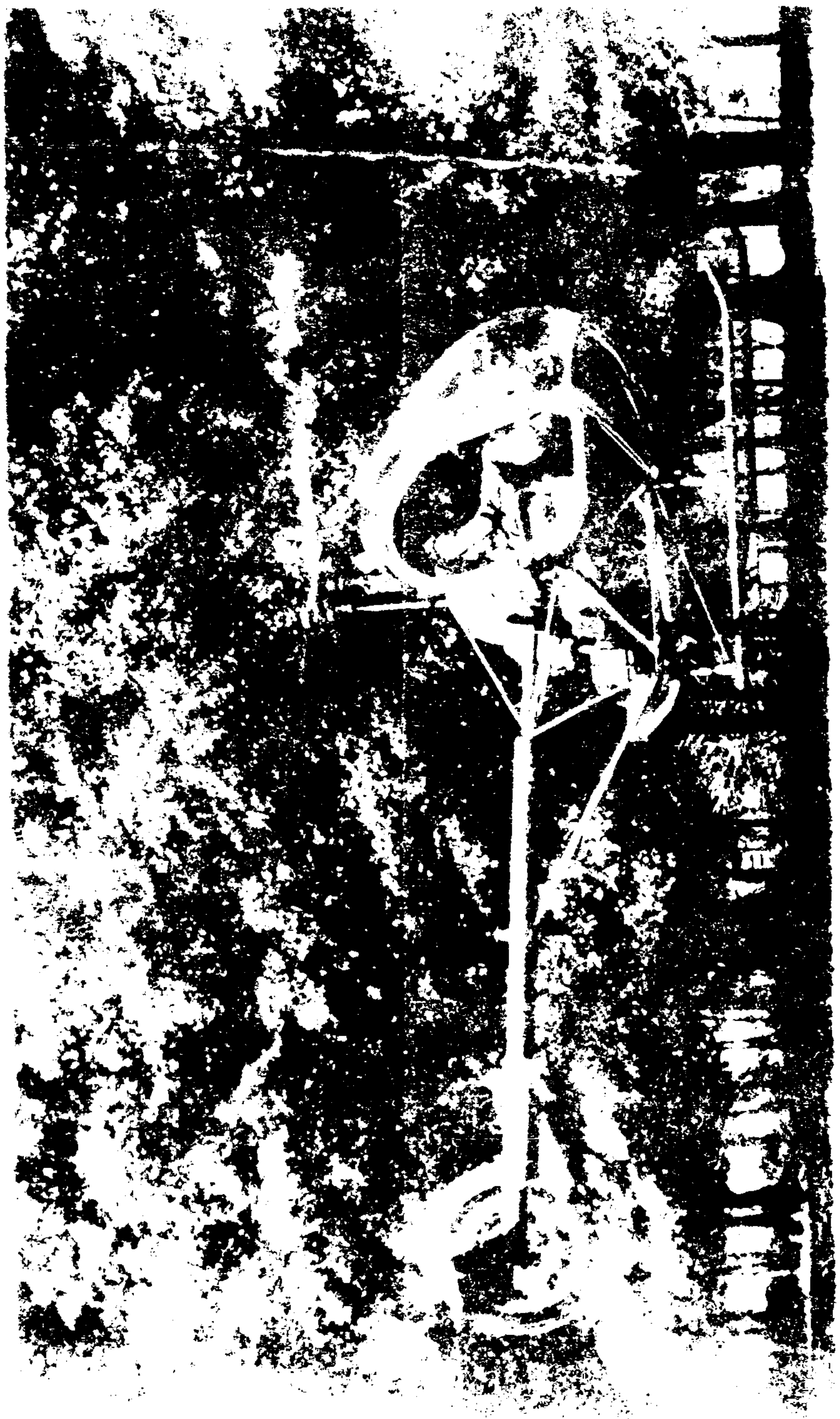
Undergraduate Pilot Training-Helicopter

Unlike fixed-wing pilot training, all undergraduate pilot training-helicopter (UPT-H) students are assigned to one flying organization, the 3588th Flying Training Squadron (FTS) located at Fort Rucker, Alabama. It may seem unusual to have an Air Force flying training squadron on an Army post, but in this case it is essential because the Army provides initial helicopter training for the Air Force. For the first 30 weeks of the program, either civilians under Army contract or Army instructor pilots conduct flying training. Like a fixed-wing course, the student flies two different types of aircraft and concurrently receives flying and classroom instruction. But unlike UPT, one student can have several instructors during each phase of training and completes one entire phase of training before being advanced in the program.[46]

A civilian instructor pilot begins teaching the fundamental skills during the primary phase. Using the TH-55 Osage helicopter, the student must demonstrate a degree of proficiency in basic maneuvers such as hovering and autorotational flight before earning his or her solo wings. Following successful completion of the primary check ride, he or she graduates into the UH-1 "Huey" and begins advanced training. Advanced training consists of four phases of instruction: contact, instrument, combat skills, and night. Army instructor pilots teach the student pilots how to fly the Huey under visual flight rules. They introduce the syllabus-directed maneuvers and prepare the pilot candidate for his contact check ride. After demonstrating proficiency in this phase, the student is assigned a civilian instructor and advanced to the instrument phase. Both the Huey and flight simulator are used to teach basic instrument flying. The aspiring pilot must pass a check ride in each one prior to progressing to combat skills flying.

The combat skills phase can be a real confidence builder for beginning students in that it requires them to think quickly and be decisive. They fly close to the ground in a simulated high-threat environment and are taught nap-of-the-earth flying techniques by highly qualified military instructors. The final phase of Army training, the night phase, is also taught by military instructors. The pilot candidates are exposed to maneuvering the Huey under minimum field-lighting conditions and learn how to use night-vision goggles.[47]

Following completion of night flying, the Air Force students break away from their Army classmates and begin flying with a small cadre of Air Force instructors. Air Force-unique flying training is now introduced with an emphasis on developing additional instrument flying skills. Academics also are included during this six-week period to ensure that the students have a solid understanding of the appropriate



UH-1 "Huey"

Air Force regulations and are well prepared to assume the responsibilities of a helicopter pilot in the operational arena. Passing the Air Force-unique check ride is the last flying activity before graduation. The students then are reunited with their Army classmates and begin preparing for the commencement ceremonies.[48]

Dual-Track Pilot Training

Dual-track pilot training or specialized undergraduate pilot training (SUPT) is the training methodology scheduled to replace the current, generalized undergraduate pilot training (UPT) program. It is not a new concept of flying training operations. Until the introduction of generalized UPT and the all-jet program in 1959, the Air Force used dual-track flight training to train all new pilots. Since then, advocates of SUPT and generalized UPT have routinely argued the pros and cons of both programs with a projected change in training always being right around the corner. In addition to frequent informal debates, generalized UPT and SUPT have been the topic of several research projects and independent study efforts. Although a complete change in training from generalized to specialized has not yet occurred, modifications to the current program have been implemented and a growing concern over graduate pilot skills and pilot training costs have bolstered support for specialized training.

The basic concept of operations for SUPT is similar to the present UPT program. Student pilots will receive both academic and flying training during the normal course of instruction with specific requirements being syllabus directed. The big difference will be in how this training is administered. Under dual-track training, pilot candidates will arrive on station for preflight training followed by the primary jet training phase in either the T-37 or the next generation trainer. During this phase they will spend more actual flying time in formation, instrument, and navigational flying than the average UPT student in today's program. Near the end of primary training, the students will be identified as either a fighter, attack, reconnaissance (FAR) or tanker, transport, bomber (TTB) candidates (fig. 8). (The actual point in training where this decision will be made has not yet been identified.) FAR students will receive advanced training in the T-38 aircraft whereas the TTB candidates will complete their training in a yet-to-be-determined multiengine jet trainer.

This specialized training approach offers several advantages, including lower overall per capita training costs, student training which is better suited for follow-on flying assignments, and increased flexibility in meeting the future needs of the using commands. Consequently, both the FAR and TTB candidates will finish pilot training in an environment that will foster operationally oriented flight instruction for a specific category of aircraft. Once entering a specific track, they will not be allowed to change from FAR to TTB or TTB to FAR. Both tracks are to be slightly longer than the current advanced training phase and a typical student will be scheduled for more

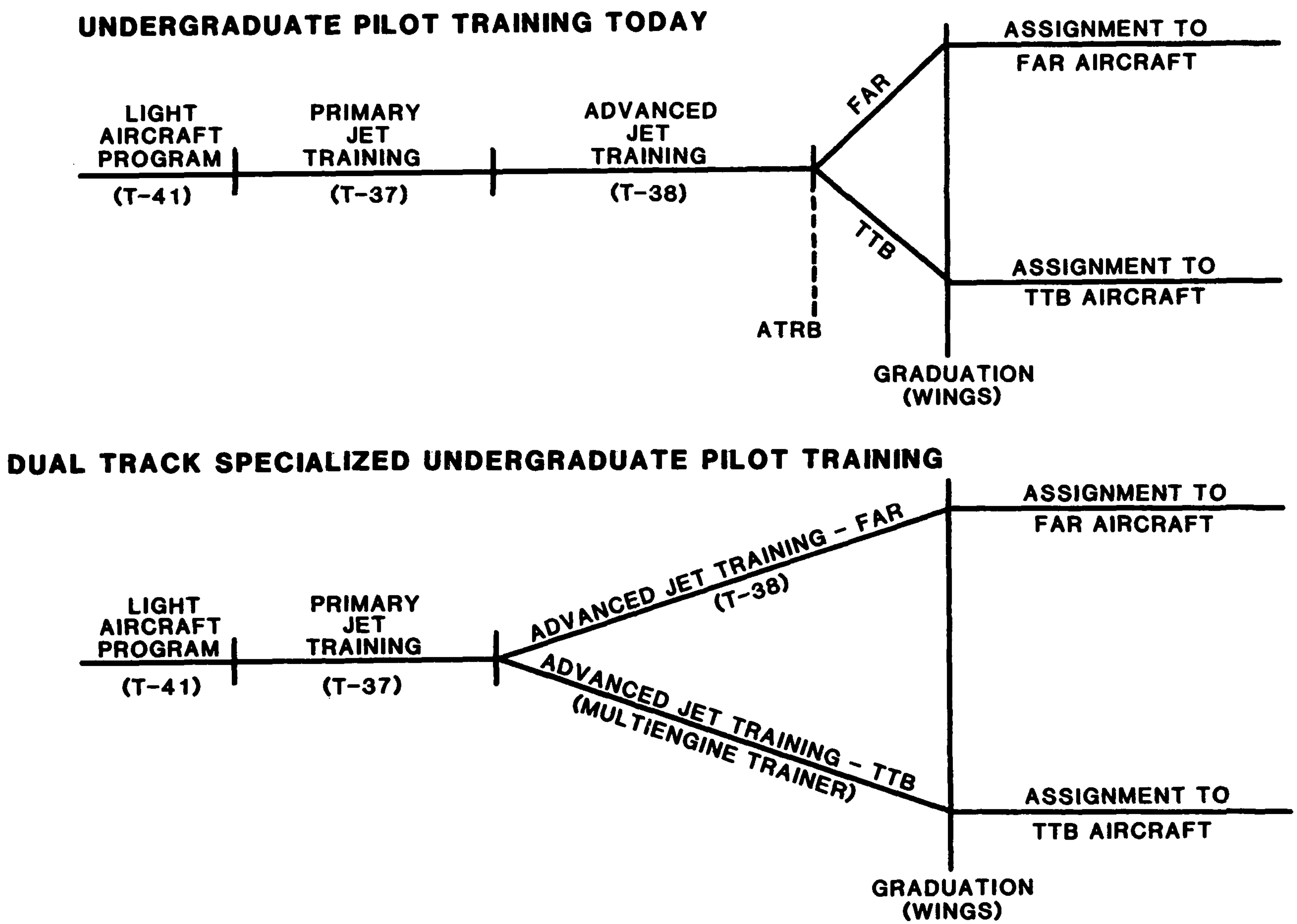


Figure 8. Comparison of Current FAR-TTB Decision with the Dual-Track Pilot Training Program.

sorties and receive more flying time. Following graduation, the new pilot will receive an appropriate aircraft assignment. Under current plans, once an individual is categorized as either FAR or TTB, he or she will not be assigned to fly an aircraft in the opposite category for the remainder of their Air Force careers.[49]

Specialized training will replace only the current undergraduate pilot training (UPT) program. Therefore, implementation of SUPT will not affect ENJJPT and UPT-H directly. The five UPT bases--Williams AFB, Laughlin AFB, Reese AFB, Vance AFB, and Columbus AFB--will conduct specialized training. Primary jet training will be common to all five bases, but only Williams and Laughlin AFBs will have FAR training; Reese, Vance, and Columbus AFBs will be the sites for the TTB portion of specialized undergraduate pilot training.[50]

NOTES

CHAPTER 2

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CHAPTER 3

ADVANCED TRAINING RECOMMENDATION BOARD

Although not widely publicized, the advanced training recommendation board (ATRB) decision is perhaps the single most important event in a pilot's flying career; it directly affects the composition of all flying squadrons. The specific USAF policy is that "each pilot training wing will convene an Advanced Training Recommendation Board to evaluate each USAF student's capability and potential to assume the varying mission requirements of Air Force aircraft weapon systems immediately upon graduation."[1]

Air Training Command Regulation (ATCR) 51-28, Advance Training Recommendation Board, dated 5 April 1985, governs the policies and procedures for recommending future USAF and international undergraduate pilot training (UPT) graduates for advanced aircrew training. The outcome of this board normally determines what type of aircraft a pilot will fly in the future and, to a large extent, his or her initial and subsequent major air commands of assignment. Once trained as a tanker, transport, or bomber crewmember, the pilot will probably never have the opportunity to fly a fighter, attack, or reconnaissance aircraft. An ATRB is held for all graduates of both the UPT and Euro-NATO Joint Jet Pilot Training (ENJJPT) programs, but since the ENJJPT program is a special case, only the UPT ATRB process is discussed in this chapter.

Today's Air Force flying inventory includes basically two categories of aircraft--those requiring an aircrew and those designed for only one or two flying officers. An aircrew aircraft normally has two pilots on board, the pilot in command or aircraft commander and the copilot; aircraft requiring an aircrew are categorized as either a tanker, transport, or bomber. Aircraft designed for only one or two flying officers (one of whom is the pilot in command or aircraft commander and the other could be a navigator or weapon systems officer) are designated as fighter, attack, or reconnaissance aircraft. Each type of aircraft in both categories is usually controlled by one or more of the major air commands with the norm being that one type of aircraft is the responsibility of one major air command. For instance bomber aircraft fall under the jurisdiction of the Strategic Air Command. In the tanker, transport, bomber (TTB) world, a new pilot will normally perform copilot duties for a period of time specified by the appropriate major air command before being upgraded to an aircraft commander position. In the fighter, attack, reconnaissance (FAR) environment, this operational "seasoning" process is not possible since copilot duties are nonexistent. Consequently, a newly assigned FAR pilot will assume aircraft commander duties following assignment to an operational flying unit.

Hence, the new pilot's capability to carry out "the varying mission requirements of Air Force aircraft weapon systems" equates his or her ability to perform aircraft commander or copilot duties immediately after arriving at his or her new duty station. Making a simple substitution clarifies the intent of ATCR 51-28; each pilot training wing will convene an ATRB to evaluate each USAF student's capability and potential to assume aircraft commander or copilot duties immediately upon graduation. Another way of looking at it is that the ATRB will decide if the graduate is recommended for operational "seasoning" before becoming an aircraft commander (TTB designee) or if he or she is recommended for an aircraft commander position without the benefit of "seasoning" (FAR designee). It is important to emphasize that the ATRB only makes a recommendation as to the type of advanced training they believe the graduate is best suited for.[2] The actual decision and subsequent student assignments are made by the Graduate Flying Training Assignment Unit at the Air Force Manpower and Personnel Center (AFMPC). In addition to the ATRB recommendation, this unit also considers the availability of follow-on training and the preferences of each graduate before making the final decision.[3]

ATRB procedures are basically the same as they were during its implementation in 1975. Each board is chaired by the UPT wing deputy commander for operations (DO) and includes key supervisors who are most knowledgeable of each student's performance. In addition, at least one board member must have TTB experience and one must have FAR experience. The following criteria are used for recommending further training: (1) flying performance--daily lesson grades and check-ride performance; (2) academic performance--overall average and number of examinations failed; (3) procedural performance--emergency procedure quiz results, number failed, ability to respond to verbal questioning; (4) other performance indicators--history of substandard performance and progress checks administered; and (5) individual recommendations--the knowledge of the instructor pilots and supervisors most familiar with each student's potential to complete follow-on training. The ATRB charter is to provide the Graduate Flying Training Assignment Unit of AFMPC with an alphabetical listing of graduates identifying the top 10 percent of each class, by order of merit, those students who are FAR qualified, those who are recommended for TTB only, and those who are instructor pilot (IP) nominees. This order of merit ranking includes both student performance indicators and instructor recommendations. The students nominated for IP duty also must be rank ordered and must be recommended for a specific aircraft. In addition, they must be FAR qualified, but they do not have to be IP volunteers.[4] Following submission of this listing to AFMPC, usually in the 42d week of training, the wing DO and senior squadron supervisors monitor student performance and are required to report any changes which might affect the ATRB recommendation.[5]

A total of five USAF flying training wings (FTWs)--14th FTW, Columbus AFB; 47th FTW, Laughlin AFB; 64th FTW, Reese AFB; 71st FTW, Vance AFB; and 82d FTW, Williams AFB--are actively training and graduating new pilots to fulfill vacancies in the operational flying arena. Approximately every 6 weeks a new UPT class enters the 49-week training cycle with the annual production rate of each FTW being 8 classes.[6] Consequently, the 5 FTWs graduate 40 UPT classes each year, which means that 40 separate ATRBs (8 at each base) are convened annually. Air Training Command provides general ATRB guidance in ATCR 51-28, but the flying training wings are responsible for conducting the actual recommendation board and each wing has a slightly different method of conducting their ATRBs.

14th Flying Training Wing, Columbus AFB, Mississippi

ATRB preparation for a typical UPT class at Columbus AFB begins several weeks prior to graduation. Initial planning (fig. 9, step 1) starts at the end of the T-37 phase of training (phase II) when the section one and section two T-37 flight commanders hold a separate meeting with the instructor pilots (IPs). Based on the demonstrated performance of each student, with respect to the ATCR 51-28 guidance, the individual instructors selectively recommend the students they have flown with for either FAR or TTB duty. If a disagreement develops, the flight commander reviews the facts and, with the aid of all the IPs present, reaches a decision. Both flight commanders summarize the results of their meetings and review their findings with the class commander during a joint session (fig. 9, step 2). Once the FAR and TTB determination has been made at this level, the squadron commanders and deputy commander for operations (DO) independently review the class distribution of FARs and TTBs. The squadron commanders have the opportunity to voice their opinions to the DO before the final decision is made (fig. 9, step 3).

The student now enters the T-38 phase of training (phase III) tentatively identified as either a FAR or TTB candidate. However, the student is not aware of his or her classification. Near the end of phase III, the T-38 flight commanders meet with their IPs using the same ground rules as the T-37 flight commanders did at the end of phase II and recommend each student in the class for a FAR or TTB assignment based on his or her performance in the T-38 (fig. 9, step 4).

Approximately eight weeks before graduation, the T-37 and T-38 flight commanders from section one meet with both the T-37 and T-38 class commanders to compare their findings and discuss the merits of each student in their section of the class. At the conclusion of this meeting, they will have determined which section one students should be recommended for a FAR assignment and which ones should go on the TTB track. During the same week, the section two flight commanders have a similar meeting and determine the status of section two students (fig. 9, step 5).

The T-38 class commander now must merge the section one and section two results with other pertinent training data, student desires and flying, academic, and military performance. Once completed, the class commander convenes a meeting at the squadron commander level to finalize a comprehensive class listing of FAR and TTB recommendations (fig. 9, step 6). One day before the actual ATRB, squadron supervisors and the DO review this listing and flag potential problem areas for formal ATRB consideration (fig. 9, step 7); the final decisions are made the following day. The DO, as the approving authority (fig. 9, step 8),

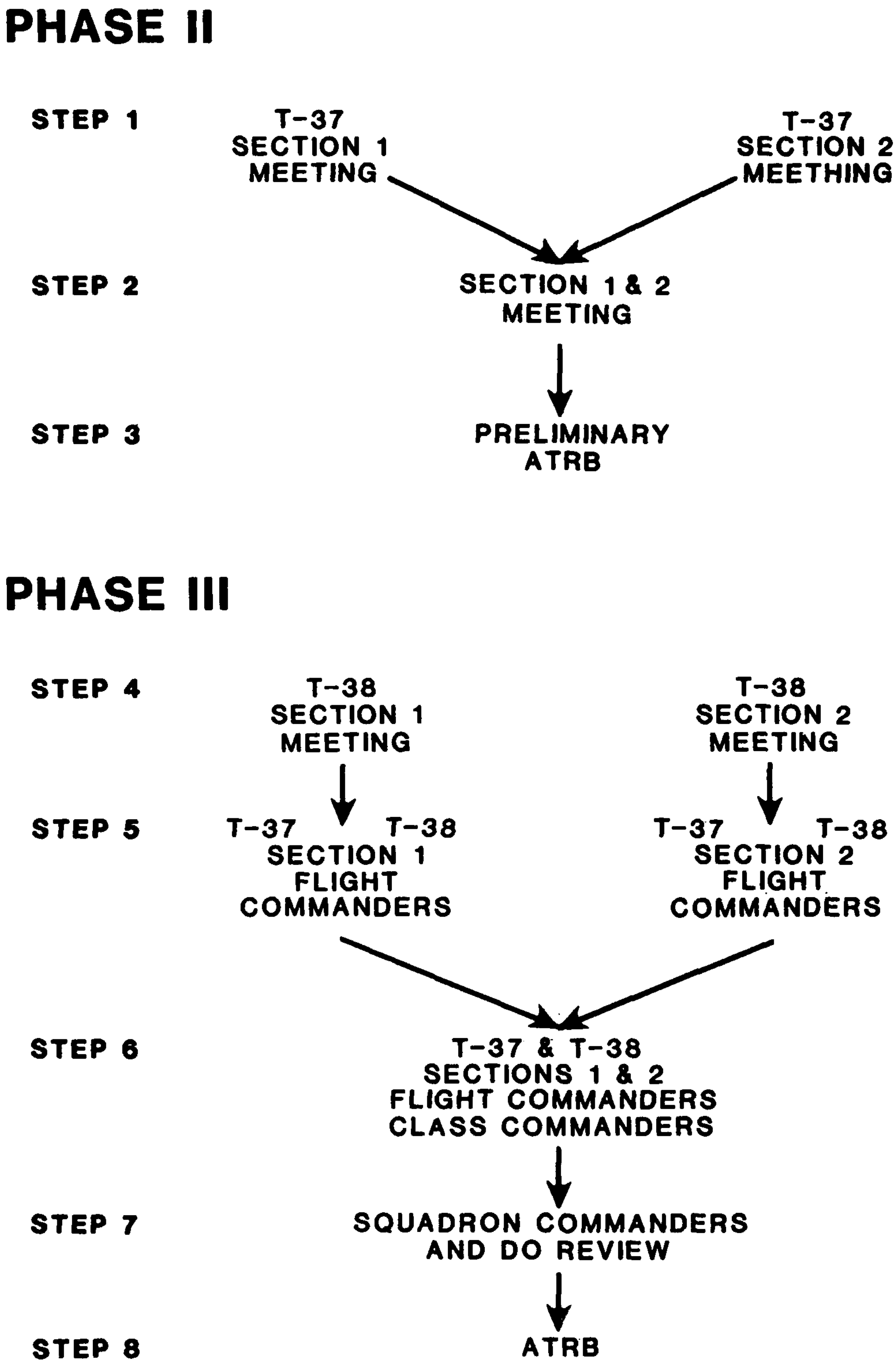


Figure 9. 14th Flying Training Wing ATRB Process.

normally discusses these decisions with the wing commander before submitting the list to AFMPC.[7]

At this point the formal ATRB cycle for this particular UPT class ends and AFMPC is now responsible for making the final aircraft assignments. However, the accuracy of the ATRB recommendation remains a flying training wing concern. Supervisory personnel must ensure that the student's performance is consistent with the ATRB recommendation. For this reason, the flying training supervisors initiated a system of checks and balances which culminates in the wing commander being advised of the progress of each senior UPT student until the day of graduation.

Confidentiality of student pilot candidacy, involvement of supervisory personnel, and post-ATRB review procedures at the other UPT bases are similar to the policies and procedures described for Columbus AFB. To minimize duplication, they will not be repeated when outlining the remaining ATRBs.

47th Flying Training Wing, Laughlin AFB, Texas

The Laughlin AFB ATRB process begins towards the end of phase II when both T-37 flight commanders convene separate meetings with their instructor pilots to discuss student performance (fig. 10, step 1). ATCR 51-28 guidance provides the framework for these informal meetings and the instructors openly discuss their personal experiences with each student. After considering all pertinent information, the instructors recommend either FAR or TTB candidacy for each student pilot. All recommendations are documented by the T-37 class commander and flight commanders and provided to the T-37 squadron commander for final review (fig. 10, step 2).[8]

Near the end of phase III, the T-38 flight commanders convene a similar meeting to determine follow-on training recommendations for each student pilot (fig. 10, step 3). As with the phase II meetings, the phase III meetings focus on both student performance and personal observations made by each instructor pilot in the T-38 flight.[9] The T-38 class commander makes a record of all recommendations for use in the pre-ATRB meeting scheduled for the following week (fig. 10, step 4). Chaired by the T-38 class commander, the pre-ATRB panel provides a forum for both phase II and phase III flight commanders and the class commanders to review the complete training history of each student pilot and establish either a FAR or TTB candidacy recommendation for ATRB consideration. All three squadron commanders (T-37, T-38, and student squadron) review the candidacy listing shortly after the meeting adjourns (fig. 10, step 5). One week before the ATRB all of the pre-ATRB participants meet to review the candidacy list and, when necessary, make last minute changes (fig. 10, step 6). The T-38 class commander schedules the ATRB and ensures that each voting member has a current copy of student performance data and previous recommendations (fig. 10, step 7). ATRB members review this data, discuss student potential, and make a final FAR or TTB recommendation. After DO

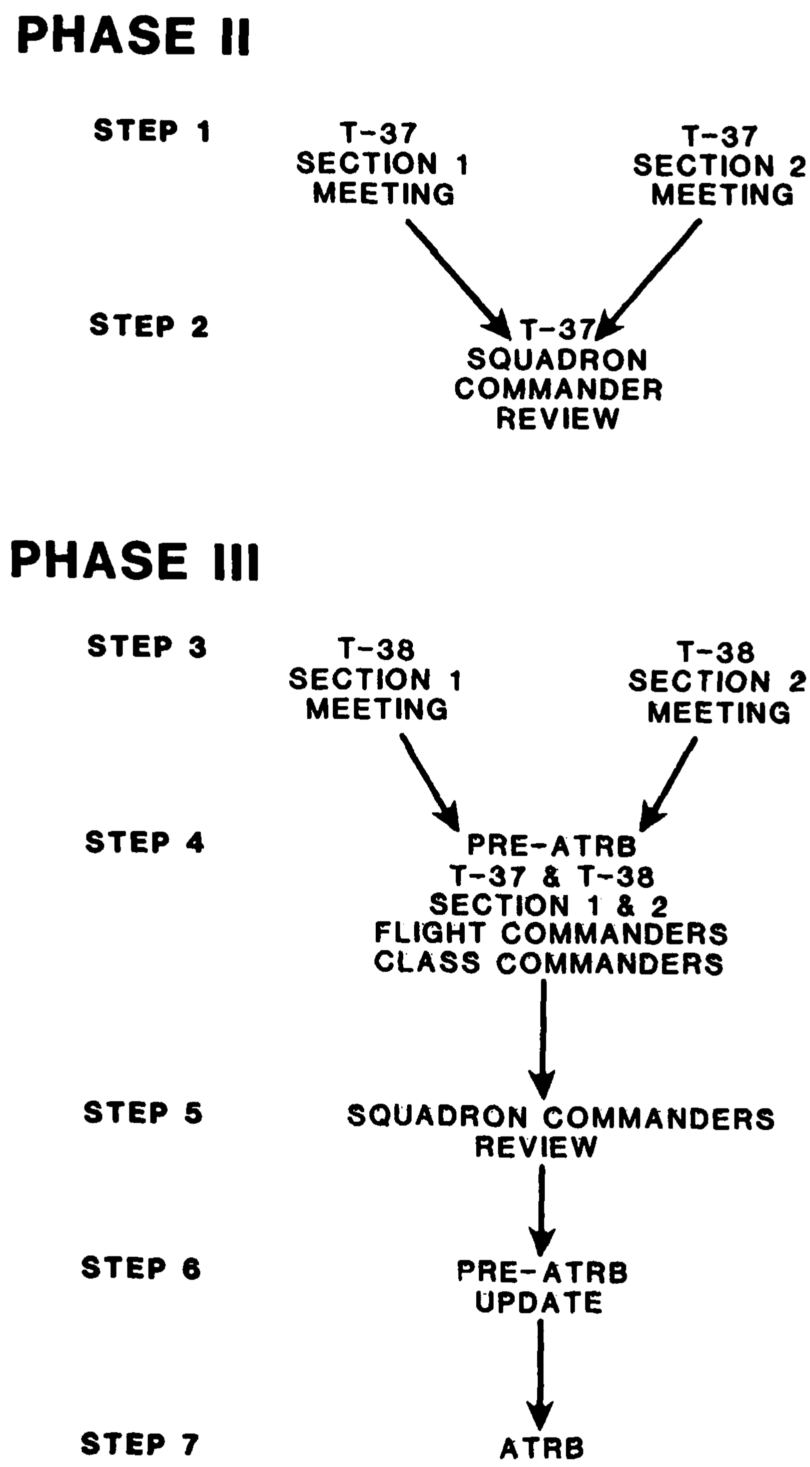


Figure 10. 47th Flying Training Wing ATRB Process.

approval, the class listing is forwarded to the wing commander for review and is then sent to AFMPC for assignment action.[10]

64th Flying Training Wing, Reese AFB, Texas

Initial ATRB meetings occur at the end of phase II when the T-37 flight commanders scrutinize student performance with the instructor pilots assigned to their respective flights (fig. 11, step 1). ATCR 51-28 provides the basic guidance for the initial sessions and all subsequent meetings. The T-37 squadron commander, operations officer, both flight commanders, and the class commander discuss the results of the first meeting in a closed-door session (fig. 11, step 2). At this point, phase II FAR and TTB candidacy is confirmed and all pertinent information is retained by student squadron personnel for future reference.

Approaching the 40th week of training the T-38 flight commanders have a similar session with their instructor pilots to assess the performance of the students during phase III (fig. 11, step 3). Again, senior squadron supervisory personnel review and discuss these results (fig. 11, step 4) before being finalized at this level. The T-38 class commander then schedules a pre-ATRB review with his T-37 counterpart, both phase II and III flight commanders, and student squadron supervisory personnel to establish the best FAR and TTB listing for the graduating class (fig. 11, step 5). Decisions made by this group are documented by the T-38 class commander and used by all personnel participating in the actual ATRB (fig. 11, step 6). Following DO approval at the conclusion of the ATRB, wing personnel forward the class listing to AFMPC for assignment action. Supervisors at all levels continue to monitor student performance in compliance with the guidelines established in ATCR 51-28.[11]

71st Flying Training Wing, Vance AFB, Oklahoma

As with other UPT bases, the first step in the ATRB process at Vance AFB begins at the end of phase II training. T-37 flight commanders and instructor pilots meet to discuss student performance and potential for flying either a FAR or TTB aircraft. Based on the ATCR 51-28 criteria, they recommend each student for either FAR or TTB candidacy (fig. 12, step 1). The T-37 class commander consolidates input from both of these meetings and compiles a comprehensive list of phase II predictions for future reference (fig. 12, step 2).[12]

Nearing the final weeks of training, the T-38 flight commanders and appropriate instructor pilots for the class review student performance indicators from phase III training records and express their opinions about student aptitude. They discuss differences of opinion thoroughly under the guidance of the flight commander and make a phase III FAR or TTB recommendation for each student pilot (fig. 12, step 3). The T-38 class commander combines these recommendations with the phase II predic-

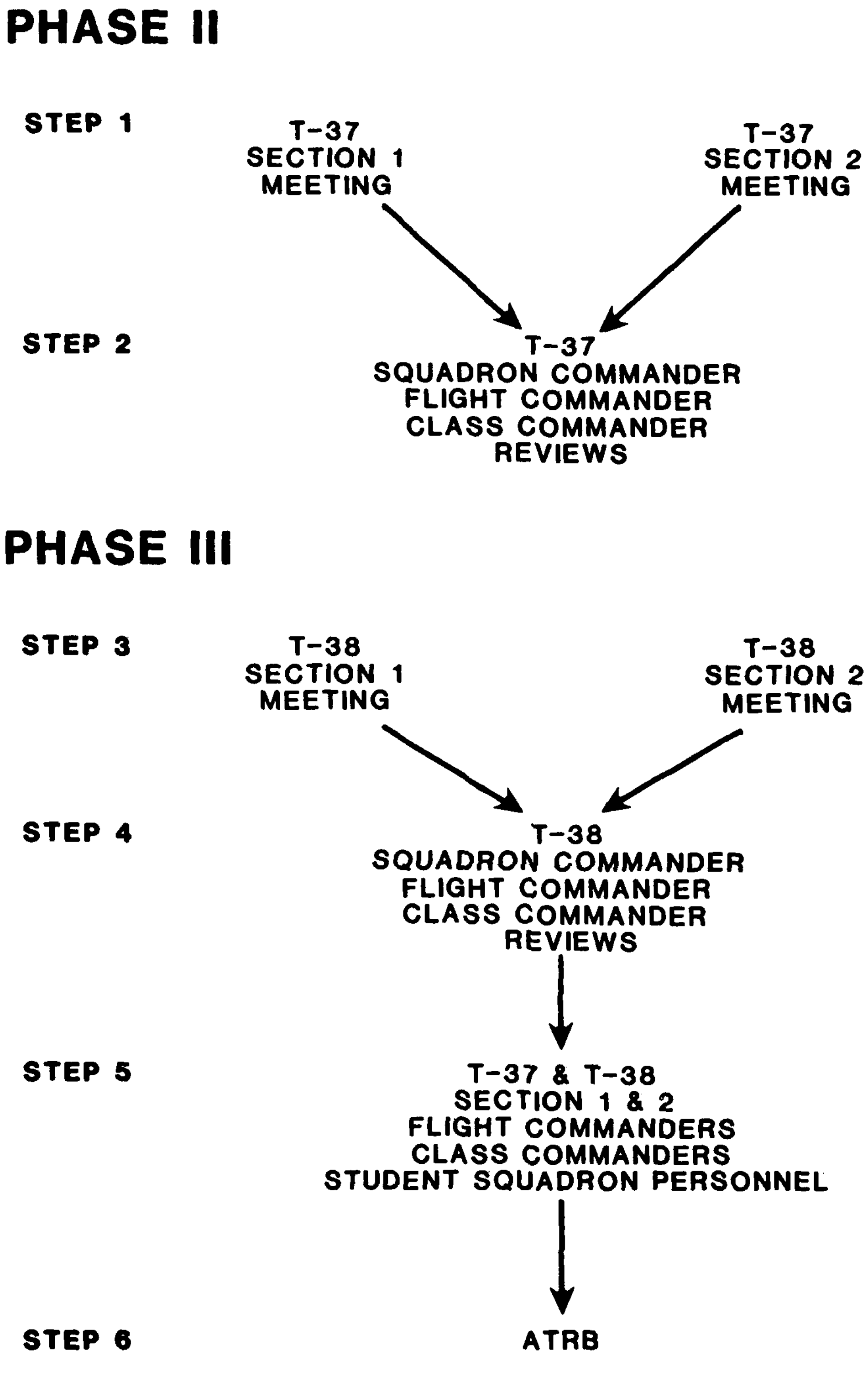


Figure 11. 64th Flying Training Wing ATRB Process.

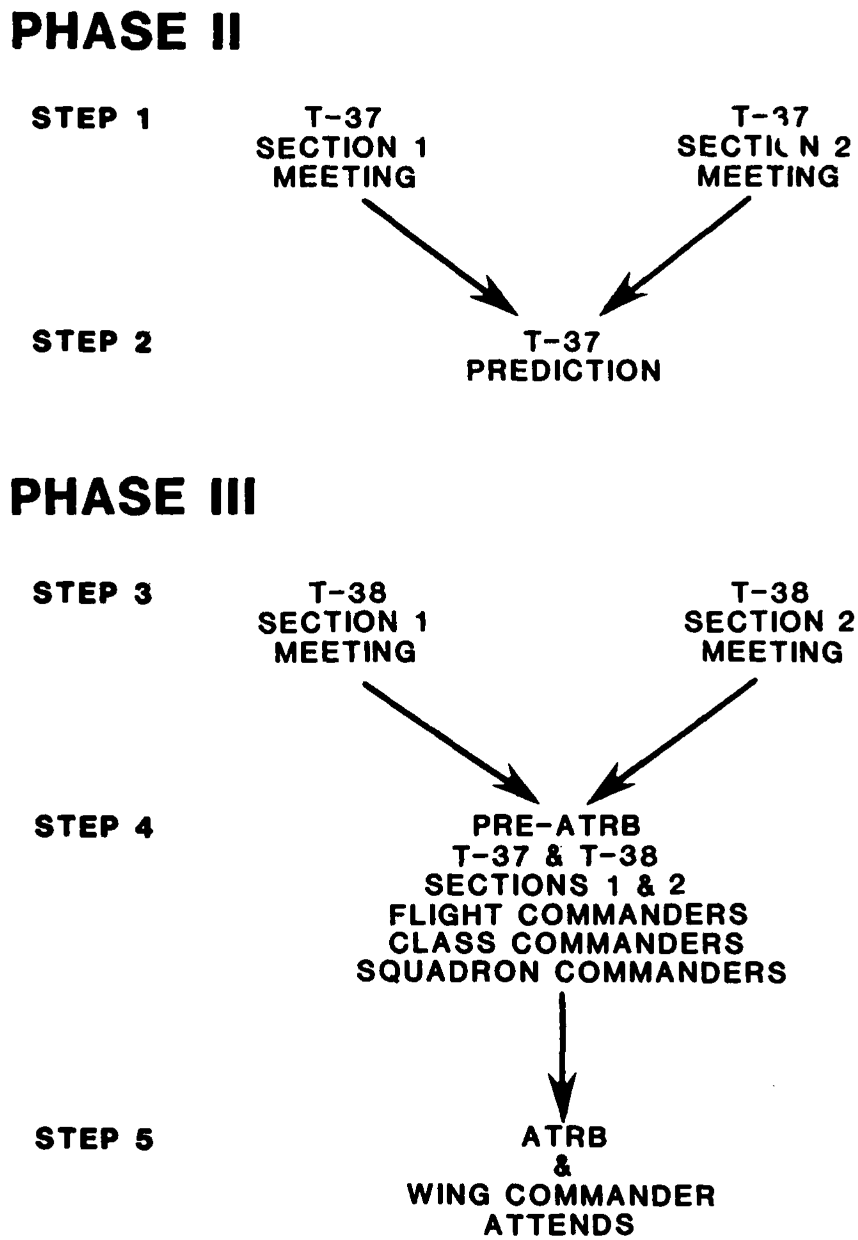


Figure 12. 71st Flying Training Wing ATRB Process.

tions prior to scheduling the pre-ATRB. At the pre-ATRB, both phase II and phase III supervisors, including the T-37 and T-38 squadron commanders and the student squadron commander, present their views in an closed forum with the T-38 class commander and document the final decisions for use by all of the ATRB participants (fig. 12, step 4). The actual ATRB is held shortly thereafter with the DO being the final approving authority.[13] However, unlike the other UPT bases, the Vance wing commander attends the ATRB (fig. 12, step 5).[14]

82d Flying Training Wing, Williams AFB, Arizona

The ATRB process at Williams AFB involves both phase II and phase III reviews with the initial session occurring at the end of phase II. T-37 flight commanders and the instructor pilots from both sections who provided training to the student pilots apply ATCR 51-28 criteria and arrive at follow-on training recommendations (fig. 13, step 1). Both flight commanders then discuss their decisions with the T-37 class commander and provide the information he or she needs to complete a comprehensive list of FAR and TTB recommendations for the class (fig. 13, step 2). The T-37 squadron commander scrutinizes this list (fig. 13, step 3) before senior supervisory personnel review the recommendation for advanced training (fig. 13, step 4).[15]

The phase III review begins much the same as the phase II review with the first meeting being held at the flight commander-instructor pilot level (fig. 13, step 5). Once they make their decisions, the T-38 class commander schedules a mini-mini-ATRB with the first-line flight supervisors: both T-37 and T-38 flight commanders and the T-37 class commander (fig. 13, step 6). At this meeting they determine which students should be considered for either FAR or TTB assignments upon graduation from UPT. The class commander(s), with their subordinate flight commanders in attendance, present this list to the flying squadron commanders (fig. 13, step 7). These meetings allow the squadron commanders to review independently the recommendations made by their flight commanders prior to participating in the ATRB. During the actual ATRB, the DO carefully reviews the recommendations that have been made, and similar to what takes place elsewhere, exercises his or her authority to challenge the candidacy of any FAR or TTB student (fig. 13, step 8). Following DO approval, the appropriate information is forwarded to AFMPC with ATCR 51-28 guidance being strictly adhered to until the students graduate.[16]

Realities of the Advanced Training Recommendation Board

A closer examination of the ATRB process as it is conducted at the flying training wing level reveals that several similarities exist which are not specifically contained in ATCR 51-28. As would be expected, the decision-making process begins at both the phase II and phase III levels with the instructor pilots voicing their opinions concerning student aptitude and potential. This flight-line input undergoes screening by

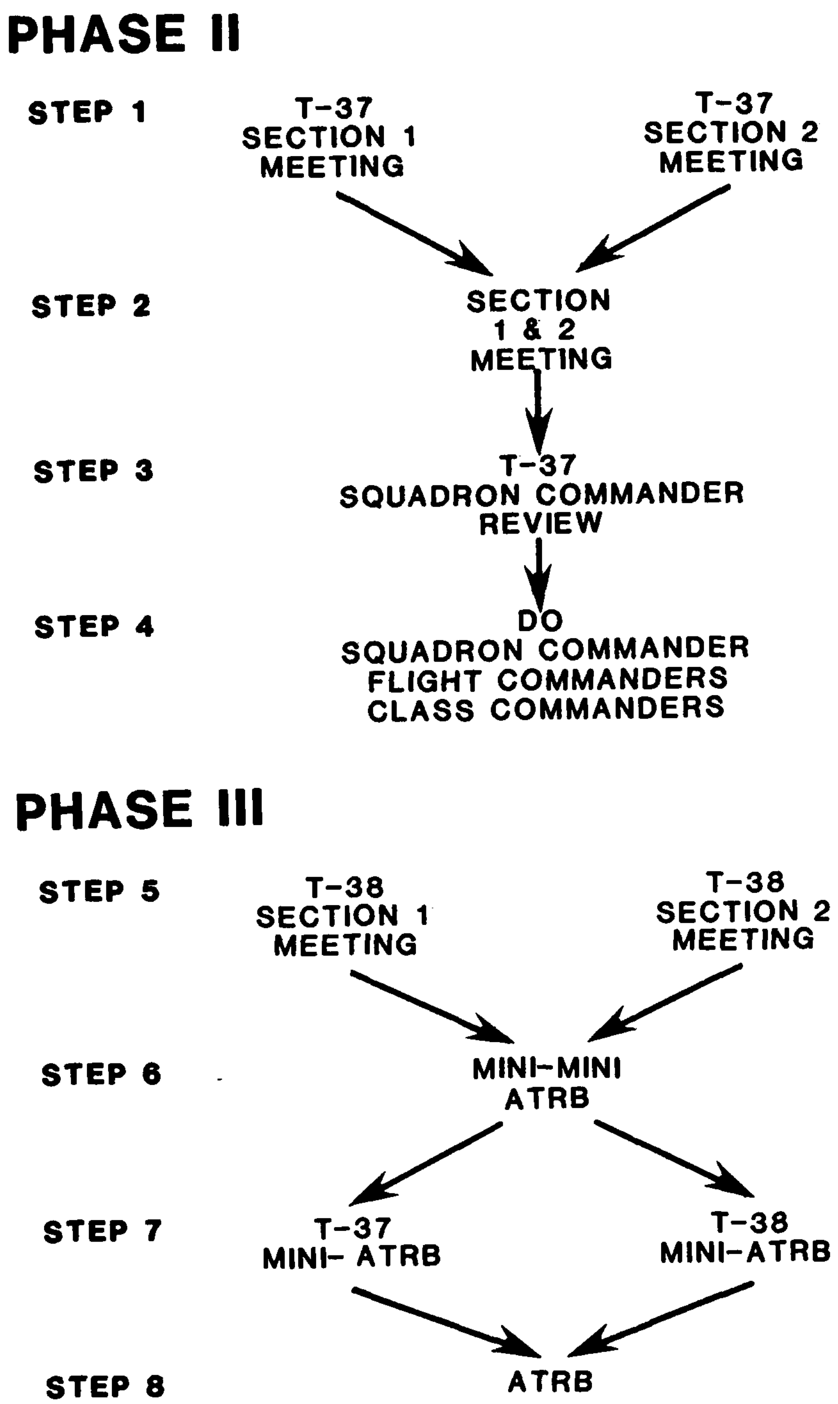


Figure 13. 82d Flying Training Wing ATRB Process.

various supervisory levels and depending upon the strength of the student's demonstrated performance, the initial recommendations may or may not be challenged. Eventually, the ATRB convenes, reviews student performance indicators, considers previous recommendations, notes student desires, makes the final recommendation, and passes the information to AFMPC for assignment action. ATCR 51-28 specifies the minimum number of performance indicators (flying, academic, procedural, and other) that should be considered and directs the ATRB to "carefully consider each student's characteristic performance, demonstrated capability and potential to perform the duties peculiar to the various major command (MAJCOM) aircraft immediately after graduation."[17] To present a complete picture to the members of the ATRB adequately and still have the information in a manageable form, the T-38 class commander normally prepares an alphabetical spread sheet which includes the performance indicators, previous recommendations, and student preferences (fig. 14). Most of the information contained on the spread sheet is a matter of record and completing these spread sheets merely involves transferring information from one form to another. The academic and flying averages, in contrast, have to be computed. Computation of the academic average is straightforward--the number of questions answered correctly divided by the number of questions answered. Computation of the flying average is more involved. The actual percentage score is computed by the base-level computer system as part of the check-flight rating analysis program. Consequently, this flying average is only the check-ride flying average and does not incorporate daily flying performance.[18] Additionally, the check-flight rating analysis program uses a numerical conversion table to translate letter grades (E--excellent, G--good, F--fair, U--unsatisfactory) into numerical values. This conversion table, referred to as the maneuver grade table, is a weighted table. That is, the numerical value of an excellent on one flying maneuver may not equal the numerical value of an excellent on another flying maneuver.[19]

Information presented to the ATRB, regardless of the form or method of computation, is intended to complement the experience and mission knowledge of the board members and to aid them in making their decisions. In the final analysis, graduate performance in follow-on training provides the best measure of ATRB success or failure.

From 1980 through 1985 the five flying training wings convened 200 ATRBs and graduated 9,823 active duty Air Force pilots.[20] Of those graduated, 126 had problems in follow-on training that subsequently led to some type of administrative action. The specific problems ranged from poor officership to physical limitations, but most often individuals were eliminated for flying deficiencies. A majority of those in this category were being trained for aircraft commander positions (FAR) and could not perform at the desired levels. They were reevaluated and typically reassigned to an aircrew aircraft (TTB) where they could be seasoned prior to assuming aircraft commander responsibilities.[21] Therefore, when viewing the ATRB process in terms of success or failure in follow-on training, records indicate that approximately 98.7 percent of the graduates succeeded, while 1.3 percent were unable "to assume the varying mission requirements" of the aircraft initially assigned to them.

ATRB WORKSHEET

CLASS ____________

NAME	FAR	TTB	IP	T-37 CHECKS			T-38 CHECKS		ACAD AVG	FLY AVG	ASSIGNMENT PREFERENCE			EPQ AVG	SMS HISTORY	REMARKS
				M	C	I	C	F			1	2	3			

Figure 14

NOTES

CHAPTER 3

1. Air Training Command Regulation (ATCR) 51-28, Advanced Training Recommendation Board, 5 April 1985, 1.

2. Ibid., 2.

3. MSgt Ralph E. Duggan, Air Force Manpower and Personnel Center, Graduate Flying Training Assignment Unit (AFMPC/RTP1), telephone interview with author on 21 November 1985.

4. ATCR 51-28, 1-2.

5. Duggan interview, 21 November 1985.

6. Headquarters Air Training Command, Pilot Training Division (HQ ATC/DOTF), "Syllabus of Instruction for Undergraduate Pilot Training (T-37/T-38)," April 1985, 1.

7. 14th Flying Training Wing Operations Instruction 51-3, Advanced Training Recommendation Board, 7 November 1985, 1-3.

8. Capt Paul S. Land, class commander, 47th Student Squadron, Laughlin AFB, Texas, telephone interview with author on 9 December 1985.

9. Ibid.

10. 47th Flying Training Wing Manual 60-1, vol. IV, 4 August 1983, 5-3.

11. Capt Charles F. Todar, class commander, 64th Student Squadron, Reese AFB, Texas, telephone interview with author on 20 November 1985.

12. Capt Mark A. Kleinheksel, class commander, 71st Student Squadron, Vance AFB, Oklahoma, telephone interview with author on 20 November 1985.

13. "Pre-ATRB/ATRB Information Sheet," Vance AFB, Oklahoma, undated, 1.

14. Kleinheksel interview, 20 November 1985.

15. Maj William L. Perkins, chief, Student Branch, 82d Student Squadron, Williams AFB, Arizona, telephone interview with author on 20 November 1985.

16. 82d Student Squadron Operations Instruction 50-10, 18 March 1985, 5-6.

17. ATCR 51-28, 5 April 1985, 1.

18. Capt William E. Stone Jr, Headquarters ATC, Operations Data Systems Division (HQ ATC/DOXD), telephone interview with author on 29 November 1985.

19. "Maneuver Grade Tables," Course PV4A-A, undated.

20. Headquarters ATC, Plans and Programs Division (HQ ATC/DOXP), "USAF Pilot Production Figures," September 1985.

21. Headquarters ATC, Curriculum Division (HQ ATC/DOTC), "Information on Follow on Attrition of UPT Graduates," 16 September 1985.

CHAPTER 4

ANALYSIS

The previous chapters briefly reviewed the historical development of pilot training and outlined the current pilot development program--from accession planning through pilot training. An understanding of this information provides the foundation for addressing the objective of this research project: To identify the most effective and economical point in undergraduate pilot training (UPT) where individuals would be identified for fighter, attack, reconnaissance (FAR) or tanker, transport, bomber (TTB) under the dual-track system. Of equal importance is an appreciation that this project is not an attempt to justify or criticize current recruiting or training practices or FAR and TTB selection procedures. Additionally, overall graduate quality, the validity of specialized undergraduate pilot training (SUPT), and the accuracy of Air Force Manpower and Personnel Center (AFMPC) in selecting the best aircraft assignments for graduating student pilots lie beyond the scope of this effort. However, recommendations offered in the final chapter may affect these areas.

When analyzing the assigned objective or research problem, several questions arise concerning the meaning or definition of the descriptive terms used in the problem statement. These terms must be clearly understood before developing a research plan, exploring possible solutions, and making recommendations. Chapters 1 through 3 provide an intuitive insight as to their meaning, but to avoid any confusion, the following assumptions and definitions have been made about the terms used in the statement of the research problem.

1. Within the context of this problem, undergraduate pilot training (UPT) includes the period of time from recruitment through graduation from pilot training.

2. The dual-track system is synonymous with SUPT outlined in chapter 2.

3. As stated at the beginning of chapter 3, FAR equates to a first assignment as an aircraft commander whereas TTB means that operational "seasoning" as a copilot is required before assuming an aircraft commander position.

4. Identifying the most effective and economical point implies that a set of identifiable criteria exists that it is measurable at several points during UPT, and that one point can be identified where effectiveness and economy are optimized.

If a set of identifiable criteria indeed exists, then it is a subset of all the recorded data collected on each student pilot during UPT (fig. 15, case 1), not a matter of record (fig. 15, case 2), or only a portion of it is recorded (fig. 15, case 3). Assuming that a set of identifiable criteria exists, each case is addressed individually.

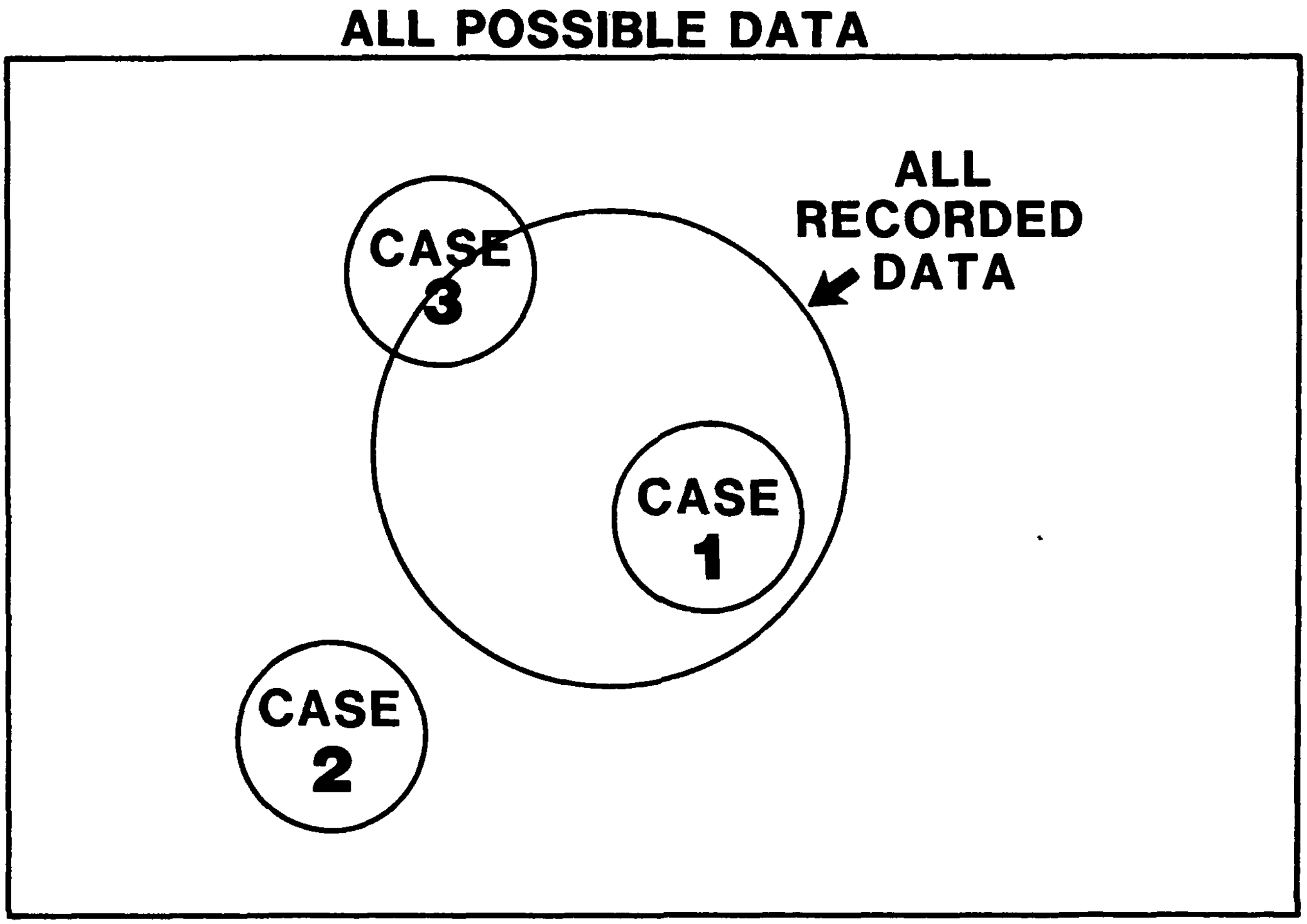


Figure 15. The Universe of All Identifiable Criteria for Use in Selecting Pilot Trainees Includes Three Possible Sets of Data.

Case 1

The set of identifiable criteria is a subset of all recorded data collected on each student pilot.

From recruitment through completion of aviation training, each pilot candidate compiles a personal history and receives several written and flying tests. Most personal information and test results are a matter of record and are attainable through proper channels. Remembering that 98.7 percent of the graduates identified for either FAR or TTB under the advanced training recommendation board (ATRB) process successfully completed follow-on training (see chap 3), the first set of data considered was individual flying training data. The rationale used was as follows: a 98.7-percent success rate in follow-on training is significant. If it is possible to model the current ATRB decision-making process mathematically and use modeling equations to predict ATRB decisions accurately, then those equations may be useful in an SUPT environment.

In addition to the ATRB success rate, the previous chapter also pointed out that each UPT wing has a unique ATRB process and further investigation revealed that some UPT wings weigh the training data differently. For example, one UPT wing may place more emphasis on T-37 check-ride performance when evaluating a student for a FAR recommendation. Consequently, a complete set of flying training data had to be located that was common to all UPT wings, uniformly reflected student potential within the subjective arena, and was free from local biasing. The best set of available data which seemingly had these attributes came from Headquarters Air Training Command (ATC) flight operations directorate and included the following elements:

1. T-37 midphase check-ride scores
2. T-37 contact check-ride scores
3. T-37 instrument check-ride scores
4. T-38 contact check-ride scores
5. T-38 navigation check-ride scores
6. T-38 formation check-ride scores
7. Total T-37 flying time
8. Total T-38 flying time
9. Total flying time

The problem now was to manipulate mathematically this set of data elements to predict the FAR and TTB recommendations made by a typical ATRB.

The first step was to compile the completed training records of all 1985 UPT graduates. After eliminating non-USAF graduates and sorting out the incomplete records, 1,514 usable records were available for analysis. Secondly, a linear regression was performed by identifying each data element (1-9) as an independent or predictor variable and defining the FAR-TTB decision as the dependent or criterion variable The Statistical Package for the Social Sciences (SPSS-9) was used to perform this regression and all 1,514 records were included in the population sample. Statistical information for each variable (mean, variance, standard deviation, etc.) and specific regression findings (r, r^2, etc.) are available for all valid cases in appendix 1.

For the nonstatistician, the final result revealed a correlation coefficient of .619, which, when translated, means that about 38 percent of the variance (r^2) of the criterion variable (FAR-TTB decision) could be "explained" by the set of predictor variables (1-9). At first glance, this result may not seem to be of much value since 62 percent of the variance could not be explained by the predictor variables. In a scientific laboratory or when conducting medical research this criticism might be valid, but when dealing with the behavioral sciences it is erroneous. In these disciplines the effect size or worth of the regression can be interpreted by the correlation coefficient (r) and categorized as either small, medium, or large depending upon the value of the coefficient. One popular interpretation of these categories defines small as r = .10, medium as r = .30, and large as r = .50.[1] Therefore, with an r = .619 the overall worth of the regression can be interpreted as being large.

A simple test of this interpretation seemed in order, so 500 student records were selected at random from the 1985 population sample and the regression equation was used to compute a FAR or TTB decision for each student pilot. Of the computations made, approximately 80 percent of them coincided with the actual ATRB decision, but the test records came from the same population sample used to determine the regression equation. Consequently, the equation had some descriptive value, but its predictive value still remained a question. A test of predictive value required student records from outside the original population sample. Since 1984 pilot training data was not available, 1986 data provided the requisite test bed. FAR and TTB predictions were computed for 434 1986 students and compared to the actual ATRB decisions. Of those computed, 339 coincided with the ATRB decision, an overall 78.1-percent success rate. Further testing should be conducted before establishing the degree of predictability, but initial testing indicates that this linear regression equation has predictive value.

Could the worth and subsequent predictive value be improved by examining the nonlinear or polynomial relationships between the predictor and criterion variables? To answer this question, three polynomial regressions were performed by introducing new predictor variables that were multiplicatives of the original nine data elements. The first polynomial regression examined had 18 predictor variables--the original 9 data elements plus the squared value of each data element. Regression number 2 had 27 predictor variables--the 18 variables from the first polynomial regression plus the cubed value of each data element. The third regression included the previous 27 variables plus the original 9 data elements raised to the fourth power, for a total of 36 predictor variables. An examination of each polynomial regression revealed that for the first regression, a slight improvement in r was possible (r = .623), however, testing revealed that the .004 increase did not significantly improve the descriptive or predictive power. For all other cases, the r value was not improved.

The overall worth of the complete set of predictor variables had been established and tested. It was possible to partially model the curren ATRB decision-making process and achieve a certain degree of predictive success. Whether or not it could be applied in an SUPT environment was another matter. Recalling from chapter 2, SUPT requires that a FAR or TTB decision be made no later than the end of primary jet training (phase II). Additionally, chapter 2 implied that the type of aircraft flown in the primary phase, the amount of flying time, and the entire syllabus of instruction would likely change before SUPT implementation. With so many uncertainties and a lack of definitive plans it was difficult to conclude that data elements 1 through 9 would be applicable in a future pilot training environment let alone be a reasonable set of predictors. The following assumptions had to be made before continuing:

1. The light aircraft programs (flight screening program--FSP, flight instruction program--FIP, pilot indoctrination program--PIP) will essentially remain the same under SUPT.

2. As described in chapter 2, the phase II portion of the SUPT syllabus will approximate current training practices.

3. The phase II aircraft used in SUPT will have the same basic handling and performance characteristics as the current phase II aircraft.

4. The performance factors considered important in today's FAR and TTB selection process will remain important factors in the FAR and TTB selection process used in SUPT. For example, if landing an aircraft is a valid performance indicator today, then it will be equally valid in SUPT.

Given these assumptions, it is reasonable to assume that the following phase II data elements will have SUPT counterparts:

1. T-37 midphase check ride
2. T-37 contact check ride
3. T-37 instrument check ride
4. Total T-37 flying time

Depending upon when the FAR or TTB decision is made, one or all four of these data elements may be available for use by the decision makers. Consequently, all reasonable subsets of these elements were examined for potential predictive value using the same approach as used on the complete set of data elements. The correlation coefficient or r value is the overall measure of "worth" and, as before, each case was tested against a random sample of 500 1985 and the 434 available 1986 student records to project the descriptive and predictive success rates. Although the second order polynomial regression increased r slightly, the overall increase had little effect on the test results and was not considered significant.

In addition to the basic relationship between the predictor and criterion variables, other significant relationships were revealed during each step of the linear regression routine. They included:

1. Correlation between the predictor variables.

2. Level of significance--the "best" data element from the entire set of data elements is selected as the first variable in the regression equation; second best is the second and so on. Consequently, when

viewing all of the data elements for a given regression, the data element with the best predictive value will be the first variable in the equation, the second best the second, and so forth.

3. Largest unit effect--a one-unit change of this predictor variable will have the largest effect on the prediction of the criterion variable.

The level of significance and largest unit effect may be illustrated by the following example:

3 (predictor variable 1) + 5 (predictor variable 2) = criterion prediction

Predictor variable 1 has the highest level of significance (predictive value) since it is first in the regression equation and a one-unit change in predictor variable 2 will have the largest effect on the predicted value of the criterion variable. Since all of these relationships provide additional insight that can be useful in developing future models, they will be annotated for each subset regression.

Appendix 2 contains specific mathematical data on the linear subset regressions with a synopsis of the findings as follows:

Subset 1

Data elements: T-37 midphase check ride
T-37 contact check ride

Worth: r = .401

Level of significance: T-37 midphase check ride
(highest to lowest) T-37 contact check ride

Largest unit effect: T-37 midphase check ride

Descriptive success rate: 65.4 percent
(1985 population)

Predictive success rate: 63.6 percent
(1986 sample)

Remarks: none

Subset 2

Data elements: T-37 midphase check ride
T-37 contact check ride
T-37 instrument check ride

Worth: r = .450

Level of significance: T-37 midphase check ride
(highest to lowest) T-37 contact check ride
T-37 instrument check ride

Largest unit effect: T-37 midphase check ride

Descriptive success rate: 69.5 percent

Predictive success rate: 67.0 percent

Remarks: none

Subset 3

Data elements: T-37 midphase check ride
T-37 contact check ride
Total T-37 flying time

Worth: r = .476

Level of significance: Total T-37 flying time
(highest to lowest) T-37 midphase check ride
T-37 contact check ride

Largest unit effect: T-37 midphase check ride

Descriptive success rate: 69.7 percent

Predictive success rate: 70.0 percent

Remarks: none

Subset 4

Data elements: T-37 midphase check ride
T-37 contact check ride
T-37 instrument check ride
Total T-37 flying time

Worth: r = .495

Level of significance (highest to lowest): Total T-37 flying time
T-37 instrument check ride
T-37 midphase check ride
T-37 contact check ride

Largest unit of effect: T-37 midphase check ride

Descriptive success rate: 71.7 percent

Predictive success rate: 70.9 percent

Remarks: Total T-37 flying time was negatively correlated with the midphase, contact and instrument check rides. This implies that as flying time grew larger, check ride values became smaller.

An examination of the four linear subset regressions revealed that as the number of data elements increased so did the descriptive and predictive success rates, with the best rate occurring when all phase II data were considered (subset 4). But, since the Air Force Manpower and Personnel Center (AFMPC) will require a reasonable amount of time to make the final assignment decisions and process the requisite paperwork, the flying training wing recommendations will probably have to be made before the student completes phase II. Consequently, all phase II data elements will not be available for consideration by the wing level decision makers, which means that the subset 4 findings will not be usable for SUPT FAR or TTB recommendations.

With this in mind and the fact that the SUPT syllabus will direct more formation training (see chap. 2), a set of data elements had to be defined which could be realistically used by the decision makers. If the FAR and TTB recommendations were made at the latest possible point during phase II training, then this new set of predictor variables could include the following elements:

1. T-37 midphase check ride
2. T-37 contact check ride
3. T-37 formation check ride
4. T-37 flying time

Under an SUPT program, the wing-level decision makers should have this data in time to make their recommendations and still allow AFMPC sufficient time to make the final aircraft assignment decisions and process the requisite paperwork.

Evaluating the descriptive and predictive success rates of these factors posed a new problem since a T-37 formation check ride is not administered to student pilots under the current syllabus of instruction. But a T-38 formation check ride is administered to each graduate. Therefore, the T-38 check-ride scores were substituted for the proposed T-37 formation check-ride element. In addition, total T-37 flying time was substituted for the proposed T-37 flying time element. These substitutions required making two more assumptions before continuing: SUPT formation check flight performance in phase II can be approximated by current T-38 formation check-flight scores and total T-37 flying time will approximate T-37 flying time as an SUPT FAR and TTB data element.

Two linear regressions were run to determine the descriptive and predictive success rates of this new set of elements. The same procedures were followed as in the previous regressions with a synopsis of the findings as follows:

<u>Subset 5</u>

Data elements: T-37 midphase check ride
T-37 contact check ride
T-38 formation check ride

Worth: $r = .461$

Level of significance: T-37 midphase check ride
(highest to lowest) T-38 formation check ride
T-37 contact check ride

Largest unit effect: T-37 midphase check ride

Descriptive success rate: 69.6 percent

Predictive success rate: 66.6 percent

Remarks: none

Subset 6

Data elements: T-37 midphase check ride
T-37 contact check ride
T-38 formation check ride
T-37 flying time

Worth: r = .514

Level of significance: (highest to lowest)
Total T-37 flying time
T-38 formation check ride
T-37 midphase check ride
T-37 contact check ride

Largest unit effect: T-38 formation check ride

Descriptive success rate: 72.1 percent

Predictive success rate: 69.8 percent

Remarks: none

With a correlation coefficient of r = .514, a 72.1-percent descriptive success rate, and a 69.8-percent predictive success rate, subset 6 contained the best set of usable predictors for the SUPT decision makers. Given the stated assumptions, the current ATRB decision-making process had been modeled partially by the subset 6 regression equation and that equation should have practical application in the SUPT FAR and TTB decision-making process.[2]

The available set of flying training data was exhausted and a degree of predictive success had been obtained. The next step was to examine all of the other recorded data for each student pilot to test whether the predictive success rate obtained in subset 6 could be improved. As with the flying training data analysis, the first hurdle was to identify a common set of data that would be both available and usable. AFMPC is the repository for all personnel data and with the help of Headquarters ATC, directorate of commissioning programs, the following set of possible predictor variables was identified for each 1985 pilot training graduate:

1. Prior service
2. Age
3. Marital status
4. Degree type (arts, science)
5. Level of degree (bachelor, master, doctorate)
6. AFOQT pilot composite score
7. AFOQT navigator-technical composite score
8. AFOQT academic aptitude composite score
9. AFOQT verbal composite score
10. AFOQT quantitative composite score

This set of possible predictor variables was merged with the 9 flying training elements previously obtained to provide a complete set of recorded data for each 1985 pilot training graduate. As before, a linear regression provided a mathematical model for projecting a FAR or TTB assignment. The SPSS-9 computer package was used to obtain this model. However, personal data for the 1986 pilot graduates was not available, and a predictive success rate could not be calculated. The descriptive success rate for the 1985 graduates was 81.0 percent (appendix 3).

The next step was to combine these personnel data elements with the best set of SUPT-oriented flying training data elements to determine a mathematical model which could be used in an SUPT training program. Since subset 6 contained the best set of descriptive and predictive SUPT variables, they were combined with the 10 personnel variables. This new set was labeled subset 7. The linear regression computed for subset 7 provided a 75.6-percent descriptive success rate for 1985 pilot training graduates. (See appendix 4 for subset 7 regression values and subset 3 and 4 regressions with personnel data included.) Although 1986 personnel data was not available for analysis, the previous flying training regressions demonstrated a solid relationship between the descriptive and predictive success rates and it was concluded that a similar relationship would exist for the subset 7 regression.

All recorded data had been collected and analyzed for descriptive and, when possible, predictive value. Subset 7 contained the best set of SUPT FAR and TTB predictors, but accounted for only a 75.6-percent success rate when compared to the actual ATRB decisions. This led to two probable conclusions:

a. The ATRB decisions were incorrect and the FAR and TTB recommendations calculated by the subset 7 equation were accurate.

b. All of the variables contained in the set of identifiable criteria had not been revealed. Consequently, predictor variables existed which were not part of all of the recorded data collected on each student pilot during UPT.

Since the ATRB success rate in follow-on training is 98.7 percent, the latter conclusion seemed the most reasonable and was accepted. Therefore, the set of identifiable criteria is not a subset of all recorded data collected on each student pilot and case 1 is false.

Case 2

The set of identifiable criteria does not intersect the set of all recorded data collected on each student pilot.

The descriptive and predictive success rates achieved in case 1 illustrate that some elements in the set of identifiable criteria are contained in the set of recorded data. Since the set of identifiable criteria and the set of recorded data have common elements, they must intersect. Therefore, case 2 is false.

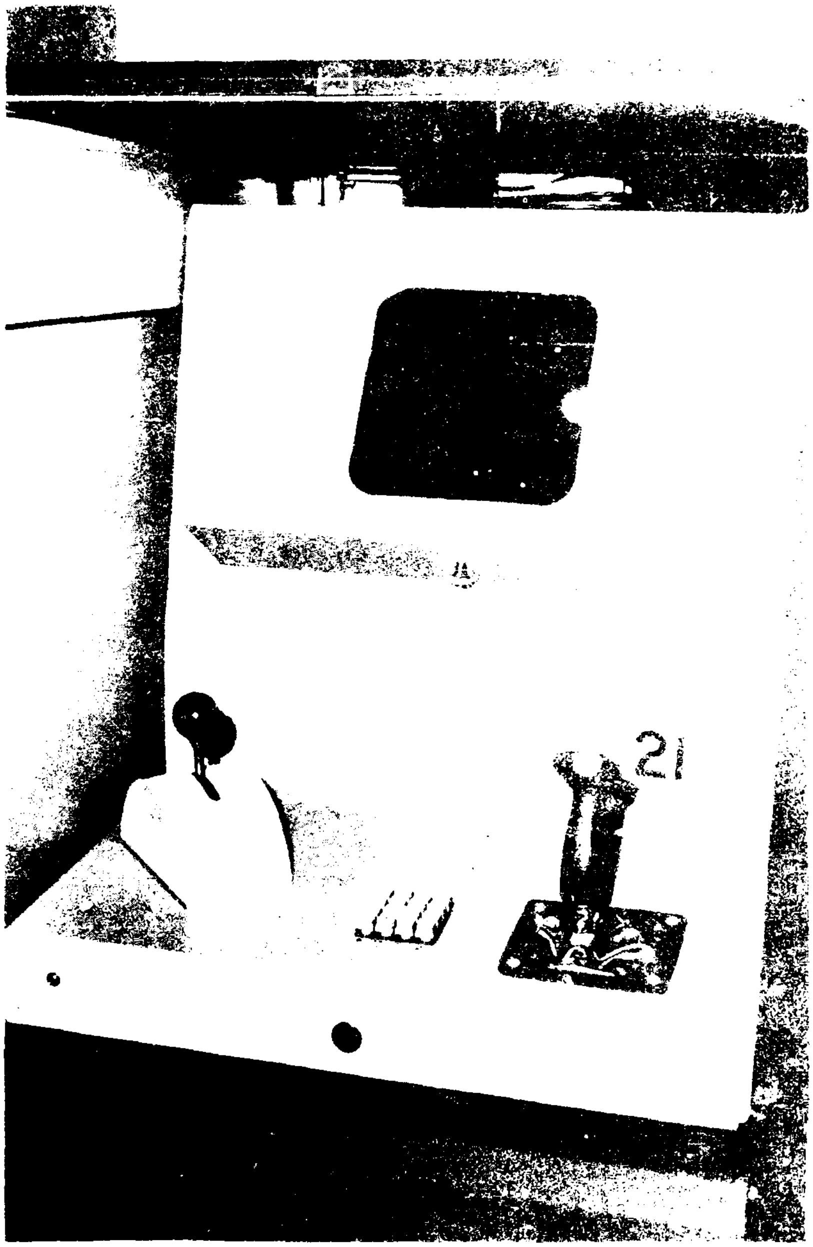
Case 3

The set of identifiable criteria intersects the set of all recorded data collected on each student pilot.

Since there are only three possibilities and cases 1 and 2 are false, the final option, case 3, must be true. Case 1 identified the recorded elements which have descriptive and predictive value. Their values were either measured or demonstrated. Assuming that other usable predictive variables may exist, case 3, the next step is to determine whether or not additional data could be collected which would reveal these variables thereby expanding the set of identifiable criteria and improving the predictive success rate.

One possible data collection method could be the approach used for the 1940's vintage classification battery (see chap. 1). This battery consisted of several written and apparatus tests that measured mental and psychomotor ability. Investigation of this battery led to the Aircrew Selection and Classification Branch of the Air Force Human Resources Laboratory (HRL) Brooks AFB, Texas. In 1974 HRL initiated electronic psychomotor testing to determine the correlation between psychomotor skills and success in pilot training. Their research was ongoing when, in 1978, Headquarters ATC requested HRL to develop methods specifically aimed at improving pilot candidate selection. This request for personnel research (RPR) 78-11 was followed in 1980 by RPR 80-02 which focused on SUPT and the FAR and TTB selection process.[3] HRL continued with its laboratory based testing approach until 1983 when an effort was made to consolidate information processing, personality profiling, and psychomotor testing. The result of this effort was a portable basic attributes testing device (PORTA-BAT) which featured "a powerful super microcomputer with very high-speed, high-resolution graphics and communications features that permitted networking or on-line data transfer to a monitoring station during testing."[4] A summary of the basic attributes tests and the psychological factors associated with each test are contained in appendix 5.

In April 1985, Headquarters ATC issued a program guidance letter to test and evaluate a PORTA-BAT based pilot candidate selection method. The two and a half year test period began in 1986. If the PORTA-BAT selection method proves worthwhile, operational pilot candidate screening can begin as early as 1988.[5] In addition to satisfying RPR 78-11, the PORTA-BAT test and evaluation period should provide valuable information for future SUPT FAR and TTB selection methods (RPR 80-02). According to Dr Jeff Kantor, chief of the Aircrew Selection and Classification Branch, HRL hopes "to develop a profile on each pilot candidate. We're planning to test people before they enter the Air Force and again in pilot training, advanced pilot training, and later in their operational squadrons. Those profiles will be matched with different types of flying missions--fighter, attack, and reconnaissance as well as tankers, transports, and bombers. This information will help determine which of two career tracks a student will enter during specialized UPT."[6] Although still in the test and evaluation phase, data obtained from the PORTA-BAT program could reveal useful predictive



Early Model
Porta[illegible]

variables thereby improving the FAR and TTB predictive success rate achieved in subset 7.

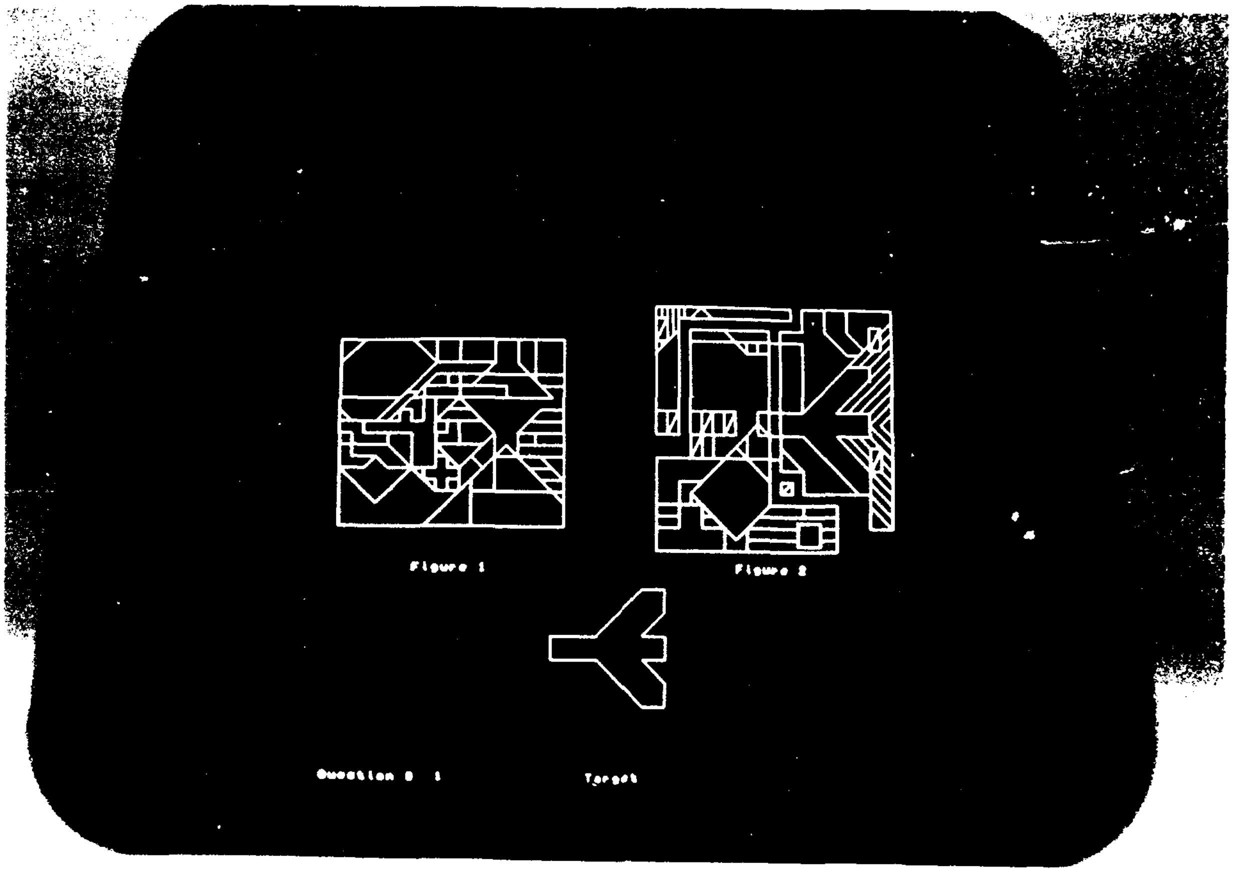
Another possible source of predictive data could stem from a psychosocial evaluation of pilot candidate behavior. Although related to the PORTA-BAT's personality profiler, a psychosocial evaluation could be designed to project an individual's leadership potential, ability to work in a group or structured environment, and behavior variations in a changing social setting.

A social-psychological approach to predicting behavior and performance potential is not a new concept to either the military or civilian community. In particular, the Psychological Sciences Division, Office of Naval Research, conducted several studies into this area one of which was to "develop a series of situational performance problems designed to cover various aspects of leadership skill required by junior Naval officers, and to validate these problems against criteria of on-the-job performance during duty in the fleet."[7] The overall result of this study indicated that there was "a statistically significant positive relationship between performance on the situational problems and job performance as measured . . . on Navy fitness reports."[8]

Another supporter of psychosocial predictors is Capt Frank E. Dully. As commanding officer, Naval Aerospace Medical Institute, Captain Dully routinely lectured on naval aviator behavior and performance. Based on his 18 years in the naval fleet, Captain Dully developed a set of typical behavior characteristics which he believes can accurately identify both the healthy and stressed aviator. These characteristics are identified with a specific social setting (appendix 6).

Recognizing that background and social climate affect individual behavior and that performance is the first step in developing a psychosocial evaluation and screening process. If developed, this process might lead to the identification of more predictive variables. These variables could then be added to the list of identifiable criteria thereby improving the FAR and TTB predictive success rates for pilot training.

Recording the facts, testing the knowledge and measuring the performance of each student pilot forms the basis of today's FAR and TTB recommendation process. However, "it is the whole man who enters the cockpit to undertake flight; into that arena is brought all the frailties that mark the man."[9] Case 3 includes those frailties and, as states earlier, was accepted as being true.



Sample Porta Bat Problem
(Embedded Figures)

NOTES

CHAPTER 4

1. Jacob Cohen, Statistical Power Analysis for the Behavioral Sciences (New York: Academic Press, 1977), 77-81.

2. Recall that the data used to determine these equations was extracted from the flying training records of 1985 student pilots who successfully completed pilot training. The current phase III attrition rate is approximately 7 percent. At the phase II point in training, the advanced training recommendation board (ATRB) decision makers will not know which student pilots will successfully complete phase III training. Since flying training data was not available for phase III failures, it was not possible to determine whether or not the 7-percent attrition would have been evenly distributed between the student pilots predicted for FAR and TTB candidacy.

3. Dr Jeff Kantor, Air Force Human Resources Laboratory, Brooks AFB, Texas, interview with author on 16 October 1985.

4. Basic Attributes Tests (BAT)--Version 4 Information Pamphlet, Air Force Human Resources Laboratory, Manpower and Personnel Division, Brooks AFB, Texas, June 1985, 1.

5. Headquarters Air Training Command Program Guidance Letter, "Pilot Candidate Selection Method (Psychomotor Screening)," 15 March 1985, 1-2.

6. TSgt Jim Katzaman, "Going Batty," Airman, August 1985, 34-5.

7. Clifford P. Hahn, "The Development and Validation of Situational Problems for Training in Those Leadership Behaviors Essential for Effective Performance as a Junior Officer," Office of Naval Research, 1.

8. Ibid., 35.

9. Capt Frank E. Dully Jr, "The Life Style Keys to Flight Deck Performance of the Naval Aviator--Another Window" (California: Society of Automotive Engineers, Technical Paper Series, October 1983), 6.

CHAPTER 5

CONCLUSIONS, RECOMMENDATIONS, AND COMMENTS

As stated earlier, the objective of this research project is to identify the most effective and economical point in undergraduate pilot training (UPT) where individuals would be identified for fighter, attack, reconnaissance (FAR) or tanker, transport, bomber (TTB) duty under the dual-track system. Chapters 1 through 3 served as a point of departure for the analysis of this research problem in chapter 4. A case-by-case examination of possible sets of predictive criteria led to a "best set" of usable criteria, to include both personnel information and flying training performance data. A psychosocial analysis and the basic attributes testing (BAT) program are possible indicators of potential but their value has yet to be determined. The final aspect of the research problem, that has not been addressed, is determining the most effective and economical point.

Conclusions

Since economy can be equated to dollars and cents, the earlier in UPT the FAR and TTB recommendations are made, the less pilot training is going to cost. So, if a determination could be made during the recruiting of potential pilots, the amount of training dollars spent would be minimized. For example: if the Air Force needed a FAR category pilot and he or she could be identified during recruiting, then training dollars would not have to be spent to determine whether or not the individual could be placed into a FAR category. Conversely, if the FAR and TTB recommendations were made at the latest possible point in phase II training, per capita expenses would be at a maximum. The actual dollar cost of the latter case is difficult to determine since neither the flying training syllabus nor the primary jet aircraft have been identified. But, with the emphasis in the Air Force on fuel conservation and reducing expenses, future per capita training costs should be at or below current levels.

Within the context of this research problem, effective equates to determining pilot quality accurately. So, to identify an individual for a FAR or TTB position, one must be as confident as possible that the person being identified possesses the right combination of qualities and has the best chance of being highly successful in his or her designated aircraft of assignment. Based on the information available today, chapter 4 illustrated that an accurate determination of quality was most likely to occur when decision makers considered all available flying training. Consequently, the best FAR and TTB recommendations can be made towards the end of phase II training. But, as noted in the previous paragraph, this is not the most economical point in training to make the recommendations.

In fiscal year 1985 dollars the per hour cost of flying a T-37B aircraft was estimated to be $355.00. As illustrated by the following examples, per hour flying costs of the T-38A and major weapon system aircraft were considerably higher:[1]

Aircraft	Per Hour Cost
B-52G	$10,060.00
C-5A	$ 9,163.00
C-141A	$ 2,891.00
F-15C	$ 4,977.00
F-111F	$ 9,483.00
KC-135A	$ 3,417.00
T-38A	$ 806.00

Although early FAR and TTB recommendations will mean fewer initial undergraduate pilot training dollars, an incorrect FAR or TTB recommendation will probably result in higher phase III attrition and an increase in both phase III and major weapon system flying training time--early recommendations will not be cost effective. An incorrect decision might also place valuable manpower and materiel in jeopardy. Potential losses due to aircraft accidents or incidents further reduces the significance of making early FAR and TTB recommendations. Consequently, the most effective and economical point is reduced to the most effective point. As illustrated in chapter 4, if specialized undergraduate pilot training (SUPT) were implemented tomorrow, the best recommendations would be made when all appropriate personnel and flying training data were considered, and that point in UPT occurs near the end of phase II training.

Recommendations

For the purpose of making recommendations, the undergraduate pilot training program, as defined in chapter 4, is divided into three separate areas: preflight training, light aircraft screening, and pilot training.

Preflight Training

1. The Air Force Reserve Officer Training Corps (AFROTC) program provides college men and women with a basic understanding of the Air Force and their role as junior officers. Specific guidance concerning the pilot career field is not a part of the current college curriculum, but it should be since AFROTC provides a large number of pilot candidates each year. The Air Force should develop a detailed pamphlet for these UPT-bound AFROTC cadets. This guide should include the following:

a. An explanation of the three pilot training programs: helicopter, ENJJPT, and normal pilot training.

b. An outline of the selection methods used for each pilot training program.

c. A description of the flight screening and field training programs to include the possible options in the event of failure.

d. An overview of the typical course of instruction for each pilot training program to include: a normal day in training, training milestones, and special events (first solo, cross-countries, Tactical Air Command [TAC] day and open house).

e. An explanation of the advanced training recommendation board and the aircraft assignment process.

f. Postpilot training programs for each major weapon system and the typical duties and responsibilities of a new pilot in that weapon system.

g. A brief outline of one or two typical pilot career paths for each major air command to include the opportunity for career broadening and promotion potential.

Each qualified student should receive a copy of this pamphlet. An informational approach of this type will benefit pilot candidates in today's generalized program as well as SUPT. It will provide them with immediate answers to several pilot training questions and present the opportunities associated with flying the various major weapon systems aircraft. A lesson learned during World War I pilot training was that satisfactory training results could not be obtained unless students had a high desire to succeed (see chap. 1). Knowledge about a major weapon system will enable the pilot candidate to establish a tentative personal goal and select the aircraft that is best suited for his or her lifestyle. By developing an early interest in a specific aircraft and establishing a personal goal, student pilot performance in training should improve and their desire to succeed should increase.[2] The feasibility of having an informational pamphlet approach to Air Force career expectations and opportunities should be explored for the other career fields.

2. Air Force recruiters do an admirable job in screening young men and women for pilot training program selection. But, because of their geographic separation and unique job requirements, they often have to draw on several sources of information or their prior experiences when addressing pilot training opportunities. The informational pamphlet outlined for the AFROTC program should be modified for the Officer Training School (OTS) program and be made available to each recruiter to distribute to pilot recruits.

3. The Weighted Professional Officer Course Selection System (WPSS) worksheet (AFROTC Form 1000) and the pilot selection opportunity worksheet are numerical rating systems used by AFROTC and OTS to initially establish an individual's pilot potential. The Air Force needs to develop a common worksheet to satisfy both AFROTC and OTS requirements. Although AFROTC and OTS are two distinct methods of training, a standardized approach to initial screening will benefit both

programs. The value of AFROTC and OTS standardization is reflected by the recent decision to modify the flight instruction program (see chap. 2).

Light Aircraft Screening

1. Career enlightenment and goal setting should be extended to the light aircraft screening program. An aircraft specific information program needs to be incorporated into the flight screening programs. A suggested approach is as follows:

a. Develop a concise videotape briefing that honestly depicts the undergraduate pilot training program--from preflight through graduation. This briefing should emphasize the basics: overall course objectives, location of training bases, duration of course, a brief description of each phase of training, a normal training day, and the assignment process.

b. Prepare a videotape presentation for each major air command that accurately presents the duties and responsibilities of a pilot flying one of its weapon systems. The flow of the tape should be from the general to the specific. For instance: the command mission statement, the mission of its flying organizations, location of its flying bases, the type of aircraft flown, post-UPT training programs, specific duties and responsibilities of a new pilot for each particular weapon system, possible career paths, and promotion potential.

c. Require each student to view the videotapes before graduation from flight screening.

d. Update the videotape presentations annually.

2. Since aircraft deployment under SUPT will vary depending on the location of the pilot training base, some bases will have TTB training while others will be designated as FAR bases (see chap. 2). To reduce the number of student pilot moves following completion of phase II SUPT, the Air Force Manpower and Personnel Center should adopt a composite factor assignment process to determine the initial base of assignment for each pilot candidate. As a minimum, the following factors should be included in this assignment process:

a. Student pilot preference--upon completion of flight screening, require each student to designate the major air command and specific aircraft he or she wishes to fly following pilot training graduation.

b. Flight screening instructor evaluation--require each flight screening instructor to evaluate their student's potential for flying both FAR and TTB aircraft.

c. Student pilot potential--assess student pilot potential based upon an evaluation of their personnel data and, if applicable, their psychomotor testing results (see chap. 4).

Pilot Training

1. Under SUPT, primary jet training will be common to all pilot training bases with Reese AFB, Texas; Vance AFB, Oklahoma; and Columbus AFB, Mississippi, being designated as TTB bases (see chap. 2). The draft TTB system operation concept (SOC) states that "ATC [Air Training Command] evaluated the potential options for operational desirability and resource utilization. Operational considerations included production capacity, sufficiency of existing airspace, availability of suitable auxiliary airfields, runway compatibility of aircraft, logistics supportability, impact of midcourse student permanent change of station (PCS) moves, and ease of transition from UPT to SUPT."[3] ATC's evaluation could provide additional information about SUPT, so a copy of the source document was requested. The document provided was a 1978 operations analysis report which found that the most desirable basing strategy was to have Williams AFB, Arizona, Vance AFB, and Columbus AFB conduct TTB training. Additionally, assumptions were made at the beginning of the report which are not valid in today's training environment.[4] Since the current basing plan does not coincide with the 1978 finding and the report is based on questionable assumptions, recommend a new study be conducted to reconsider SUPT basing options.

2. Since the large pilot training efforts of the 1940's, attempts have been made to identify and quantify successful FAR and TTB attributes (see chap. 1). Some advancements have been made, but as illustrated in chapter 3, the recommendations made by the advanced training recommendation boards (ATRBs) have accounted for a 98.7-percent completion rate in post-UPT training courses. With such a high-completion rate, the ATRB process has successfully identified those student pilots who have the potential to complete major weapon system training. The first step in the ATRB process, irrespective of the UPT base, is to obtain instructor pilot input. After several additional steps, the ATRB decision makers are presented with a complete class picture in the form of a spread sheet.

In preparation for making a FAR and TTB decision earlier and to complement the current ATRB system, the following course changes are recommended:

a. Modify the computerized grade sheets designed for recording T-37 and T-38 flight performance to include a follow-on training or ATRB maneuver number entry. For instance: in the T-37 contact maneuver item file, maneuver number 45 could be ATRB. This ATRB maneuver line would have two possible entries, FAR or TTB, as follows:

	FAR	TTB
ATRB	===	===

b. Issue guidelines for completing the ATRB entry as follows: based on the preparation, performance and demonstrated capability of the student on that particular flight; the instructor pilot assesses the student's potential for flying a FAR or TTB aircraft and indicates the highest potential by filling in the appropriate entry.

c. Require the ATRB entry to be recorded by the instructor pilot on each completed sortie following the T-37 solo block of instruction.

d. Modify the check-flight rating analysis program to tally all of the FAR and TTB recommendations for each student pilot and make this information available to the appropriate class commander. Require the class commander to present this information on the class spread sheet prepared for ATRB review.

In addition to providing the ATRB decision makers with daily instructor pilot assessments and establishing a data base for future recommendation proceedings, the ATRB entry will provide positive feedback to the T-37 and T-38 flight lines. This feedback will either realign or validate the factors used by the individual instructor pilots to assess their student's potential, thereby establishing a standard for the future training program.

3. As explained in chapter 3, the base-level computer system at each UPT wing uses the check-flight rating analysis program to compute a numerical flying average for each student. Each student's flying average is based on the maneuvers graded for each completed check flight, and those maneuvers normally vary from student to student. A maneuver-grade table, an element of the check-flight rating analysis program, converts the letter grades into numerical values before the flying averages are computed. This maneuver grade table is a weighted table and the numerical value of an excellent on one maneuver may not equal the numerical value of an excellent on another maneuver. For example; on the T-37 contact check flight, the chandelle grades are converted as follows:

Fair - 3 points
Good - 4 points
Excellent - 5 points.

Whereas, clearing grades are interpreted as:

Fair - 9 points
Good - 12 points
Excellent - 15 points.

By examining several ATRB recommendations and follow-on student assignments, it became apparent that check-flight performance and the associated flying averages were important elements in the FAR and TTB equation (see chap. 4). Recommend that the current ATRB process be modified as follows:

a. Provide the major air commands (ATC, MAC, SAC, TAC) with a maneuver item file for each category and phase of training.

b. Request them to assign a point value for all maneuver grades. For instance; maneuver--T-37 slow flight: unsatisfactory - 0, fair - 5, good - 10, and excellent - 15.

c. Remove the current maneuver-grade table from the check-flight rating analysis program and replace it with the inputs received from each major air command.

d. Modify the check-flight rating analysis program and compute four numerical flying averages, based on major air command inputs, which will incorporate both check-flight scores and daily performance.

e. Modify ATCR 51-28, Advanced Training Recommendation Board, to ensure that all four flying averages reach the ATRB decision makers for evaluation prior to convening the ATRB.

f. Establish annual procedures to revalidate the command inputs. A possible forum for this task might be the annual course training standards conference.

During the 1985 Course Training Standards Conference, the SAC representative pointed out that, for a B-1 pilot position, SAC will require FAR qualified students trained through the TTB track.[5] The suggested modifications allow the major air commands to have a direct line to the ATRB decision makers. ATC, MAC, SAC, and TAC will be able to establish their own selection criteria and emphasize the flying skills they feel are critical to a particular type of weapon system. Their input should improve graduate performance in follow-on assignments. In addition, the ATRB decision makers will have a better idea of daily student flying performance and student aptitude.

By the time SUPT is implemented the major air commands will have had the opportunity to identify and validate those phase II attributes which they feel are important to FAR and TTB aircraft. This knowledge will facilitate a smoother transition to the future SUPT FAR and TTB recommendation process and increase the probability of identifying those pilot candidates who are best suited for FAR and TTB aircraft.

Comments

Goal setting and the information recommendations might be viewed as a salesmanship approach to pilot training. Recommending a direct line of communication from the instructor pilots and major air commands to the ATRB decision makers could be construed as meddling with a proven program. Some may scoff when reading these recommendations and point out that they are nice but not necessary. Their argument would be simple, seemingly solid, and probably include the following: the Air Force selects only highly motivated individuals for pilot training, there are 10 qualified applicants for every available pilot training position, and the high success rate in postgraduate training courses proves that the current system works.

These statements are based in truth and it would be foolish to attempt to refute them. However, not all student pilots are motivated to fly high-performance single-seat aircraft, but they are nonetheless highly motivated individuals. Also, future trends may significantly change the pilot training outlook and reduce the effectiveness of current methods. Two specific threats are as follows:

1. Major weapon system complexity is increasing and so is the cost of training a fully mission capable pilot. Ensuring that the right man or woman is place in the right cockpit will become increasingly more important regardless of the type of pilot training system used. Goal setting at the recruiting level and direct involvement at the instructor pilot and user level should increase the probability of identifying and training the right individuals.

2. The Future Aviation Professionals of America (FAPA), an Atlanta based pilot-counseling company, "estimates that on average, almost 6,000 pilots will be hired annually by airlines operating jet equipment through the end of this century. This estimate takes into consideration economic downturns as well as economy gains. Some of the larger airlines, including American, are looking at establishing their own flight training programs . . . much as is done by the military."[6] If FAPA's projections are even close to reality, the Air Force will compete with the civilian sector for pilot recruits and may face significant pilot retention problems. Information, career education, encouraging an individual to establish a personal goal, and helping him or her achieve that goal can provide the Air Force with the competitive edge it might need to recruit and retain future pilots.

> . . . new conditions require for solution, and new weapons require for maximum application, new and imaginative methods. Wars are never won in the past.
>
> Gen Douglas MacArthur

NOTES

CHAPTER 5

1. Air Force Regulation (AFR) 173-13, US Air Force Cost and Planning Factors, 1 February 1985, 6-8.

2. Richard M. Steers, Motivation and Work Behavior (New York: McGraw-Hill, Inc., 1983), 222-4.

3. Headquarters Air Training Command (ATC), "System Operational Concept for the Tanker, Transport, Bomber Training System" (Draft), undated, 12.

4. Headquarters ATC, "Basing Strategies for Specialized Undergraduate Pilot Training (SUPT)," November 1978, 1-5, 41-44.

5. Headquarters ATC, "Minutes of 1985 Course Training Standards Conference," 16 January 1986, 3.

6. David M. North, "US Airlines Expect to Hire Increased Numbers of Pilots," Aviation Week and Space Technology, 11 November 1985, 97-101.

APPENDICES

Appendix 1

Statistical Information on Predictor Variables

Variable List:

1. T-37 midphase check ride (C2790)
2. T-37 contact check ride (C3190)
3. T-37 instrument check ride (I2290)
4. T-38 contact check ride (C5590)
5. T-38 navigation check ride (N5590)
6. T-38 formation check ride (F5690)
7. Total T-37 flying time
8. Total T-38 flying time
9. Total flying time

Numerical Code:

1. Unsatisfactory - 1
2. Fair - 2
3. Good - 3
4. Excellent - 4

Variable	Mean	Mode	Median	Standard Deviation	Valid Cases
1	2.578	3.000	2.873	1.058	1560
2	2.872	3.000	3.037	0.958	1585
3	2.962	3.000	3.136	1.010	1585
4	2.485	3.000	2.810	1.088	1562
5	2.927	3.000	3.110	1.020	1585
6	2.866	3.000	3.040	0.969	1577
7	77.871	75.700	76.997	4.634	1601
8	103.060	101.000	102.206	5.047	1603
9	178.401	-------	179.827	21.921*	1618
10	FAR designee: 847 graduates--53.5 percent				
	TTB designee: 737 graduates--46.5 percent				1584

*The high standard deviation for the total flying time variable was due to several low total flying time entries on the original data file. These entries were omitted during the regression analysis.

Regression Inputs

Variable	Mean	Standard Deviation	Valid Cases
1	2.581	1.058	1514
2	2.890	0.950	1514
3	2.976	1.005	1514
4	2.494	1.088	1514
5	2.944	1.013	1514
6	2.883	0.966	1514
7	77.799	4.144	1514
8	102.926	4.210	1514
9	180.568	7.683	1514

Level of Significance
(Highest to Lowest)

Total flying time, T-38 contact check ride, T-37 midphase check ride, T-38 formation check ride, T-37 contact check ride, total T-38 flying time, total T-37 flying time, T-37 instrument check ride, T-38 navigation check ride

Regression Results

Variable	Coefficient
1	-0.0599201
2	-0.0582280
3	-0.0459140
4	-0.0677473
5	-0.0204249
6	-0.0603689
7	0.0186920
8	0.0276071
9	0.0026618
constant	-2.4689885

When all variables have been replaced with numerical values, the results should be interpreted as follows:

0 - 1.499999--FAR recommendation

1.5 - 2.5--TTB recommendation

Appendix 2

Subset Regression Results

Variable List:

1. T-37 midphase check ride (C2790)
2. T-37 contact check ride (C3190)
3. T-37 instrument check ride (I2290)
4. T-38 contact check ride (C5590)
5. T-38 navigation check ride (N5590)
6. T-38 formation check ride (F5690)
7. Total T-37 flying time
8. Total T-38 flying time
9. Total flying time

Numerical Code:

1. Unsatisfactory - 1
2. Fair - 2
3. Good - 3
4. Excellent - 4

SUBSET 1

Variable	Coefficient
1	-0.1367927
2	-0.1276528
constant	2.1767126

SUBSET 2

Variable	Coefficient
1	-0.1247221
2	-0.1095027
3	-0.1027794
constant	2.3976937

SUBSET 3

Variable	Coefficient
1	-0.0784353
2	-0.0770887
7	0.0365257
constant	-0.9630988

SUBSET 4

Variable	Coefficient
1	-0.0795195
2	-0.0725171
3	-0.0732034
7	0.0305752
constant	-0.2934376

SUBSET 5

Variable	Coefficient
1	-0.1224821
2	-0.1176713
6	-0.1194692
constant	2.4526513

SUBSET 6

Variable	Coefficient
1	-0.0709520
2	-0.0731036
6	-0.1042035
7	-0.0330162*
constant	-0.4226337

*This coefficient is based on total T-37 flying time. The mean and standard deviation for total T-37 flying time for this regression was:

mean--77.8368
standard deviation--4.1527
valid cases--1564

When all variables have been replaced with numerical values, the results should be interpreted as follows:

0 - 1.499999--FAR recommendation

1.5 - 2.5--TTB recommendation

Appendix 3

Statistical Information on Predictor Variables

Variable List:

1. Prior service
2. Degree level (bachelor, master, doctorate)
3. AFOQT pilot composite
4. AFOQT navigator-technical composite
5. AFOQT academic composite
6. AFOQT quantative composite
7. AFOQT verbal composite
8. Age
9. Degree type (arts or science)
10. Marital status
11. T-37 midphase check ride (C2790)
12. T-37 contact check ride (C3190)
13. T-37 instrument check ride (I2290)
14. T-38 contact check ride (C5590)
15. T-38 navigation check ride (N5590)
16. T-38 formation check ride (F5690)
17. Total T-37 flying time
18. Total T-38 flying time
19. Total flying time

Variable Number		Numerical Code	Variable Number		Numerical Code
1	Nonprior service	- 0	2	Bachelor	- 1
	Prior service	- 1		Master	- 2
				Doctorate	- 3
3-8	As reported		9	Arts	- 0
				Science	- 1
10	Single	- 0	11-16	Unsatisfactory	- 1
	Married	- 1		Fair	- 2
				Good	- 3
				Excellent	- 4
17-19	As reported				

Level of Significance
(Highest to Lowest)

Total flying time, T-38 contact check ride, T-37 midphase check ride, T-38 flying time, T-37 flying time, T-38 formation check ride, T-37 contact check ride, T-37 instrument check ride, AFOQTQ, age, degree level, T-38 navigation check ride, AFOQTV, AFOQTA, AFOQTN, AFOQTP, prior service, degree type

Regression Results

Correlation Coefficient: r = 0.64250
Standard Error: 0.38430

Variable	Coefficient	Variable	Coefficient
1	0.0130420	11	-0.0656176
2	-0.1806619	12	-0.0644135
3	0.0018635	13	-0.0506184
4	-0.0027309	14	-0.0655278
5	-0.0075243	15	-0.0209633
6	0.0030917	16	-0.0658602
7	0.0050053	17	-0.0194398
8	0.0018567	18	-0.0321170
9	-0.0045447	19	-0.0005604
10	not in equation	constant	-2.7733569

When all variables have been replaced with numerical values, the results should be interpreted as follows:

0 - 1.499999--FAR recommendation
1.5 - 2.5--TTB recommendation

Appendix 4

Subset Regression Results

Variable List:

1. Prior service
2. Degree level (bachelor, master, doctorate)
3. AFOQT pilot composite
4. AFOQT navigator-technical composite
5. AFOQT academic composite
6. AFOQT quantative composite
7. AFOQT verbal composite
8. Age
9. Degree type (arts, science)
10. Marital status
11. T-37 midphase check ride (C2790)
12. T-37 contact check ride (C3190)
13. T-38 formation check ride (F5690)
14. Total T-37 flying time

Numerical Code: The above variables are coded as in appendix 3.

Level of Significance (Highest to Lowest)

Total T-37 flying time, T-38 formation check ride, T-37 midphase check ride, T-37 contact check ride, AFOQTQ, AFOQTV, AFOQTA, degree level, age, marital status, AFOQTN, AFOQTP, prior service

Regression Results (Subset 7)

Correlation Coefficient: r = 0.54008
Standard Error: 0.42180
Descriptive Success Rate: 75.6 percent

Variable	Coefficient	Variable	Coefficient
1	-0.0322532	8	not in equation
2	-0.1845633	9	-0.0331571
3	0.0025048	10	-0.0732975
4	-0.0034195	11	-0.0724628
5	-0.0095874	12	-0.1084372
6	0.0066338	13	0.0327184
7	0.0019143	14	-0.0327184
		constant	-0.7946387

Regression Results
(Using Subset 3 and Personnel Data)

Correlation Coefficient: r = 0.47005
Standard Error: 0.44267
Descriptive Success Rate: 73.2 percent

Variable	Coefficient	Variable	Coefficient
1	-0.0184597	8	0.0024122
2	-0.1796284	9	-0.0121218
3	0.0028714	10	-0.0306870
4	-0.0045471	11	-0.0999486
5	-0.0085181	12	-0.0877421
6	0.0036235	14	0.0235525
7	0.0060866	constant	-0.3820116

Regression Results
(Using Subset 4 and Personnel Data)

Correlation Coefficient: r = 0.49665
Standard Error: 0.43543
Descriptive Success Rate: 74.4 percent

Variable	Coefficient	Variable	Coefficient
1	-0.0316425	9	-0.0154935
2	-0.2005958	10	-0.0270956
3	0.0023027	11	-0.0989591
4	-0.0039875	12	-0.0812201
5	-0.0080865	14	0.0179690
6	0.0035561	**	-0.0856262
7	0.0057015	constant	0.2644823
8	0.0024759		

**T-37 instrument check ride (I2290)

When all variables have been replaced with numerical values, the results should be interpreted as follows:

0 - 1.499999--FAR recommendation
1.5 - 2.5--TTB recommendation

Appendix 5

Basic Attributes Tests (BAT) Battery Summary

	TASK NAME	TASK CODE
1.	Task battery introduction	BIO
2.	Perceptual speed	SPD
3.	Dot estimation	DOT
4.	Time-sharing	TMS
5.	Encoding speed	ENC
6.	Mental rotation	MRT
7.	Item recognition	ITM
8.	Immediate/delayed memory	IDM
9.	Decision-making speed	DMS
10.	Risk taking	RSK
11.	Embedded figures	EMB
12.	Self-crediting word knowledge	WKA
13.	Activities interest inventory	AIA
14.	Automated aircrew personality profiler	AAP
15.	BAT versions of psychomotor tests	PS2
	a. Two-hand coordination (rotary pursuit)	
	b. Complex coordination (stick and rudder)	

INDIVIDUAL TASK SUMMARIES:

1. TASK BATTERY INTRODUCTION BIO

Intro is a subprogram and interactive task which collects identity, age, gender, and other vital statistics together with items of personal history and attitudes related to flying.

2. PERCEPTUAL SPEED SPD

The subject is presented with a sequence of four digits all at once and in random order, and is required to respond by pressing the response pad buttons in the same order as the presented digits. In addition to noting accuracy and overall response time, a measure of perceptual speed is taken by forcing the subject to press a special "enabling key" which activates his response pad buttons on each trial.

PSYCHOLOGICAL FACTORS: Information input efficiency.

Source: Basic Attribute Tests (BAT)--Version 4 Information Pamphlet, Air Force Human Resources Laboratory, Manpower and Personnel Division, Brooks AFB, Texas, June 1985, 1.

3. DOT ESTIMATION DOT

The subject is presented with two boxes containing an arbitrary number of dots; one of the two boxes has one more dot than the other. It is the subject's task to determine as quickly as possible which of the two boxes has the greater number of dots. The subject is not explicitly told to count the dots in each box, only to decide as quickly and accurately as possible which has the greater number.

PSYCHOLOGICAL FACTORS: Complusiveness vs. decisiveness.

4. TIME-SHARING TMS

During a series of 90-second trials the subject in this task is first required to learn a compensatory tracking task. To perform the compensatory tracking task, the subject must anticipate the movement of a marker on a visual display and operate a control stick to counteract the movement and keep the marker aligned with a fixed central point. An adaptive logic adjusts task difficulty throughout the task. The control dynamics are a combination of rate and acceleration components and the "disturbance" is a quasi-random summed sinusoidal forcing function. After a fixed number of "tracking only" trials, the subject is required to track while cancelling digits which appear at random intervals and locations on his display. He "cancels" the digits by pressing corresponding buttons on his keypad. A "cross-adaptive" logic forces him to respond to digits within a specified period of time after onset. The dual-task trials occur in two blocks of three trials each. The information processing load is 1 bit in the first block and 3 bits in the second. This task ends with a final block of "tracking only" trials. The effects of the different secondary task loads are reflected in the pattern of level of difficulty changes generated by the adaptive logic which effectively holds tracking error constant.

PSYCHOLOGICAL FACTORS: Higher order tracking ability, learning rate, and time-sharing ability as a function of differential load in a task involving one continuous- and one discrete-events subtasks.

5. ENCODING SPEED ENC

Subjects are presented simultaneously with two letters and required to make a same-different judgment on the letter pair. This judgment may be based on: Physical identity (AA vs. Aa), or name identity (AA vs. AH). The latency of the encoding judgment provides a measure of the speed of the encoding process. Moreover, latency differences indicate the speed of recoding; that is, the reaction time for the name identity judgments minus reaction time for physical identity judgments indicates the speed with which physical stimuli may be recoded to the level at which their name may be accessed.

PSYCHOLOGICAL FACTORS: Verbal processing ability at increasing levels of information complexity.

6. MENTAL ROTATION MRT

Subjects are presented sequentially with a pair of letters and asked to make a speeded same-different judgment. The letter pair may be either identical or mirror-images, and the pair may be either in the same orientation, or rotated in space with respect to each other. A correct "different" judgment is associated with a mirror image and is not a function of relative rotation. In order to perform the task, the subject must form a mental image of the first letter (no longer displayed) and perform a point-by-point comparison with the second (which remains on the display). In addition when the letters are rotated with respect to each other, the subject must mentally rotate the mental image of one letter into congruence with the other before undertaking the comparison.

PSYCHOLOGICAL FACTORS: Mental-spatial transformation and classification.

7. ITEM RECOGNITION ITM

In the item recognition paradigm, a series of one to six digits is presented in a row on a CRT display, removed and followed, after a brief delay, by a single digit. The subject is instructed to remember the initial series of digits, then to decide if the single digit is one of those presented in the initial series. The subject is instructed to push one button (marked "yes"), if the digit was in the series; another (marked "no"), if not. The subject is instructed to make a response as quickly and accurately as possible.

PSYCHOLOGICAL FACTORS: Short-term memory store, search, and compare operations.

8. IMMEDIATE/DELAYED MEMORY IDM

In this task the subject is presented with a sequence of digits and required to push a button corresponding to the item which occurred one or two digits previously. Each subtask is presented in two parts. In the first part the digits are presented for .5 seconds followed by a 2-second interstimulus interval. In the second part, the interstimulus interval is 5 seconds; thus, part one deals with immediate memory, part two deals with delayed memory for both the one- and two-back subtasks.

PSYCHOLOGICAL FACTORS: Continuous short-term memory storage and retrieval operations.

9. DECISION-MAKING SPEED DMS

In this choice reaction time task, one of a number of alternative signals is presented to the subject. The subject is required to respond to the signal with the matching response as quickly as possible. The key to this task is the amount of uncertainty that must be resolved in order to make the response decision. When more alternative signals may potentially be presented, greater uncertainty exists and the decision is made more slowly. This task consists of four subtasks each with three parts: in part one, two potential signals and two responses are defined (1 bit); in part two, four potential signals and responses (2 bits); and part three, eight potential signals and responses are defined (3 bits). In subtask two, where but not when; in subtask three, when but not where; and, finally, in subtask four the subject knows neither where or when.

10. RISK TAKING RSK

In the risk-taking task, the subject is presented with a matrix of 10 boxes (in two rows of 5) and is told that 9 of the boxes contain a reward, whereas one box is a disaster box. The subject is allowed to select the boxes, one at a time. If the selected boxes contain a payoff, the subject gets to keep it, but if it is the disaster box, the subject loses all of the payoff acquired. The average number of boxes selected provides an index of the subject's propensity for taking risks when making decisions.

PSYCHOLOGICAL FACTORS: Effects of uncertainty on decision making.

11. EMBEDDED FIGURES EMB

The subject is presented with a simple geometric figure and two complex geometric figures. His task is to decide which of the two complex figures has the simpler figure embedded within it and to indicate a choice by pressing the button corresponding to that figure. Speed and accuracy of response measures are taken.

PSYCHOLOGICAL FACTORS: Field dependence/independence.

12. SELF-CREDITING WORD KNOWLEDGE WKA

The self-crediting test is essentially a vocabulary test where the subject is presented with a "target" word and five other words from which he must choose the one which means most nearly the same as the "target." There are 3 blocks of 10 questions each and the target words become increasingly difficult with each succeeding block. The subject is informed of this increasing difficulty and is required to make a bet prior to each block which reflects how well he expects to do.

PSYCHOLOGICAL FACTORS: Self-assessment ability/self-confidence.

13. ACTIVITIES INTEREST INVENTORY AIA

This task is a questionnaire designed to sample the subject's interest in various activities. The subject is presented with 81 pairs of activities and asked to choose between them. For each activity the subject is told to assume he or she has the necessary ability. The activities force a choice between tasks which weigh differently on threat to life and limb, sometimes subtlety, sometimes not.

PSYCHOLOGICAL FACTORS: Survival attitudes.

14. AUTOMATED AIRCREW PERSONALITY PROFILER AAP

This task is a questionnaire examining subject attitudes and interests. The subject is presented with 200 questions each requiring a choice between two alternatives. The subject is instructed not to spend time pondering, but to give the first, natural answer as it comes. The instrument is a traditionally formatted personality inventory specially compiled in cooperation with the School of Aerospace Medicine and targeted for aircrew work.

PSYCHOLOGICAL FACTORS: Personality factors to be extracted.

15. BAT VERSIONS OF PSYCHOMOTOR DEVICE TESTS: TWO-HAND COORDINATION AND COMPLEX COORDINATION (STICK AND RUDDER). PS2

Two subtests evaluate psychomotor abilities. The first subtest, the two-hand coordination task, is a variation of an old rotary pursuit task in which a target box traverses a circular path on a CRT at a rate of 20 cycles per minute. The rate of movement of the target box within each cycle varies in a fixed sinusoidal pattern. The subject controls the vertical and horizontal movement of a small cross (zero order dynamics) using a left and right joystick, respectively. While the original psychomotor device version of this test uses two dual-axis joysticks (isotonic), the BAT version uses a left-hand single-axis control device and a right dual-axis device (both spring centered). Direction of control and the fact that each control device is restricted to a single-axis effect (left--vertical, right--horizontal) remain the same. The subject receives instruction followed by a 3-minute practice and a 5-minute test run. Both horizontal and vertical tracking error scores are recorded as are respective axis-stick movement rate scores. The second subtest, complex coordination, involves the use of dual-axis joystick (right-hand, first-order dynamics) to control the horizontal and vertical movement of a small cross. The original task's rudder pedals are replaced by the BAT single-axis left-hand joysticks to control the left-right movement of a vertical "rudder bar" of light at the base of the CRT (also, first-order relationship). The subject's task is to maintain the cross (against a constant horizontal- and vertical-rate bias) centered on a large cross fixed at the center of the CRT while, at the same time, centering the rudder bar at the base of the CRT also against a constant-rate bias. Instructions, practice, testing, and scoring are as in the first subtask.

PSYCHOLOGICAL FACTORS: Low to moderate order tracking and time-sharing ability in pursuit and compensatory tracking tasks involving multiaxis continuous events.

Appendix 6

Excerpts from "The Life Style Keys to Flight Deck Performance of the Naval Aviator--Another Window" presented by Capt Frank E. Dully to The Second Aerospace Behavioral Engineering Technology Conference, Long Beach, California, 3-8 October 1983.

1. The cardinal feature of the healthy aviator is being in control . . . he has gravitated towards this task since he was a toddler. He probably is the oldest son. He learned to survive in a success oriented home environment where mastery and achievement were the order of the day.

2. His male/female interface is marked by calculated emotional distance. This, too, has its origins in early childhood where it is obvious to all that a boy who clings to his parents is an embarrassment. Big boys don't cry. Dependency feelings are unmasculine.

3. The aviator is a mission oriented compartmentalizer. Compartmentalization offers a system to exclude distractions . . . all the unrelated components: an overdrawn bank account, a fight with the spouse, etc. Controllers dislike interruptions and are commonly quite intense in mission accomplishment, sometimes without regard for the relative importance or unimportance of the task.

4. He is systematic and methodical. This is actually a summation of the other three characteristics. The controller, hell-bent to accomplish a mission, unencumbered by distractions, and reinforced by his successes, believes he has found a system or method to ensure the continued success of his efforts. There shall be no surprises.

Capt Dully believes that the following defects, if left unattended, will trap the aviator and have disastrous effects:

1. Limited spontaneity.

2. Complacency.

3. The familiarity breeds contempt syndrome--increasing experience in an aircraft excludes the aviator from being hurt by the aircraft.

4. The ritual trap--a preflight performed thousands of times becomes devoid of meaning.

5. The "positive maleness feedback" requirement--risk taking or flying dangerously to prove himself better.

Captain Dully defines a pecking order for aviators. Multiplaced propeller driven aircraft are on the lower end and single-seat jet aircraft with a tailhook are on the upper end of the spectrum. Captain Dully believes that the higher up on the pecking order one goes, the greater is the preponderance of oldest sons to be found, beginning at the low end with 50 percent or less, and culminating at the high end with 80 percent or better.