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AIR WAR COLLEGE

RESEARCH REPORT

PILOT CANDIDATE SELECTION

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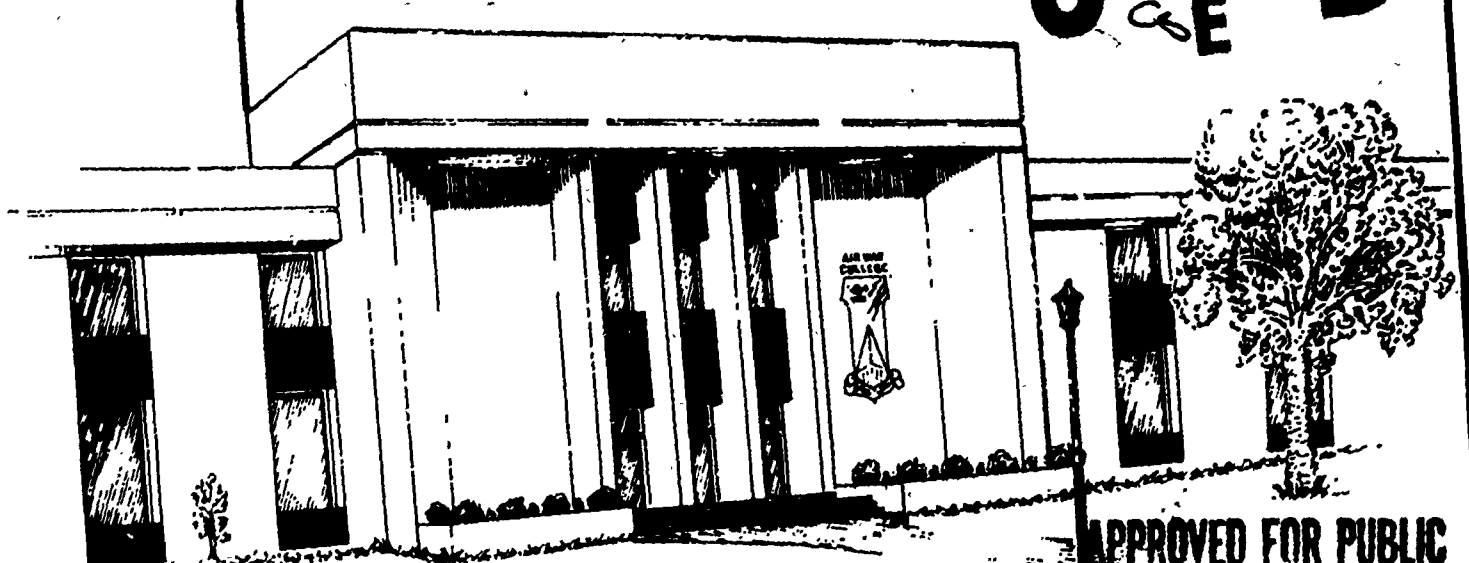

AIR UNIVERSITY
UNITED STATES AIR FORCE
MAXWELL AIR FORCE BASE, ALABAMA

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PILOT CANDIDATE SELECTION

by

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A DEFENSE ANALYTICAL STUDY SUBMITTED TO THE FACULTY

IN

FULFILLMENT OF THE CURRICULUM

REQUIREMENT

Advisor: Lieutenant Colonel Barry R. Levitz

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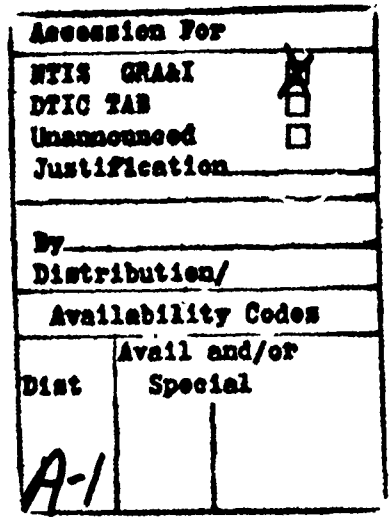

EXECUTIVE SUMMARY

TITLE: Pilot Candidate Selection

AUTHORS: Robert M. Negley, Jr., Colonel, USAF and Gerald V. Boesche, Lieutenant Colonel, USAF

This paper deals with the current system for pilot candidate selection to include selection sources and criteria. It covers the historical record of generalized and specialized pilot training. With the demand for pilots, there is a need to produce a better finished product from Undergraduate Pilot Training. The answer would seem to be Specialized Undergraduate Pilot Training, which is what the U.S. Air Force and Air Training Command are advocating and have been for years. Much research and development has been done, especially in the last 10 years, to come up with a better selection system for pilot candidates. An improved selection system would help decrease attrition and could be used for earlier track selection for Specialized Undergraduate Pilot Training. This paper evaluates the current selection system and the selection methods and tools that are available and could be used in the future. The main focus is on what selection criteria is the best predictor of success and should be used in the future to select candidates for pilot training.

BIOGRAPHICAL SKETCH

Colonel Robert M. Negley (B.A., Colgate University) has been associated with Air Training Command's (ATC) Undergraduate Pilot Training (UPT) program throughout most of his Air Force career. After graduation from UPT at Vance Air Force Base (AFB), Enid, Oklahoma in 1969, he served as a T-37 instructor pilot, Flight Commander, and Chief, Check Section at Laredo AFB, Texas until 1972. From 1972 to 1973, he served as an OV-10 Forward Air Controller (FAC) in Southeast Asia. In 1974, he returned to ATC at Reese AFB, Texas where he again served as an instructor pilot and supervisor. In 1979, Colonel Negley was assigned to Headquarters, Air Training Command, where he held positions of Chief, Airspace and Air Traffic Control Division and Chief, Operations Division until 1983. From 1983 to 1985, he commanded the 96th Flying Training Squadron at Williams AFB, Arizona. Following his tour at Williams, he returned to ATC Headquarters as Chief of the Inspector General's Operations and Training Division. His most recent assignment was as Headquarters USAF, Chief, Education and Training division at the Pentagon from 1986 to 1988. Colonel Negley has 4000 flying hours in trainer and FAC aircraft. He graduated from Squadron Officer School in 1971, Air Command and Staff College in 1979, and the Air War College in 1989.

BIOGRAPHICAL SKETCH

Lieutenant Colonel Gerald V. Boesche (M.B.A., University of Colorado) has been involved with Undergraduate Pilot Training (UPT) since he was a student pilot at Vance Air Force Base (AFB), Enid, Oklahoma in 1969. He served as a T-38 instructor pilot at Craig AFB, Selma, Alabama from 1970 to 1972 and as a T-38 instructor pilot at Pilot Instructor Training, Randolph AFB, San Antonio, Texas from 1972 to 1974. He flew the T-37 from 1975 to 1978 while assigned to the U.S. Air Force Academy and the F-4 from 1978 to 1982 while stationed at Ramstein Air Base, West Germany. Returning to Air Training Command (ATC) in 1982, Lt Col Boesche was a T-37 instructor pilot, Flight Commander, and Chief, Check Section at Reese AFB, Lubbock, Texas until 1984. In 1984, he was assigned to Headquarters, Air Training Command as the Chief, Primary Branch (T-37), ATC Standardization/Evaluation Division at Randolph AFB. From 1986 to 1988, Lt Col Boesche was the 25th Flying Training Squadron Commander (T-38) and then the Assistant Deputy Commander for Operations at Vance AFB. He has over 4300 hours flying time in trainer and fighter aircraft and over 11 years experience in Air Training Command. He graduated from Squadron Officer School in 1975, and the Air War College in 1989.

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CHAPTER I

INTRODUCTION

Background

Since the early 1960s, the United States Air Force (USAF) has used a "generalized" system to train new pilots. The term "generalized" Undergraduate Pilot Training (UPT) simply means that each student receives essentially the same training. Prior to that time, from 1939 through 1959, the Army Air Corps and the United States Air Force conducted Specialized Undergraduate Pilot Training (SUPT). Students received advanced training in twin-engine aircraft if they were going to fly heavy aircraft, or trained in single-engine aircraft if they were going to fly fighters. This program continued until 1960 when a two aircraft, single track "generalized" UPT became the standard. (3:9)

Several key factors contributed to the switch from a specialized training philosophy. The Air Force had begun to integrate two new jet training aircraft, the T-37 and T-38, to replace the T-28, primary trainer, and the T-33, advanced trainer, for those students bound for fighters. Originally, the TB-25 was to continue to be used for the heavy aircraft advanced training. However, in 1957, the fleet of TB-25s was left virtually unsupportable after a catastrophic hailstorm at Reese Air Force Base (AFB), Texas. Most available spare parts were used to repair those damaged aircraft. By 1959

there were no spare parts available for the TB-25s and no funds to develop and purchase a new heavy trainer. (3:9) Thus, the TB-25s were phased out, and generalized UPT was implemented. However, the decision was more a matter of convenience and affordability than a change in philosophy. (3:9,4:49-50)

Currently, generalized UPT consists of three phases: (1) a short ground training phase; (2) primary training in the T-37 aircraft complemented by academic subjects; and (3) advanced training in the T-38 aircraft along with appropriate academic subjects. (34:20-78) One of the drawbacks to the current generalized UPT program is the inability of a single UPT advanced training syllabus to meet the needs and requirements of the various Major Air Commands (MAJCOMs). For example, additional formation training to meet the needs of Tactical Air Command (TAC) might result in eliminating instrument training required by Strategic Air Command (SAC) or Military Airlift Command (MAC). (3:7) This problem stems from the funding limitations imposed on Air Force flying hours which do not allow flying hours to be indiscriminately added to the training syllabus. Thus, meeting the new or changing requirements of one MAJCOM may result in Air Training Command's (ATC) inability to meet the requirements of another MAJCOM. (4:48)

As an interim fix to this problem, ATC introduced a "special track" to the T-38 syllabus. This "special track" encompasses eight flights in the syllabus and is flown after the student is identified for assignment to either a fighter, attack, reconnaissance (FAR) or tanker, transport, bomber (TTB) aircraft. FAR-identified students fly eight additional formation sorties, while TTB-identified students fly eight additional instrument/navigation sorties. (34:16,51,55,58) However, all training is still conducted in the T-38 aircraft which makes it difficult for TTB-identified students to "specialize" in multi-crew procedures. The "special track" system is the forerunner of the planned SUPT system scheduled for implementation by ATC in fiscal year (FY) 92. In addition to providing training tailored specifically to MAJCOM requirements, several studies have revealed that SUPT is the most cost effective method of pilot training. (3:9)

As a result of several studies conducted in the 1970s, which concluded that SUPT was the most prudent way to train, ATC, in 1978, published General Operational Requirement 78-01. "This document called for the development of a 'Tanker-Transport-Bomber' (TTB) aircraft and a return to SUPT as the preferred USAF pilot training philosophy." (3:9) In 1980, the SUPT concept was approved by the Chief of Staff and development efforts were begun. However, over the next several years, the SUPT program "encountered a series of

programmatic slips and (cost) delays." (3:9) Due to the current congressional scrutiny, SUPT is still not a certainty, but it remains a high Air Force priority and planning continues for FY92 implementation. (26:10,14)

SUPT provides a common primary phase for all students in the T-37 aircraft. Following primary training, students identified for fighter or bomber duty will fly the advanced phase of their training in the T-38 aircraft. This aircraft offers appropriate cockpit design and flight characteristics for pilots with follow-on assignments to the fighter or bomber missions. This represents a change to the original SUPT philosophy in that bomber students will now fly the T-38 rather than the new tanker-transport trainer. The rationale for this change is that the B-1 and other future bomber aircraft will possess flight characteristics which more closely resemble the T-38 than the planned, new tanker-transport trainer. Under SUPT, students with follow-on assignments to tanker and transport aircraft will do their advanced training in a new Tanker-Transport trainer aircraft scheduled to be operational in FY92. (3:11) Over forty percent of all students receive follow-on assignments to tanker and transport aircraft. (See figure 1-1.) Implementation of SUPT is contingent upon procurement of the Tanker-Transport Training System (TTTS) currently pending Congressional approval.

UPT GRADUATE DISTRIBUTION
(FY 86-88 AVERAGE)

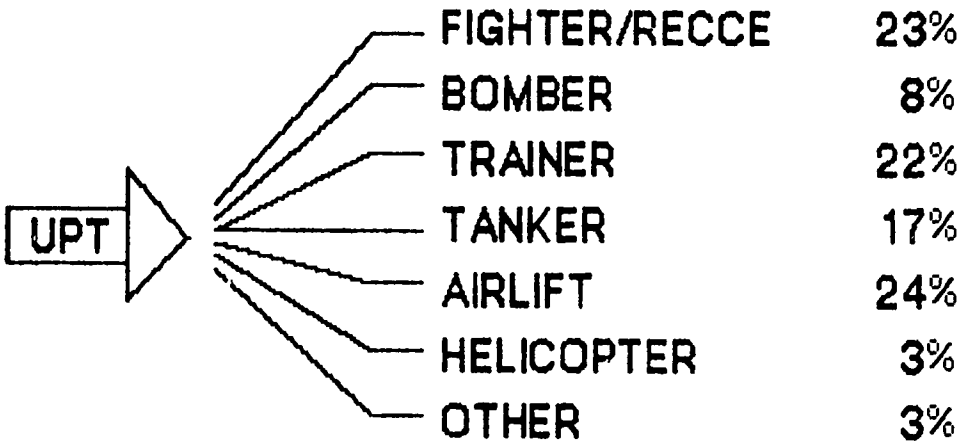


Figure 1-1 Source AFMPC

Under the current UPT program, students are categorized for follow-on assignments approximately six weeks prior to graduation. A group of senior flying training supervisors make up a selection board called the Advanced Training Recommendation Board (ATRB). The ATRB reviews the training records of the members of the graduating class and categorizes the students into one of two groups. Each group normally consists of approximately half of the class. One group is designated as qualified to fly a single-pilot aircraft system. Members of this group may be assigned to a single-pilot or multi-crew aircraft upon graduation. The second group includes those students who the ATRB believes require additional experience prior to serving as pilot-in-command of either a single-pilot or multi-crew aircraft. Individuals in the second group must receive initial assignments to multi-crew aircraft. (3:8) The current ATRB system is presently under review by ATC and may be revised even prior to SUPT implementation.

When SUPT is implemented, each student will be selected for one of three training tracks (fighter, bomber, or tanker-transport) prior to entering pilot training. The Human Systems Division (HSD) of the Air Force Human Resources Laboratory (AFHRL), Brooks AFB, Texas, is currently working on test criteria to identify the track in which a particular pilot candidate is most likely to

succeed. Track selection will occur after pilot candidate selection and flight screening but prior to flying the T-37 aircraft. Thus, personnel with the responsibility for classifying a student for a specific track will not have the benefit of any T-37 or T-38 training records as the ATRB does under the current system. After track selection and entry into pilot training, students will not be permitted to change tracks. If they fail to complete their training track, they will be eliminated from SUPT rather than being offered a chance to complete the course in a different track. Due to the current legal restrictions against women participating in combat, all female students will be assigned to the tanker-transport advanced training track. (3:10)

The decision to track select students prior to their entry into training requires that pilot candidate and track selection criteria accurately predict not only success in pilot training but success in a particular track. The penalty for failure to accurately predict an individual's ability to succeed in pilot training is the sunk cost which is lost when the student is eliminated from training. The average cost, figured in 1986, for one such eliminee exceeds $67,000 and the total loss of resources is significant since the USAF generally eliminates in excess of 400 students per year. (5:1;47:8) This situation "wastes nearly $30 million

per year." (47:8) Attrition from pilot training is already relatively high and potentially could go even higher under SUPT because of the change in timing for track selection. Since current plans include a provision that students may not change from one track to another, selection methodology must be evaluated to ensure that attrition from SUPT is maintained at a acceptable level.

Attrition rates from the current generalized UPT program have traditionally been at rate of twenty percent or less. However, during FYs 86 and 87, attrition rates rose dramatically to 28.2 and 36.9 percent respectively. (5:1) These figures were well above the anticipated and programmed rates. (See figure 1-2.) During FY88, Air Training Command added three weeks to the current UPT program making it 52 weeks in length. ATC officials credit the increased UPT length with helping to reduce the attrition rate by providing the students with more time to sort out their problems. (4:49) Likewise, SUPT will be a 52 week course.

As mentioned, students who are eliminated from training represent a waste of valuable defense dollars. However, other options such as lowering the training standards can be even more costly. Weaker graduates, generated by a lowering of standards, would likely have difficulty in more expensive follow-on training where

UPT ATTRITION RATES
(USAF -- 5 UPT WINGS)

%	PROGRAMMED	ACTUAL	DEVIATION
FY 85	23.7	22.5	- 1.2
FY 86	22.7	28.2	+ 5.5
FY 87	21.7	36.9	+15.2
FY 88	19.0	26.9	+ 7.9

Figure 1-2 Source HQ ATC/DOPR

attrition or additional flying hours cost even more. (10:3) Thus, USAF's ability to select candidates who can meet the required proficiency standards is crucial to the success of SUPT.

In addition to more accurately identifying flying aptitude, USAF needs a better system to measure a candidate's motivation and commitment toward an Air Force flying career. Lack of motivation and commitment can contribute to difficulties in training or may lead to low pilot retention after pilots fulfill their initial service obligation. This is commonly referred to as measuring the "heart" of a candidate. (10:2) While this paper does not deal directly with the causes of low pilot retention, it does recognize that a sound pilot candidate selection system must do a better job selecting highly motivated candidates.

Statement of the Problem

Currently, attrition rates from UPT are high, and Air Force pilot retention rates are low. USAF utilizes several methods to select and screen pilot candidates. Procedures vary according to the applicant's source of commission and whether or not the candidate possesses a private pilot's license (PPL). Candidates are selected for their follow-on aircraft track (FAR or TTB) approximately eight weeks prior to graduation. With the advent of SUPT in FY92, pilot candidates will be selected for the fighter,

bomber, or tanker-transport track prior to entering the primary (T-37) phase of training. Thus, pilot candidate selection requires review for two reasons: (1) to improve the current selection system, and (2) to determine what changes, if any, are required to prudently implement SUPT. This report attempts to answer the following question: what changes, if any, are required to improve the current pilot selection system and to best support up-front track selection for SUPT?

Assumptions

The USAF Trainer Masterplan does not include a plan to replace the T-41 with a new flight screening aircraft. In addition, the Masterplan states that candidates will be track selected prior to entry into primary training. (3:10) While the Masterplan is not a static document and aircraft procurement plans and/or the timing of track selection are subject to change, these two factors will be assumed as not being subject to change. In addition, the following two general assumptions are made: (1) the proficiency standards for graduation from UPT should not be lowered, and (2) funds will not be available in the foreseeable future to support costly changes to the pilot selection and screening methodology. (10:3)

Limitations

The following five limitations apply to this study.

First, ATC and Air Force Systems Command (AFSC) HSD are currently developing a Pilot Selection and Classification System (PSACS) for SUPT and are reviewing several of the issues discussed in this paper. (38:--) Second, the ATC Deputy Chief of Staff for Operations recently began a Broad Area Review which will include a review of some of the issues discussed in this paper. (23:--) Third, while Air National Guard (ANG) and Air Force Reserve (AFRES) pilot candidates attend UPT and are mentioned for continuity throughout this report, selection procedures identified in this report are for use by sources which provide inputs to the active duty Air Force. Fourth, while USAF inputs to the EURO-NATO Joint Jet Pilot Training (ENJJPT) program go through a screening and selection process similar to that used for regular UPT inputs, much of the statistical data in this report does not apply to the ENJJPT program. Fifth, with planning for SUPT on-going, changes after 31 December 1988 were not considered in this report.

Research Outline

This research report will cover six main areas: (1) Chapter II describes the current tools and criteria used for pilot selection; (2) Chapter III describes the various UPT entry sources and their application of the selection criteria; (3) Chapter IV assesses the utility of the current pilot selection methodology; (4) Chapter V examines

personality testing and the impact of revised Active Duty Service Commitments; (5) Chapter VI assesses the use of psychomotor and other testing available to better identify flying skill aptitude; and (6) Chapter VII concludes the report with some recommendations to improve the pilot candidate selection and classification process.

CHAPTER II

PILOT SELECTION METHODOLOGY: THE SELECTION TOOLS

Introduction

An analysis of the current pilot selection methodology is necessary before the utility of the system can be evaluated. The selection methodology consists of the selection tools and the procedures utilized by the various UPT entry sources. The purpose of this chapter is to identify and describe the tools used in the various pilot candidate selection programs. To accomplish this purpose, the seven major current screening devices will be discussed. First, medical qualifications will be reviewed. Next, age limitations will be defined. Third, educational requirements are delineated. Fourth, the Air Force Officer Qualifying Test (AFOQT) is discussed. Fifth, the use and procedures of selection boards will be evaluated. Next, psychomotor testing will be described, and finally, the various flight screening programs will be outlined and discussed. (7:27)

Medical Standards

Medical requirements for entry into UPT are outlined in chapter 8, Air Force Regulation (AFR) 160-43, Medical Examination and Medical Standards, and are the same for all commissioning and other entry sources. (6:96-98) While individual factors can be waivered under special

circumstances, there has been a large pool of very highly qualified candidates over the past 15 years which has practically negated the need for waivers. Along with the availability of qualified applicants, the pilot training rate also impacts the need to waive medical requirements. For example, during the Viet Nam War era, when pilot training rates exceeded 4000 per year, granting medical waivers for minor conditions to otherwise highly qualified candidates seemed to make sense. (3:3) Since that time, pilot training rates have generally remained at 2000 or below. (3:3;11:1) Currently, the UPT rate for FY89 is 1600, and is programmed to remain at that level through FY94. (11:1) Thus, the current need for medical waivers is minimal and will remain so as SUPT is implemented.

Age

Another factor which is rarely waived is the pilot applicant's age. Pilot candidates cannot exceed the age of 27 and one-half years at the time of entry into UPT. (12:1) The age limit applies to all entry sources. There is almost universal agreement that the younger the pilot candidate, the greater the chances of success in pilot training. Medical, safety, and attrition reports all reflect that younger pilots are generally more successful. (7:27) ATC statistics reveal that younger candidates are more successful in UPT, while an Air Force study shows that the

younger the graduate at the time of graduation from UPT (except for previously rated graduates), the better his accident record during his flying career. (7:27;32:25;41:7) One factor which impacts the candidate's age upon entry into UPT is the educational requirement for entry into UPT.

Educational Requirements

AFR 50-5, USAF Formal Schools, states that only commissioned officers are eligible to apply for pilot training. (13:3-52) Since a bachelor's degree is required for the award of a commission, all candidates for UPT must possess a bachelor's degree. This requirement applies to all pilot training entry sources. The requirement for a bachelor's degree has not always been part of the UPT selection criteria and the need for the requirement has been questioned on numerous occasions. (32:24-25,48;33:46-47,6-7) In addition, as will be discussed later, not all services and other nations require a bachelor's degree.

Air Force Officer Qualifying Test

The Air Force Officers' Qualifying Test (AFOQT) is a pencil and paper test that is required for candidates from all three commissioning sources except the Air Force Academy (AFA). (12:1) The AFOQT consists of five major sub-tests and the candidates receive a grade on each sub-test. The five major sub-tests include Pilot, Navigator-Technical, Academic Aptitude, Verbal, and Quantitative. (9:9) Specific

subjects covered in each sub-test are outlined in Figure 2-1. The minimum requirements for entry into pilot training are as follows: (a) minimum score of the 25th percentile or better on the Pilot sub-test; (b) minimum score of the 10th percentile or better on the Navigator-Technical sub-test; and (c) a total minimum combined score of 50 or better on the Pilot and Navigator-Technical sub-tests. (12:1)

Selection Boards

All commissioning and UPT entry sources, with the exception of the AFA, utilize selection boards to designate candidates for UPT slots. Headquarters Air Force Reserve Officer Training Corps (AFROTC) convenes an annual central selection board at Maxwell AFB, Alabama. This board uses factors such as the Detachment Commander's rating, grade point average, Scholastic Aptitude Test, and the AFOQT to select candidates to fill its UPT quota. (9:10;40:7-8,11)

USAF Recruiting Service convenes the Officer Training School (OTS) Selection Board at their headquarters at Randolph AFB, Texas. The board is convened on an "as required" basis--currently six times per year. (36:--) Board members consider performance reports, college transcripts, job responsibility, and breadth of experience as criteria, and base their final selections on the "whole person" concept. (24:4,6,13-15) As USAF pilot production and officer accession rates have come down during the past few years,

Air Force Officer Qualification Test (AFOQT)

- Pencil & paper test comprising 5 sub-tests
  - Pilot: Mechanical comprehension, scale reading, instrument interpretation, aviation information
  - Navigator - technical: Arithmetic reasoning, data interpretation, general science, rotational blocks, hidden figures
  - Academic aptitude: Math knowledge, word knowledge, data interpretation
  - Verbal: Verbal analogies, reading comprehension, word knowledge
  - Quantitative: Arithmetic reasoning, data interpretation, math knowledge
- Pilot applicant's total score of the pilot & navigator-technical must be at least 50 percentile
  - Must attain 25 percentile on pilot
  - Minimum 10 percentile on navigator-technical

Figure 2-1

the OTS pilot quota has also been reduced. (39:14) Thus, the OTS Selection Board process is extremely competitive, and such additional factors as whether or not the candidate possesses a private pilot's license may be critical to his or her selection.

For active duty officers, The Air Force Military Personnel Center (AFMPC) conducts a selection board at Randolph AFB. The board normally convenes twice each year and uses the "whole person" concept by considering such factors as performance reports, civilian or military flying time, motivation, AFOQT scores, and other pertinent accomplishments. (12:6)

Psychomotor Testing

The details of the currently available psychomotor testing technology will be discussed in full later in this report as part of the alternatives for the future discussed in Chapter VI. The discussion in this chapter and the assessment in Chapter IV relate to use of psychomotor testing as part of the pilot selection system. The testing attempts to assess flying aptitude by measuring hand-eye coordination. Psychomotor testing is not new and was used as part of the Air Force pilot selection system from 1942 through 1955. However, it was discontinued in 1955 due to the difficulty of maintaining the mechanical testing equipment. (8:1) In 1978, AFHRL began a multi-year

research, test, and validation effort utilizing five new computerized test devices to test candidates from AFA, AFROTC, and OTS. (8:3) While results have been promising, the process has not been fully integrated into the pilot candidate selection system.

The only entry source utilizing psychomotor testing for all pilot training candidates is the Air National Guard (ANG). In 1986, the ANG began to screen all their pilot training candidates due to the high attrition they were experiencing in UPT. The ANG established a cutoff score of the 20th decile or higher as the minimum for entry into UPT. (27:--)

Although all AFROTC and OTS candidates without a private pilot's license currently undergo psychomotor testing prior to entry into flight screening, the test results are used solely as part of the validation test and are not part of the selection process. However, OTS recently began using psychomotor testing as a part of the actual selection process on a limited basis. In the fall of 1987, the OTS Selection Board began to make a few "conditional" selections of pilot candidates who were otherwise very well qualified but whose flying experience or some other factor left some doubt in the board's mind. In these cases, the candidate is sent to the psychomotor screening facility at Lackland AFB Annex, Texas. Based on the results of the

psychomotor testing, the candidate is then selected or non-selected for OTS. (36:--) However, at the current time, psychomotor testing is an exception rather than the rule as a factor in the UPT selection process.

Flight Screening Programs

The Air Force conducts three different programs to screen pilot candidates prior to entry into UPT. Each commissioning source (OTS, AFROTC, and AFA) has its own program. As an exception to the rule, OTS and AFROTC candidates who have been selected for a pilot training slot and possess a private pilot's license are not required to undergo flight screening. The mechanics of the three flight screening programs vary as outlined below.

The OTS Flight Screening Program (FSP) is conducted at Hondo Airfield, Texas. The program is completed just prior to the candidate's entry into OTS. The training syllabus includes 16 training days with 13 hours of academic training and 14 hours in the Cessna 172 (T-41). The student receives 12 flights including 10 instructional lessons, a solo flight, and a final evaluation during flight 12. The student must meet Maneuver Item File (MIF) proficiency requirements in order to successfully complete FSP. (2:1-17)

The screening program for AFROTC is called the Light Aircraft Training for ROTC (LATR). Although some changes are currently pending, last year the program was conducted only

at the OTS facility at Hondo Airfield. The program is designed to motivate as well as screen cadets. At the present time, the training syllabus is the same as that used for OTS so the MIF proficiency requirements and flying hours are the same as those noted above for OTS candidates. Once LATR is successfully completed, the student is qualified for entry into UPT after he or she graduates and receives a commission. (7:24-25)

The other major screening program is the Air Force Academy's Pilot Indoctrination Program (PIP). The stated purpose of the program is "to identify students who possess the potential to complete UPT and motivate qualified Academy graduates toward a rated career in the Air Force." In addition, the program has a goal to "minimize attrition of USAFA graduates in UPT." (1:2) PIP Phase I consists of 21.2 flying hours and thus, is approximately fifty percent longer than the OTS/ROTC flying syllabus which contains 14.0 hours. The course includes a solo flight and flight evaluation similar to the other programs. Successful completion of a flight evaluation and the recommendation of flying training supervisors result in entry into UPT upon Academy graduation. Also, the PIP syllabus contains an optional Phase II which consists of 4.5 hours of incentive sorties. (1:5)

Although a large majority of flight screening

entries come from the commissioning sources, the Air Force also screens entries from active duty (both rated navigators and support officers), the Air National Guard, and the Air Force Reserve. This screening takes place at the OTS flight screening facility at Hondo, Texas. As with candidates from the three commissioning sources, active duty candidates who possess a private pilot's license are not required to undergo flight screening. (3:3-53) However, based on a recent policy change, ANG now requires all its candidates (including those with a private pilot's license) to attend the FSP. (27:--)

CHAPTER III

PILOT SELECTION METHODOLOGY: THE ENTRY SOURCES

Introduction

This chapter briefly summarizes the selection programs for each UPT entry source and analyzes the use of the selection tools described in Chapter II by each entry source. The Air Force Academy (AFA), Officer Training School (OTS), and Reserve Officer Training Corps (ROTC) commissioning sources will be discussed as well as UPT entries from active duty, the Air National Guard (ANG), and Air Force Reserve (AFRES). Prior to reviewing the selection concept of each program, the remainder of the introduction is devoted to discussing the differences in size and USAF ability to adjust the number of pilot candidate inputs from these programs.

In analyzing the pilot candidate selection programs of the three commissioning sources, it is important to understand the differences in the lead times required for USAF to adjust the pilot candidate output from these sources. Under current USAF policy, all AFA graduates who are qualified, recommended by supervisors, and desire to attend pilot training are provided a UPT quota. (7:25;1:1-2) Thus, the yearly AFA pilot candidate input remains fairly stable. The lead time required to significantly increase AFA pilot candidate production is four years because the

total AFA class enrollment would have to be expanded in order to increase AFA pilot candidate output.

AFROTC is also a long lead time entry source with approximately two years required to increase inputs into UPT. To decrease the input into UPT from the ROTC source, several options are available including delaying the UPT entry of ROTC graduates. During the past two years as UPT and accession rates have decreased, the average length of delay for ROTC graduates entering UPT has increased to seven months. (31:14) This type of delay can create a hardship on the individual but the ramifications of delayed UPT entry are beyond the scope of this report.

OTS is the most flexible entry source and requires the shortest lead time (approximately 120 days) to adjust input to UPT. (7:22) OTS is generally used as the buffer when UPT rates or accessions are raised or lowered. Active duty inputs are also flexible but the numbers are small so that this input remains relatively constant even during years when the UPT production rate is adjusted.

Air Force Academy

The AFA is the source for approximately 25 percent of the pilot candidates who enter UPT each year. (9:5) (See figure 3-1.) It is also the most expensive source per candidate when one considers the cost of a four year education at the Academy. Candidates who are medically

Pilot Applicant Pool

Air Force Reserve Officer Training Corps (ROTC)	35.8%
Air Force Academy (AFA)	25.9%
Officer Training School (OTS)	22.1%
Active Duty Officer	
Rated Navigators	3.7%
Non-rated	3.7%
Non Active Duty Officers	
AFRES	1.8%
ANG	7.1%

Figure 3-1 Source (9:--)

qualified, successfully complete the Pilot Indoctrination Program, and receive the recommendation of flying supervisors, enter UPT after graduation. (7:25;1:1-2) Programmed attrition for AFA entrants into UPT is 15.1 percent for FY89, although actual rates have run considerably higher for the past three years. (5:1) (See figure 3-2.) The programmed and actual attrition rates for the AFA are the lowest of the three commissioning sources, and only active duty, rated candidates have a lower programmed attrition rate.

Officer Training School

OTS is used as the buffer to accommodate changing UPT production rates. Thus, the rate of OTS entrants into UPT varies more than from other entry sources. Over the past three years, OTS entries have averaged approximately 22 percent of the total UPT entries. (9:5) (See figure 3-1.) In order to be selected for OTS, candidates must meet age, medical, and educational prerequisites, obtain a qualifying score on the AFOQT, and be selected by the OTS Selection Board. (24:4,6,13-15) As mentioned earlier, the board requires a few otherwise highly qualified candidates to undergo psychomotor testing to check their potential for pilot training. (36:--) All other OTS candidates undergo psychomotor testing before completing FSP but this testing is part of the validation process for the psychomotor

UPT ATTRITION RATES BY SOURCE

(FY 86 - FY 88)

USAF	ATTRITION FY 86 ACTUAL	FY 87 ACTUAL	FY 88 ACTUAL	FY 89 PROG
AFROTC	33.8	42.9	32.4	29.1
USAFA	22.7	31.1	21.7	15.1
OTS	27.4	36.9	25.8	18.8
A/DUTY RTD	11.7	18.1	12.4	10.9
A/DUTY NON-RTD	20.8	37.0	32.9	23.3
TOTAL	28.2	36.9	26.9	21.9
ANG	24.0	41.3	23.8	18.9
AFRES	17.9	27.5	24.1	18.7

Figure 3-2 source HQ ATC/DOPR

testing program and the results are not used as part of the selection process. OTS selectees without a private pilot's license, who are pilot candidates, must attend the FSP before completing OTS and entering UPT. (13:3-53) OTS attrition is programmed for 18.8 for FY89, although it has averaged nearly 30 percent over the past three years. (5:1)

Reserve Officer Training Corps

ROTC annually provides the highest number of UPT entrants. Over the past three years, ROTC has provided over one-third of the total UPT entrants. (9:5) Candidates come from over 150 colleges and universities throughout the United States. ROTC candidates must successfully complete the medical examination and the AFOQT. (40:7-8;7:24) In addition, the unit commander rating, grade point average, and Scholastic Aptitude Test scores are considered. (40:11) Final selection for ROTC pilot slots is accomplished by a central selection board convened at Maxwell AFB, Alabama. (40:7-8) Following selection by the board, the candidate, if he or she does not possess a private pilot's license, must complete the LATR between the junior and senior year. Attrition of ROTC candidates is the highest of the three commissioning sources and has averaged almost 34 percent over the past three years. (5:1) (See figure 3-2.) All ROTC candidates undergo psychomotor testing as part of the

testing and validation process for this initiative. However, the results are not currently used as part of the selection process.

ANG, AFRES, and Active Duty

Although complete details and analysis of the ANG and AFRES UPT candidate selection systems are beyond the scope of this report, it is pertinent to note that the ANG began using psychomotor testing as a part of their pilot candidate selection process in late 1986. Candidates scheduled to enter UPT in FY87 with FY88 graduating classes had to achieve a psychomotor test score at the 20th decile or above in order to qualify for UPT selection. To keep the "human factor" in the process, the home unit can override the 20th decile criteria for individual candidates. (27:--) The ANG added psychomotor testing to its selection criteria in an effort to reduce its rising UPT attrition rate which exceeded 41 percent in FY87. (5:1) Results are promising as the ANG attrition rate was reduced to 24.1 percent in FY88. (5:1) While the ANG is well satisfied and intends to continue using psychomotor testing as a UPT selection factor, other factors (including the fact that ANG now requires candidates with a private pilot's license to attend FSP) may also have contributed to the lower attrition. (27:--) This subject will be further discussed in Chapters IV and VI.

AFRES UPT attrition traditionally is lower than ANG. Thus, AFRES has not opted to adopt psychomotor testing as part of their selection criteria. Although it increased to over 24 percent in FYs 86 and 87, AFRES attrition generally runs well below 20 percent. (5:1) Programmed UPT attrition rates, for AFRES and ANG, are virtually the same for FY89 with AFRES programmed at 18.7 and ANG at 18.9 percent. (5:1)

Active duty inputs to UPT include both rated (navigators and rotary wing officers) and non-rated officers. Active duty inputs are selected by a board which convenes periodically at the Air Force Military Personnel Center (AFMPC). The board considers the officer's personnel record and potential to complete UPT in making selections. (12:6) Active duty selectees without a private pilot's license (with some exceptions) are required to attend FSP at Hondo Field, Texas. (13:3-53) These individuals undergo psychomotor testing as part of the data gathering and validation program but psychomotor results are not used as part of the selection criteria. Attrition of rated officers in UPT is historically the lowest of any source of entry. Programmed attrition of rated officers scheduled to enter UPT in FY89 is 10.9 percent, while non-rated officers attrition is programmed at 23.3 percent. (5:1)

CHAPTER IV

EVALUATION OF PILOT SELECTION SYSTEM

Introduction

Now that the selection tools and UPT entry sources have been described, the effectiveness of the current USAF pilot selection system will be evaluated. To accomplish this assessment, the same format as in Chapter II will be used. Each selection factor will be evaluated for its current utility and applicability to SUPT. In addition, possible changes to the current criteria and other alternatives will be discussed. To evaluate the effectiveness of the pilot selection system, criteria must be established which define the requirements of an ideal selection system. However, no perfect system has been designed.

What is needed is a system which maintains a quality product, minimizes attrition in UPT, and produces a highly motivated pilot committed to an Air Force flying career. To this end, training experts generally agree that selection of pilot candidates must be made based on an evaluation of the applicant's "head, hands, and heart". (10:2) The "head" refers to an individual's capacity to absorb and learn new material which roughly equates to academic aptitude. The "hands" refers to an individual's natural hand-eye coordination which translates to flying skill aptitude.

Finally, the "heart" refers to the almost intangible qualities of motivation and commitment. In accomplishing the assessment of the current system, these three criteria will be used as a basis for what is required from an effective selection system.

Medical Standards

Medical standards for entry into pilot training are reasonably straight forward, common sense criteria that are designed to obtain maximum utilization of pilot training graduates. The operable theory is that the higher the standards, the longer the pilot will remain medically qualified after graduation from pilot training. The ATC Surgeon is responsible for UPT medical certification and has been delegated waiver authority for some medical conditions. However, the Air Force Surgeon General retains ultimate waiver authority for more serious medical conditions. (6:132-133) As mentioned in Chapter II, waivers are now rarely granted as a large pool of highly qualified applicants currently exists and pilot training rates have decreased from 1800 in FY86 to 1600 for FY89. (14:1)

In 1984, a waiver was granted for the Air Force Academy to enter a limited number of candidates into UPT with eyesight waivers up to 20/70 (correctable to 20/20). (35:--) Along with this waiver was a stipulation that these candidates, upon graduation, had to be assigned to a tanker,

transport, or bomber (multi-crew) aircraft. The US Navy has a similar program (eyesight waived to 20/50) with follow-on aircraft assignment limitations. (7:19) The theory on the granting of these waivers was that these candidates were highly qualified and well motivated. Thus, they had the potential (other than the eyesight limitations) to excel in UPT. In addition, rationale for the test included the fact that rated pilots are permitted vision of up to 20/200 (correctable to 20/20) without waiver. (6:81) Many students in this test program performed in an above average manner. Thus, motivation is a key factor to success in pilot training. However, it is still too early to tell if eye problems will prematurely medically disqualify these individuals, or if because of their strong motivation, they will be more career oriented and stay on active duty longer than the average Air Force pilot.

Overall, medical standards have remained fairly static and previous research indicates that the medical standards of other services and nations are very similar to those used by USAF. (7:27-28) From the above discussion of waivers, the authors believe that the waiver appears to be a viable option (with seemingly little degradation of quality) under the following circumstances: (1) if the pilot candidate volunteer pool shrinks; (2) if the pilot production rate is dramatically increased, or (3) if an

extremely highly motivated candidate needs a minor medical waiver. In these cases, it may be in the long run best interest of the Air Force to grant the waiver.

Age

The average age for UPT entry is currently 22 years. Previous research points to the conclusion that the younger the pilot trainee, the greater the chances of his or her success. In addition, the younger the pilot graduate, the greater the number of years utilization before medical disqualification becomes a factor. (7:27) However, no research is available which indicates that the Air Force is losing a significant number of pilots to medical disqualification without obtaining maximum utilization of their services. Although some studies also show a relation between age and accident potential (the younger the pilot, the lower his accident potential if flying experience is roughly equal), the possible loss of maturity in a very young pilot has not been measured and could be a significant factor when piloting a single-pilot fighter aircraft. (32:25;41:7-8)

A previous study recommended that USAF consider doing away with its requirement for a bachelor's degree as a prerequisite for pilot training. This study says that the primary benefit would be "...attracting a younger candidate, a candidate generally more motivated and healthier than

older college graduates candidates." (7:33) While the need for a college degree is debatable and will be evaluated later in this chapter, the assertion that candidates without a degree would be healthier does not appear to be based on conclusive evidence. Thus, there is little basis for attempting to lower the average entry age for pilot training based solely on medical or health reasons.

The upper age limit of 27.5 years, upon UPT entry, is an arbitrary but apparently reasonable age to ensure an acceptable number of years of flying duty in return for the training investment. (12:1) There is very limited need to waive the maximum age limit at the present time due to the overage of qualified candidates and reduced UPT rates. However, the option is always available if the need arises. When the new SUPT program is implemented, and if the planned policy to track select individuals prior to entry into training takes effect, it would be a simple matter to restrict candidates with age waivers to the tanker/transport track. The current policy of many commercial airlines who hire highly experienced military pilots (many over age 40) indicates that flying experience may be a more important factor than the possible slowing of reflexes due to age--at least for older multi-crew pilots. Thus, the authors believe that age waivers are a viable option, if USAF needs dictate, for the tanker/transport track under SUPT.

However, age is not a major factor which needs correction or change in the foreseeable future.

Educational Requirements

As mentioned earlier, the USAF stipulation that a bachelor's degree is a prerequisite for a commission and that only commissioned officers are eligible for pilot training means in effect that a degree is required for entry into pilot training. (13:3-52) Although there is no research available which conclusively links success in pilot training to a college degree, this prerequisite does require that the candidate demonstrate that he or she can complete a difficult educational program. (33:6-7) Thus, this requirement may be an indicator of academic aptitude, and to a lesser extent, motivation to complete a long term task. However, the authors believe that the stresses of pilot training differ greatly from the world of academia. While motivation and a reasonable aptitude for academic pursuits are required for success in both programs, pilot training generally requires more rapid physical and mental responses to problem solving situations. In addition, motivation not only to learn but to "service of country," is probably a greater influence on an Air Force flying career than it is on success in college. Further, skills such as hand/eye coordination which are critical to a pilot are not really tested in college. While the fact that there is no research

which links success in UPT to possession of a college degree does not prove conclusively that a degree should not be required, two other prominent factors are strong indicators that the degree requirement is arbitrary rather than necessary.

First, USAF has not always required a degree for entry into UPT. In fact, several of Air Force's top current leaders including General Larry D. Welch, USAF Chief of Staff, and General Duane H. Cassidy, CINC Military Airlift Command, both completed pilot training prior to obtaining their college degrees. Obviously, in their cases, possession of a college degree was not a prerequisite to success in pilot training or success as an officer. A second indicator that a college diploma may not be necessary is the fact that the Air Forces of Israel, Great Britain and Canada do not require a college degree as a prerequisite to pilot training entry. (7:28) The accomplishments of pilots from these nations in both combat and combined exercises over the past two decades attest that they are among the best in the world. Thus, the authors believe that there is really no validity to the requirement for a college degree other than its use as an "indicator" of academic ability and capability to complete a long, sustained program. (32:24-25;33:46-47)

Since possession of a college degree is only an "indicator" of academic ability, then perhaps the major

field of study correlates to success or failure in UPT. While the authors believe that possession of a technical or scientific degree increases the chances for success in UPT, there is currently no requirement for a specific type of degree for UPT entry. While some research has been done in this area, more is needed to validate this thesis.

While obtaining a degree also demonstrates the motivation to complete a difficult task, degree completion is only an "indicator" of motivation just as it is of academic aptitude. No research is available which indicates that this motivation will carry over to pilot training or to longer retention during the pilot's follow-on Air Force flying career. (32:24-25,48;33:46-47,6-7) In fact, research as early as 1966 indicated that a college degree may actually be counterproductive to motivation and retention due to the differing value systems of college graduates versus non-graduates. (33:42) The advent of SUPT does not appear to generate any greater need for a college degree than exists under the current UPT program.

Based on the above information regarding educational requirements, the authors believe that the current pilot selection process gives too much weight to academic aptitude. Not only must the candidate possess or be working toward a bachelor's degree but such factors as his or her Scholastic Aptitude Test scores, grade point average, class

ranking, and other similar academic aptitude indicators are considered when he or she competes for a pilot slot in ROTC or meets the OTS Selection Board. (24:4,6;40:7,8,11) The authors believe that the heavy emphasis on academic achievement may be misleading when it comes to potential to complete pilot training and ability to remain motivated and succeed in a career as an Air Force pilot. The disproportionate weight given to academic aptitude and requirements appears to have occurred due to lack of other available measures to quantify the individual's flying skill aptitude and/or motivation toward an Air Force flying career. Thus, while academic aptitude can be fairly accurately measured, the other two important factors (flying skill aptitude and motivation) are difficult to assess and currently play only a small part in the pilot candidate selection process.

Air Force Officer Qualifying Test

The Air Force Officer Qualifying Test (AFOQT) is a pencil-paper aptitude test which attempts to measure both flying and academic aptitude. It is the only selection factor other than the actual flying screening programs which attempts to measure flying aptitude. The "Pilot" section of the AFOQT includes areas which test scale reading, aviation information, mechanical comprehension, and instrument interpretation. (9:9;7:23) While this test obviously does

not measure hand-eye coordination, it at least attempts to measure subject areas which closely relate to tasks at which a pilot will have to be proficient.

Likewise, the "Navigator-Technical" sub-test relates to general aviation skills. The "Navigator-Technical" sub-test measures arithmetic reasoning, data interpretation, general science, rotational blocks, and hidden figures. (9:9) Again, while the test is not a true measure of flying skill aptitude, in the form of hand-eye coordination, it is an attempt to measure the capability of the candidate to interpret aviation-related tasks. In addition to flying skill aptitude, the AFOQT attempts to measure the traditional academic areas and includes verbal and quantitative sub-tests. Minimum qualifying scores (25th percentile on the "Pilot" sub-test, 10th percentile on the "Navigator-Technical" sub-test, and a total of at least 50 combined for both the tests) recognize the need to establish a cut-off but a philosophy that the minimum qualifying score should only eliminate those with the very lowest flying skill aptitude. (12:1) From the authors experience, this widely accepted philosophy that pilot candidates should be eliminated from candidacy only in an aircraft, and not by pencil-paper tests, simulators, or other such devices, is one of the reasons for the reluctance to implement psychomotor testing.

Overall, the utility of the AFOQT appears reasonably good, although its ability to predict success or failure in UPT is debatable. (17:8) As it is the only selection factor, other than flight screening, which measures flying skill aptitude, and since the cut-off scores are comparatively low, the authors believe that continued use of this test appears prudent. However, little recent research was available which correlated scores on the AFOQT with actual performance in pilot training. If current plans to use psychomotor testing in SUPT are implemented, the use of the AFOQT "Pilot" sub-test may not be as significant because psychomotor testing directly measures hand-eye coordination. Perhaps the best system, as AFHRL recommends, would use a combination of psychomotor testing and AFOQT scores. (8:20-22) With the small number of candidates disqualified by the AFOQT, because of the low minimum score requirements, continued use of the AFOQT under SUPT appears appropriate to eliminate candidates with very low potential.

Selection Boards

Selection boards add a personal, albeit sometimes subjective, touch to the pilot candidate selection process for ROTC, OTS, and active duty personnel. The analysis in Chapter II detailed the selection criteria utilized by the boards. As noted, academic aptitude plays a major part in the selection board process. The selection board is the one

point in the selection process where individual motivation is considered. The detachment commander's rating for ROTC candidates and the comments written by supervisors for active duty candidates attest to the motivation and commitment of the individual. (40:11;10:4) The most difficult problem is identifying the truly motivated candidates.

The motivation the Air Force is looking for is not only the motivation to complete pilot training but the propensity to serve long term in an Air Force flying career. The greatest difficulty that pilot candidate selection boards face is attempting to standardize the recommendations which come to the boards. With over 150 detachment commanders in ROTC and a multitude of supervisors who may provide comments to the Active Duty board, it is difficult to identify the truly motivated individuals. (40:11;10:4) It is this inability to standardize and objectively measure motivation which is one of the weak links in the pilot candidate selection process.

Psychomotor Testing

Currently, the other weak link in the selection process is the difficulty in determining flying aptitude. One measure which has proven fairly accurate is the possession of a private pilot's license. (10:38-39;15:4) Candidates with a private pilot's license by-pass the AFROTC

and OTS flight programs and directly enter UPT without any USAF screening of their flying skills. While the attrition of this group has been lower than the group who enter UPT without a private pilot's license, the potential of individual candidates varies widely based on the quality of previous training, actual flying time, and the true aptitude of the individual candidate. Likewise, individuals without private pilot licenses enter UPT with very little indication of their flying aptitude except the AFOQT and flying screening programs.

As mentioned earlier, the ANG now uses psychomotor testing--rejecting those applicants who score below the 20th decile. (27:--) Although the ANG has had only one full year of graduates since beginning their use of psychomotor testing, the results are promising. The year prior to implementing the program, ANG UPT attrition was 41.3 percent. However, ANG UPT attrition was reduced to 23.8 percent for FY88 graduates--the first full year that candidates were selected using psychomotor testing. (5:1) However, this 17.5 percent reduction in ANG attrition, although impressive, must be evaluated in perspective since overall UPT attrition declined by 10 percent from FY87 to FY88. Thus, the real improvement in ANG attrition over the remainder of the UPT entry sources not using psychomotor testing was approximately 7.5 percent. (5:1) The authors

believe that the 7.5 percent number is still a highly significant improvement. If this improvement continues over the long term, it will provide additional validation of the merits of using psychomotor testing.

OTS pilot candidate selection boards have also begun to use psychomotor testing on an exception basis when a candidate is otherwise highly qualified but his flying aptitude is in doubt. (36:--) Since psychomotor testing has proven effective for pilot selection and plans are underway to use it as an aid in track selection for SUPT, Chapter VI will provide more details on this system including the results of the validation program. (38:--) In the final analysis, psychomotor testing appears to be a promising method by which to measure flying skill aptitude.

Flight Screening Programs

Before assessing the merits of the flight screening programs, it is necessary to discuss the group of pilot candidates who are not required to undergo flight screening. (13:3-53) That group consists of those ROTC, OTS, and active duty candidates who receive a UPT training quota and already possess a private pilot's license. While some training experts believe that all USAF pilot candidates should undergo flight screening in order that each UPT entrant will have received a standardized screening program, statistics reveal that candidates who possess a private pilot's license

are eliminated from UPT at a lower rate than those who complete an Air Force flight screening program. (10:38-39;15:4) (See figure 4-1.)

Another argument for requiring all candidates to undergo a screening program derives from the philosophy that the screening programs serve as much to motivate candidates as to screen their flying aptitude. (1:2) However, it would be difficult to justify the additional cost of such action since those with a private pilot's license are already performing better in UPT. (10:38-39) Furthermore, there is nothing in the SUPT program that would require those with a private pilot's license to undergo flight screening.

As noted earlier, the screening programs for OTS and ROTC are nearly identical, while the AFA program contains 50 percent more flying hours. From 1965 until 1971, flight screening was conducted at a local airfield near each UPT base. The program was conducted by a civilian contractor and consisted of 30 flight hours combining screening with some flight training. Pilot candidates from all commissioning sources were required to attend. (16:16) Unlike today, all of the candidates were commissioned prior to undergoing flight screening. In addition, ROTC had a Flight Instruction Program (FIP) which included a contractor screening program at each detachment and the AFA had its Pilot Indoctrination Program. (16:5-7) In 1972, a decision

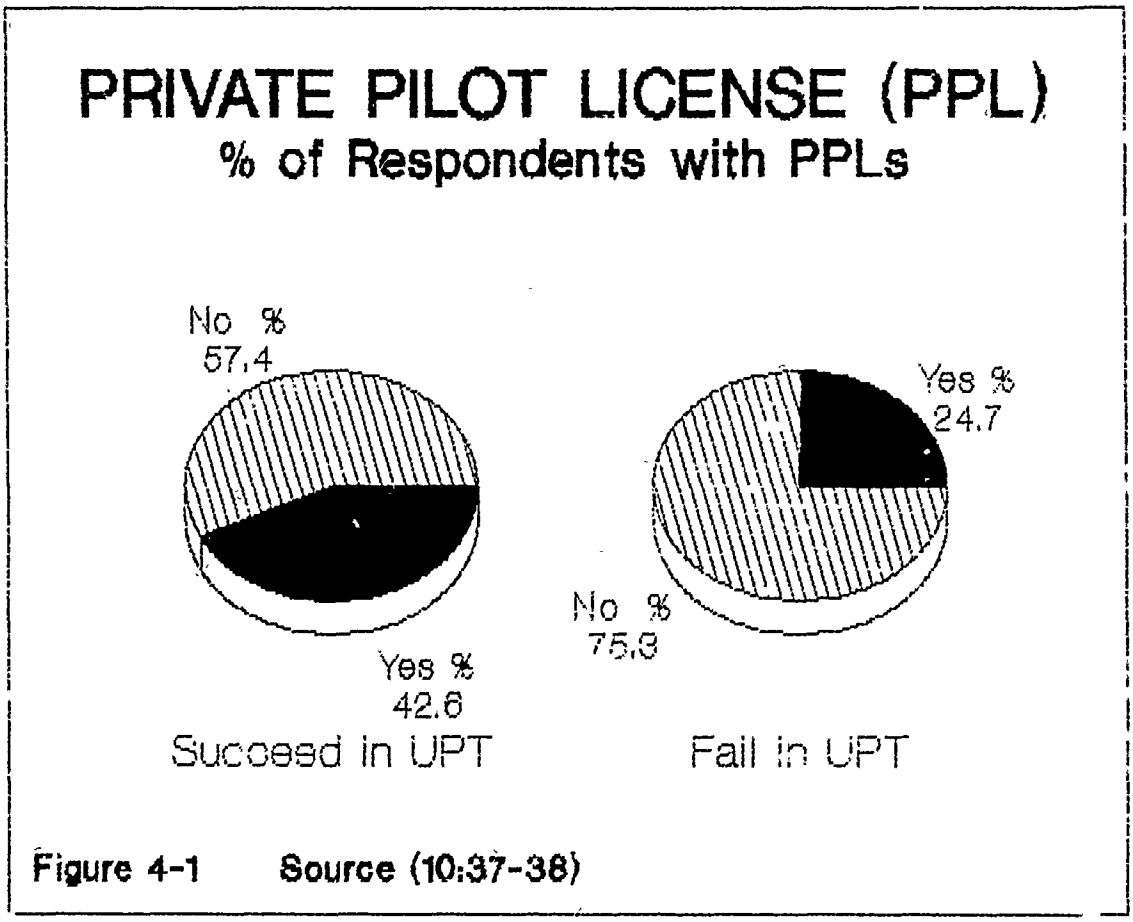


Figure 4-1 Source (10:37-38)

was made to consolidate training at Hondo Airfield, Texas. The consolidation was designed to reduce UPT attrition and to screen candidates prior to their receiving a commission. (16:17) With the consolidation, most ROTC candidates still completed FIP rather than participating in the new screening program. (16:9) Since the AFA already had the PIP, and qualified its candidates through that program, the new consolidated program included mainly OTS, active duty, ANG, and AFRES candidates. (16:18)

As can be deduced from the above discussion, the flight screening consolidation resulted in an overall reduction in flying hours for pilot candidates before entering UPT. ROTC candidates still completed FIP but no longer received any other screening. AFA retained their PIP but, as with ROTC, did not receive any other screening prior to UPT. OTS candidates received only 14 hours under the new Flight Screening Program. (16:18)

Another cost-saving measure, implemented in 1981, reduced ROTC FIP hours from 25 to 14. However, almost immediately after ROTC FIP was reduced to 14 hours, attrition of ROTC candidates in UPT increased dramatically. Lack of contractor standardization, as well as the reduced flying hours, were felt to have contributed to the increased attrition. As a result, in 1985, ROTC decided to abandon the FIP program and send its candidates through a

centralized screening program similar to that of OTS. The original plan called for three ROTC screening sites: one in the central US at the OTS screening facility at Hondo, Texas; one on the east coast at Embry Riddle Aeronautical University; and a site in the west to be determined later. After just two years, it was determined that this procedure was too expensive and in 1988, all ROTC flight screening was accomplished at Hondo. ROTC is currently exploring several alternatives (including the possibility of returning to an FIP-type screening program) in order to reduce its high UPT attrition. (15:1-6)

The reduction of flying hours in the flight screening programs resulted in most candidates without a private plot's license entering the primary (T-37) phase of UPT with only 21 hours (AFA) or 14 hours (all other sources). The impetus to reduce flying hours was generated mainly by a desire to reduce dollars expended on flying hours. However, this may be false economy since T-41 costs are low (variable depending on contract and student load), while the T-37 costs 262 dollars per flying hour, and the T-38 647 dollars per hour. (18:10)

Statistics reveal that the more flying time an individual possesses prior to UPT entry, the greater his chances of success. For example, in a recent survey of 664 FY87 UPT entrants, candidates with less than 20 previous

flying hours were eliminated at a 43.7 percent rate, while those with over 40 previous flying hours were eliminated at a rate of 26.9 percent. (10:37) As noted earlier, candidates with private pilot's licenses attrit at a lower rate than candidates without private licenses. (10:37) Since candidates with private pilot's licenses normally enter UPT with at least 40 hours compared to either 21 hours (AFA) or 14 hours (other sources), the authors believe that the lower attrition by UPT candidates with private pilot licenses supports the theory that the amount of previous flying experience relates directly to success or failure in UPT. (See figure 4-1.)

Another example of the positive impact of increased flying hours is found with Great Britain's Royal Air Force (RAF). The RAF recently expanded its previous 14 hour Chipmunk aircraft direct entrant (similar to OTS) screening program to 63 hours (30 hours for those candidates with a private pilot's license). While participants in the old RAF screening program experienced only about a five percent attrition rate, candidates are attriting from the new program at a 25 percent rate. However, the program has paid big dividends as attrition in RAF Basic Flying Training (BFT), in the more expensive Jet Provost, has been reduced from 21 percent to five percent. The RAF BFT also includes University Cadets (similar to ROTC) who receive 90 training

hours in the Bulldog aircraft while attending school. (7:12-13) Thus, the RAF expends a great many less expensive hours on screening but more than makes up for this higher screening cost by reduced attrition in BFT.

Based on the above statistics, the authors believe that the alternative for ROTC to contract to obtain private pilot licenses for its candidates may have merit. While this initiative is just in the "talking" stage, preliminary cost data reveals that the cost to obtain a private pilot's license may be less than the cost to send each candidate through the 14 hour flight screening program. (16:21) Thus, this program would not only provide about three times as many flying hours per candidate, it might actually save money. This initiative requires a lot of further study but if preliminary data is any indication, it may be a viable alternative. (15:1-6)

In addition to total flying hours, recency of flying experience appears to be a factor in success in UPT. (7:31) Recency of flying for those candidates entering UPT with a private pilot's license has not been tabulated but in most cases, it is probably limited. For those candidates required to go through a screening program, OTS candidates generally have the best flying continuity as they normally enter UPT within about four months after completing FSP. The interval between FSP and UPT entry for OTS candidates

represents the time it takes to complete OTS. Air Force Academy cadets usually have relatively good continuity as they normally enter UPT shortly after graduation. Although AFA candidates may have up to a year delay, if they complete PIP during the summer between their junior and senior years, their participation in the Academy airmanship program usually results in some type of flying activity throughout their college career. ROTC candidates have generally had the weakest flying continuity. (7:31) However, this situation should improve as ROTC cadets now attend LATR between their junior-and-senior years rather than between their sophomore and junior years. ROTC graduates currently face another problem which detracts from their continuity and recency of flying experience when entering UPT. Due to reduced accessions over the past couple of years, ROTC candidates often have to wait from four-to-eight months after graduation prior to entering UPT. (31:14) Along with its new initiative to obtain private pilot's licenses for its candidates, ROTC is looking at ideas for providing better flying continuity prior to UPT entry. (22:--)

One final area of discussion in the flight screening arena involves a comparison of the 21 hour AFA program with the current 14 hour programs for OTS, ROTC, and active duty candidates. (1:2;2:3) A recent research study pointed to a disparity in that proficiency levels on the flight

evaluation for certain Maneuver Item File (MIF) items (for example, ground operations, straight and level flight, and turns) were higher in the OTS/ROTC syllabi than in the AFA syllabus. (7:26;2:14) This appeared incongruous since fifty percent more hours are allotted to AFA students than to OTS/ROTC students. This disparity was corrected by a change to the AFA PIP Syllabus in May 1988. In addition, another syllabus change requires AFA cadets who successfully complete PIP to receive a positive recommendation from training supervisors prior to UPT entry. (1:1) However, the most significant difference between in the syllabi is the total hours allotted to each student. The AFA syllabus is fifty percent longer which may be a significant factor in the lower UPT attrition experienced by AFA candidates as compared to OTS and ROTC candidates. (5:1) Again, the authors believe this factor points to the fact that individuals with more flying time tend to do better in UPT than those who enter with the minimum 14 hours provided by the OTS/ROTC screening programs. (10:56)

Assessment Summary

The authors offer the following general observations from the foregoing assessment of the current pilot selection screening tools. First, medical and age standards appear valid but can be waived, if necessary, with little loss in candidate quality. Second, the AFOQT provides a small

measure of aviation aptitude, and should be retained because it is the only current tool (other than flight screening) which measures flying aptitude. Third, educational requirements and psychomotor testing present a dichotomy. Academic aptitude and educational requirements, including the requirement for a bachelor's degree, appear to be over-emphasized. On the other hand, psychomotor testing appears to do a good job measuring flying skill aptitude but is only being used sparingly. Fourth, although selection boards are necessary, a better way to identify the truly motivated candidate needs to be developed. Finally, the screening programs are valuable but probably need to include more flying hours. Overall, the current process has the capability of identifying the academic and flying (if psychomotor testing is used) aptitude necessary for UPT but very little is available to identify motivation and commitment. The next chapter will discuss some alternatives to better identify these factors.

CHAPTER V

ALTERNATIVE SELECTION AND CLASSIFICATION METHODS

Introduction

As mentioned in the assessment of the current pilot selection process, the Air Force needs to select its pilot candidates on the basis of three factors: academic ability (head), flying aptitude (hands), and motivation and commitment (heart). (10:2) The Air Force utilizes a great deal of academic data on pilot candidates, and is able to obtain pilot candidates with superior academic credentials. However, UPT attrition statistics reveal that USAF does not do nearly as well selecting candidates with strong flying aptitude. In addition, both UPT attrition statistics and pilot retention statistics reveal that the Air Force could do a better job selecting candidates with a strong commitment and motivation toward an Air Force career. (5:1) This chapter concentrates on two areas: (1) personality tests which might improve USAF's ability to better identify candidates who will be successful in the flying environment, and (2) a personnel initiative involving the Active Duty Service Commitment (ADSC) for UPT which may attract volunteers to UPT who possess the right motivation and commitment.

Personality Testing

Personality testing, as a means to help select pilot candidates, is not new. The United States used it extensively during World War II to "select out" those candidates not suited for flying duty. (10:9-10) However, the search for a system to "select in" the best qualified candidates from among a large, seemingly well qualified group of candidates has proven elusive. Since WWII, research on the use of personality testing to select pilot candidates has met with mostly negative results, although research over the last decade provides a little more optimism. (10:10-11) While both the Air Force Human Resources Laboratory (AFHRL) and the Naval Aerospace Medical Research Laboratory (NAMRL) are exploring the use of personality traits to measure flying adaptability, they have achieved only minimal success thus far. (10:12) The US Army, and the civilian airlines and air forces of several other nations, are using psychological and personality testing with some apparent success. (10:12) Robert L. Helmreich, a psychologist from the University of Texas at Austin, has completed some of the most promising research and has found some significant relationships between personality traits and pilot performance. (10:13) Although no personality test has been successful in predicting success in pilot training, research is on-going. (10:17-18)

The most recent study of personality testing as it relates to Air Force pilot selection was completed by Colonel Roy A. Davis, in 1988. while assigned to the Air Research Institute at Maxwell AFB, Alabama. To accomplish his research, he built a 250-item questionnaire including questions from three different personality surveys used in pilot related research. In addition, the questionnaire included biographical data. the Myers-Briggs Type Indicator (MBTI), and a social desirability scale used mainly to indicate if the respondent was faking responses. (10:23-24) The questionnaire was provided to all students from FY87 UPT classes except 87-08. The survey included both students who completed training and those who were eliminated. The respondent population represented almost 50 percent of the surveyed group and the profile of respondents (male versus female, graduate versus eliminee) appears to offer a proper cross-section in order to draw valid conclusions. (10:27) The study attempted to match personality traits with success or failure in UPT. It did find statistical significance for three of the 15 traits (extroversion/introversion, mastery motivation, and assertiveness). However, discriminant analysis revealed only a minimal correlation with success or failure in UPT. (10:27-32)

While no significant pass-fail correlation evolved. this research is important for several reasons. It may

indicate that pencil-paper personality tests do not provide a good prognosis of ability to succeed in pilot training. On the other hand, it may indicate that personality traits, other than those used in this particular survey, are better indicators, or it may be that the personality data must be used in combination with other factors in order to be more meaningful. For example, personality test results coupled with psychomotor testing results may yield a better correlation than either the psychomotor testing or personality tests alone. In addition, this research provides a valuable data base and recommends additional research which might be useful for SUPT. Specifically, the authors believe that the possible relationship between personality traits and whether or not an individual was selected as FAR or TTB should be evaluated for its potential use in the SUPT track selection process. (10:32-41)

Two other areas which might be valuable to UPT were also identified. First, the Myers-Briggs Type Indicator (MBTI) information would be of value to a UPT student's instructor. (10:32) By knowing the student's personality type, the instructor could anticipate the student's likely response to various situations encountered in the training environment. Thus, the instructor could better tailor instruction to the individual student. This capability would be especially useful when dealing with students who

are experiencing difficulty in training and might mean the difference in success or failure for some UPT students. Since the MBTI questionnaire takes less than 30 minutes to complete, it would not be a significant additional workload for students to complete it upon entry into UPT. In addition, it might be a valuable tool during follow-on assignments throughout the officer's career. (10:32)

The other area from the Davis research which might be worthwhile to follow-up is the correlation of Helmreich's "mastery motivation " trait. While the Davis research aimed at looking for a match between personality traits and success or failure in UPT, traits related to motivation which are statistically significant might be useful in measuring the motivation and commitment of UPT applicants. Again, linking scores achieved on the "mastery motivation" or other motivation tests with scores received on the psychomotor tests might result in a useful tool to evaluate flying aptitude and motivation. (10:27-31)

Additional personality testing has also been accomplished through the use of surveys. One such survey is a Pilot Characteristics Survey, a copy of which is attached to this report as appendix A-1. This survey was administered to Light Aircraft Training for ROTC (LATR) candidates. The performance of these pilot candidates will be tracked until they complete pilot training. The purpose

is to see if there is any correlation between an individual's perceived personality characteristics and flying training performance. The survey is designed to find out what kind of a person the individual thinks he or she is and then to attempt to correlate this with flying performance in UPT. If a correlation does exist, this type of personality survey may be a useful tool to help in the selection and classification of pilot training candidates for SUPT. This survey is relatively new and was administered for the first time in 1988. Thus, no results have been tabulated and its validity remains to be seen.

Another type of survey that is currently being tested is a Pilot Skills Survey which is attached as appendix A-2. This survey was also designed to help develop a selection and classification system for SUPT. Its purpose is to identify what personal abilities are important and unique to flying a particular type of aircraft and mission. It will be administered to various pilot specialties throughout the Air Force. Again, it is only a pencil-paper survey and not an actual "hands-on" test. Characteristics are grouped into three categories: information processing abilities, psychomotor skills, and personality/attitudes. Rated pilots are asked to rate the relative importance of each skill as it applies to their current aircraft and mission. Survey administrators will then attempt to

correlate what the pilots believe is important with what is currently being taught in UPT, and additional items which are planned to be instructed during SUPT. If the skills the pilots believe are important correlate with what is taught in UPT, then perhaps the test will be a valid predictor of success or failure for aspiring pilot training candidates. It might also be valuable for classifying individuals for a particular SUPT track. The various skills would be weighted and the test administered during the screening and selection process. Again, as with the Pilot Characteristics Survey, this survey is in its infancy and no data is currently available as to its validity or usefulness.

Overall, the use of personality tests to measure success in pilot training is still questionable. (10:32) While some express optimism about the future of such testing, there is nothing currently available that the Air Force can use as a reliable measurement device. (10:17-18) Thus, the Air Force needs to use other means to measure motivation and commitment. However, even if an accurate measure was available, motivation and commitment can change over time. For this reason, the following discussion of the UPT Active Duty Service Commitment (ADSC) focuses on the candidate's "up front" commitment to an Air Force flying career.

Active Duty Service Commitment

Graduates from UPT now incur an Active Duty Service Commitment (ADSC) of eight years from their graduation date. The ADSC had been six years until 1987 when it was raised to seven years. Then, in 1988, it was raised to eight years. The eight year ADSC is considerably longer than the initial commitment of four years for other newly commissioned support officers. (19:13) Prior to entry into UPT, the pilot candidate must agree to the commitment. The eight year ADSC reflects the need for a greater return on the pilot training investment which averages 458,000 dollars per graduate. (28:--) In addition, follow-on training results in an ADSC but these commitments generally run concurrently with any existing commitments. In reality, follow-on training costs for UPT graduates are often never really recouped in the form of the pilot actually serving additional years of service. This was particularly true prior to the recent increase in ADSC to eight years. Thus, the new ADSC of eight years will help provide a more reasonable return on training costs.

The revised, lengthened ADSC also serves to test the candidate's motivation and commitment "up front." Due to the varied and changeable nature of individual commitment, perhaps it is more beneficial to establish the commitment up front by virtue of the individual signing up to it prior to

pilot training. Thus far, it does not appear that the increased commitment has greatly reduced the pool of highly qualified volunteers, although it is still too early to fully evaluate the impact. However, as was assessed in Chapter IV, it would be possible to select some individuals without college degrees with little loss in quality if the candidate pool should shrink dramatically as the result of the increased ADSC.

In accordance with the current Officer Professional Development (OPD) guidance, "company grade officers best serve the Air Force and their own professional development by increasing the depth of their professional competence in their individual career areas." (20:4) For pilots, this means remaining in the cockpit until they are selected for the rank of Major. To bring the current ADSC in line with this philosophy, a 10-year ADSC after completion of UPT would equate to approximately the time the officer would be eligible for promotion to Major. Thus, with a 10-year ADSC under the OPD philosophy, a pilot could be relatively certain of remaining in the cockpit during the entire period he or she was fulfilling the initial service commitment for pilot training. At the end of the initial obligation period, the pilot would know if he or she had been selected for Major and could make a career decision based on that information.

A new 10-year ADSC would also relieve the pressure created by the current low pilot retention in the six to 11 year groups. Although retention in year groups beyond 11 years might be adversely affected, those year groups are less critical to the primary crew force that the Air Force relies on. Overall, this alternative would identify the truly committed UPT candidate "up front" and help stabilize the pilot force through the 11 year group. While many other alternatives are available which attempt to measure motivation and commitment, it is difficult to imagine that any would be as stabilizing as the 10-year ADSC.

CHAPTER VI

RESEARCH AND TESTING TOOLS AVAILABLE

Introduction

In 1968, the Assistant Secretary of Defense for Manpower recommended that the Air Force research possible improvements in the selection process for UPT. (42:18) This led to the involvement of the Air Force Human Resources Laboratory at Brooks Air Force Base. The AFHRL task was to determine the reliability of psychomotor testing for pilot candidate screening. Since 1969, a number of studies and tests were conducted to determine if state-of-the-art technology and computer-aided testing could result in ideal pilot candidate selection. (8:1)

Perceptual-motor and Cognitive Testing

One of the most exhaustive studies in this area was done by David Imhoff and Jerrold Levine. Their effort focused on psychomotor, perceptual and information processing abilities to predict pilot training performance. Their objective was "to develop a valid battery of tasks for the selection of candidates to Undergraduate Pilot Training." (44:i) The tasks had to be (1) related to the perceptual-motor and cognitive aspects of flying, (2) performance tasks to avoid verbal and cultural biases, (3) indicative of individual differences in performance, and (4) capable of being computer implemented and tested.

After an extensive study, Imhoff and Levine identified a test battery of 44 tasks that measured psychomotor and cognitive characteristics necessary for piloting. Because of practical and money constraints, the test battery was further reduced to 15 tasks by introducing additional measurement criteria. (44:i) This study was a significant step towards identifying tasks that could be tested to predict flying performance. It was computer adaptable and easily reduced or expanded as necessary. However, because many people continue to question the accuracy of these tasks to predict performance, they have not been used for any actual screening or track selection as planned.

Psychomotor Screening

Additional study and validation testing, also done by AFHRL, was started in 1978 prior to the Imhoff and Levine report described above being published. The authors of this report, which was published in July 1986 and covered from March 1978 to August 1984, were Jeffrey E. Kantor and V. Paul Bordelon. With the help of many other people, also mentioned in this report, they continued to study the utilization of psychomotor screening and the use of independent and integrated methodologies for selecting pilot training candidates. (8:i) This study focused on the three main sources of UPT entrants: Air Force Academy, Air Force Reserve

Officer Training Corps and Officer Training School. From 1978 to 1981, 2,623 pilot candidates were tested using psychomotor test devices. (see figure 6-1.) This test measured Two-Hand Coordination and Complex Cordination using computer generated images and cassette tapes. A description of these two tests can be seen in appendix A-3. The goal of this research was, "to capitalize on state-of-the-art technologies in computer-aided testing." (8:1) If accurate testing could be developed to measure psychomotor ability, then this information could be used to help select UPT candidates.

Out of the 2,623 individuals originally tested, 1,725 actually entered UPT and were tracked. Another group of 166 UPT students were tested and tracked in 1983 to get a cross validation group independent of the original group. The results, of the larger group, show UPT graduates, eliminees, and flying deficiency eliminees. (see figure 6-2.) Note that since this type of testing measures deviations, low scores are better than high scores. "All five (psychomotor) scores had significant differences ($p < .001$) between graduates and either category of eliminees." (8:8) The flying deficiency eliminees had a significantly lower mean on all three of the Complex Coordination tests suggesting that this test does the best job of identifying potential flying deficiency eliminees. The results of these tests, "validate the use of

Subjects Tested by Source

SOURCE	SUBJECTS TESTED
Air Force Academy	382
Air Force ROTC	1,229
Officer Training School	603
Unknown Source of Commission	314
Testing Plan Total	2,528
UPT, Williams AFB	95
Total	2,623

Figure 6-1 Source (8:3)

MEAN PSYCHOMOTOR SCORES
BY UPT OUTCOME

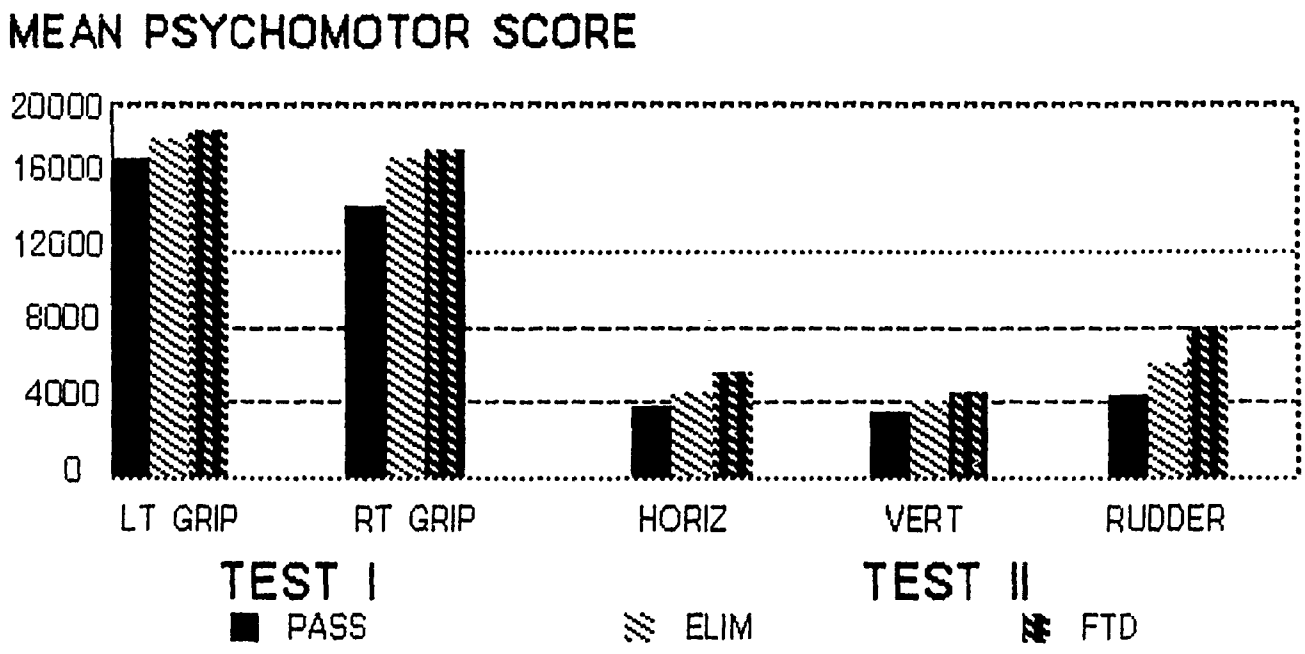


Figure 6-2 Source (8:9)

all five psychomotor scores as predictors of success or elimination in UPT." (8:8)

The results of the 166 candidates, used for cross-validation, also validated psychomotor screening as an effective predictor of success in UPT. In fact, the results correlated slightly higher with actual UPT success than the results of the larger group discussed earlier. This test group result also indicated that psychomotor screening would be accurate even when done several years prior to entering UPT. (8:14) This was a significant finding since the lead time for selecting UPT, and in the future SUPT, candidates could require that the screening be done several years in advance of entry into training.

In addition to testing pilot candidates entering UPT, 95 UPT graduating students at Williams AFB were also tested. Their psychomotor scores were then compared to their UPT performance and the ATRB results, which had already classified them as FAR or TTB. (8:3) The FAR/TTB results correlated highly with the results of the psychomotor testing. The FAR students scored higher on all five of the tests, and scored significantly higher on two of the five. (see figure 6-3.) "These results show that in addition to identifying candidates low probability of UPT success, psychomotor scores also relate to superior performance in UPT." (8:8)

MEAN PSYCHOMOTOR SCORES
BY FAR/NON-FAR (TTB)

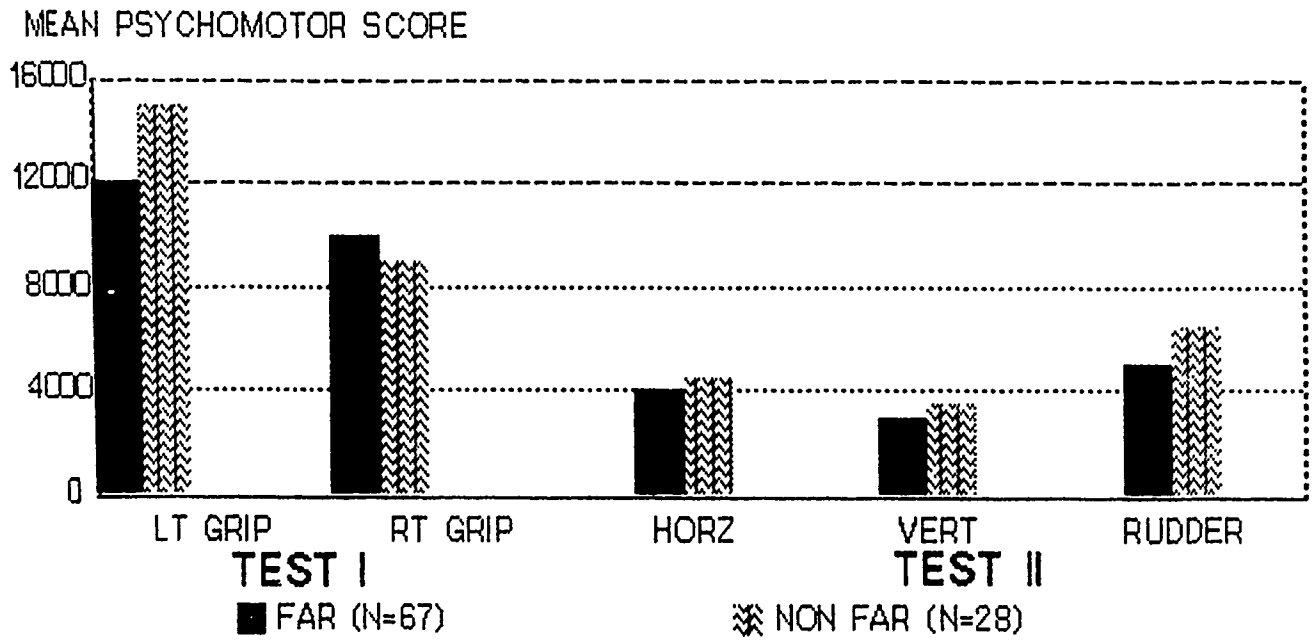


Figure 6-3 Source (8:10)

When ranked in ten equal sized groups based on score (decile) groups it is significant to note that over 40% of the lowest group were eliminated from UPT while only 13% of the top group failed to graduate. (see figure 6-4.) If this testing was used for pilot candidate selection, they could be easily ranked into deciles with the top scoring candidates selected for training. The authors of this report conclude that the Two-Hand Coordination and Complex Coordination tests, "are valid predictors of UPT outcome," and that, "superior UPT students (FAR-recommended) can be differentiated from weaker students (non-FAR)." (8:20)

Further research in this report used an integrated mix of all screening information available to come up with an Integrated Pilot Candidate Selection Model (IPCSMs). Rather than just rely on the AFOQT, age, college grade point average (GPA), private pilot's license and completion of a flight screening or indoctrination program, this IPCSM would use the best mix of inputs, selectively weighted, to screen candidates. The IPCSM would use some combination of the psychomotor test scores along with the other information. Three different IPCSMs were developed for the three different commissioning sources; AFA, OTS and ROTC, because of the different information available (for example the AFA cadets do not take the AFOQT). The results of these IPCSM scores correlated with UPT outcome (see figure 6-5) and according to

DECILE GROUPS RANKED BY

PSYCHOMOTOR SCREENING SCORE

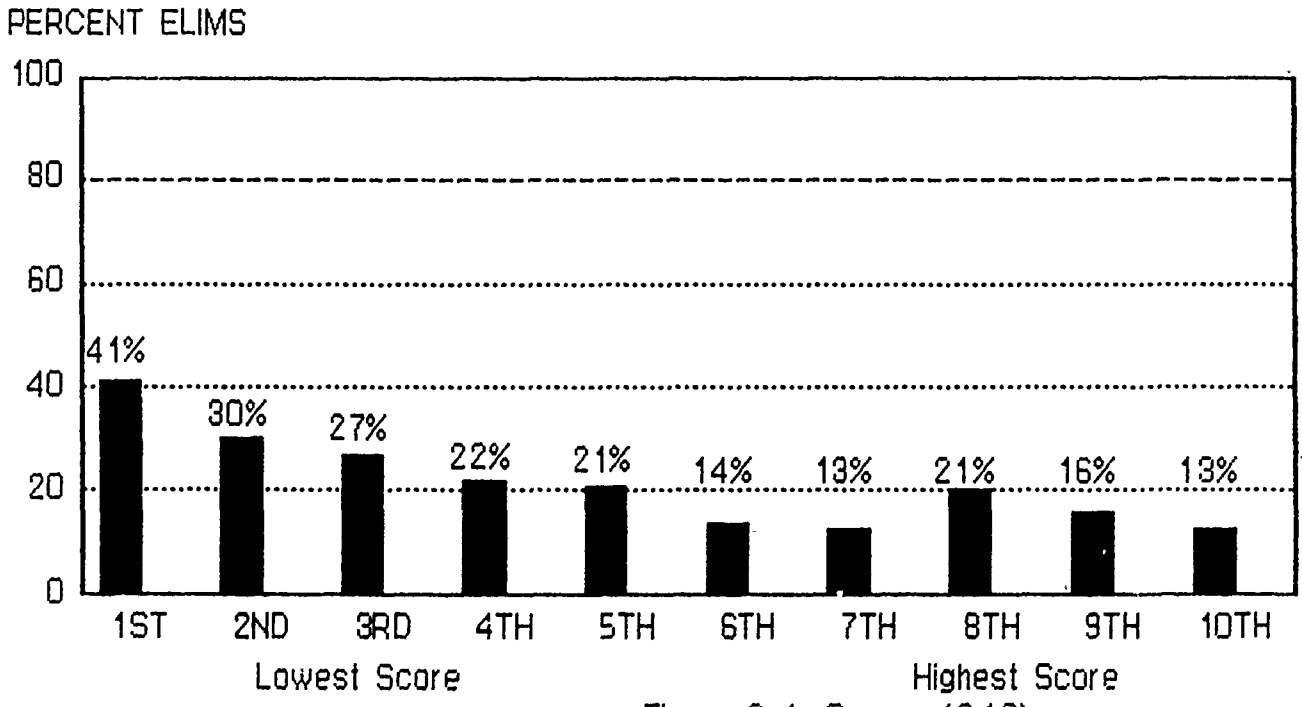


Figure 6-4 Source (8:13)

MEAN IPCSM SCORES
BY UPT OUTCOME

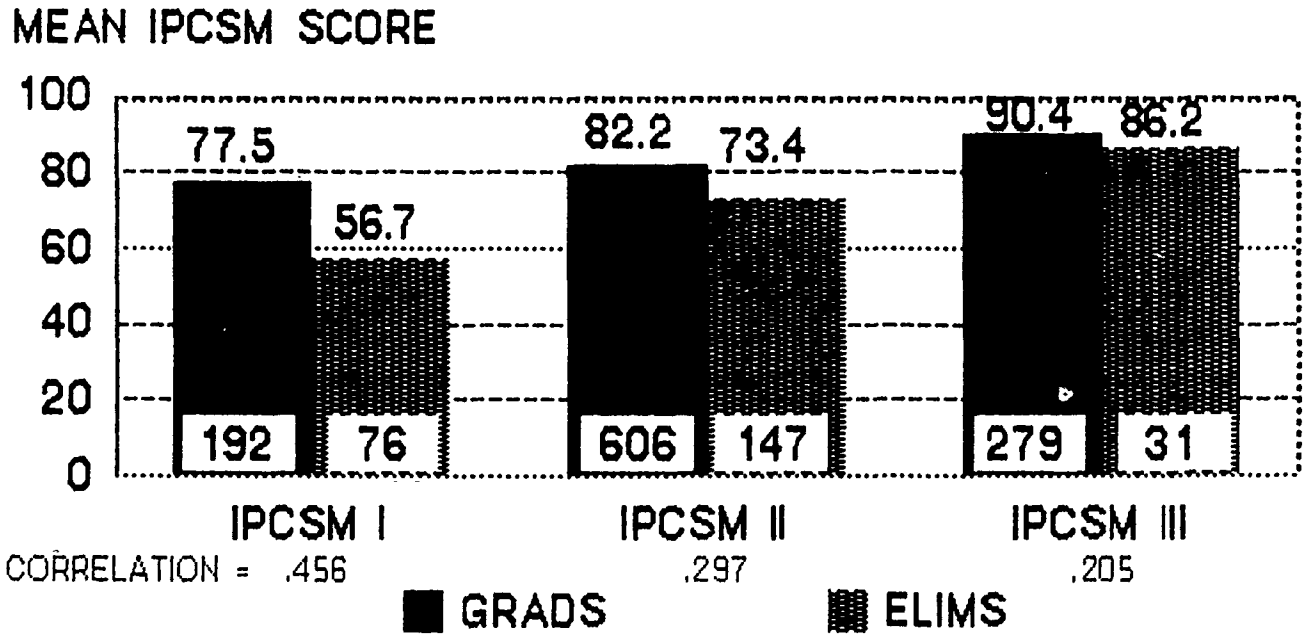


Figure 6-5 Source (8:18)

the authors, "These results validate the use of all three IPCSMs as predictors of success or elimination in USAF UPT." (8:17) The practical value of this type of screening model is even more convincing when divided into deciles. As can be seen in figure 6-6, 82% of the OTS candidates in the lowest decile were eliminated from UPT while only 7.5% of the top two groups failed to graduate. The results from the AFA and ROTC models were similar. (8:17) However, when the three IPCSMs were cross-validated with an FY83 UPT student sample, only the first two IPCSMs correlated as predictors of UPT outcome. The lack of correlation of IPCSM III, the AFA model, remains unanswered. (8:20)

Despite this very lengthy study by AFHRL personnel, psychomotor screening and integrated selection models are not the panacea. In fact, the Canadian Air Force had been using psychomotor screening, with a visual general aviation trainer (VGAT), for some time in their pilot selection process and have gone away from it. In 1982, because of continued high attrition in pilot training, the Canadian Air Force decided that their selection process, using the VGAT alone, was too error prone and elected to go to the Canadian Automated Pilot Selection System known as CAPSS. (50:21) This is a more integrated system, such as the one described earlier, but is much more job specific than what the USAF is looking for.

DECILE GROUPS RANKED BY IPCSM I
(OTS MODEL)

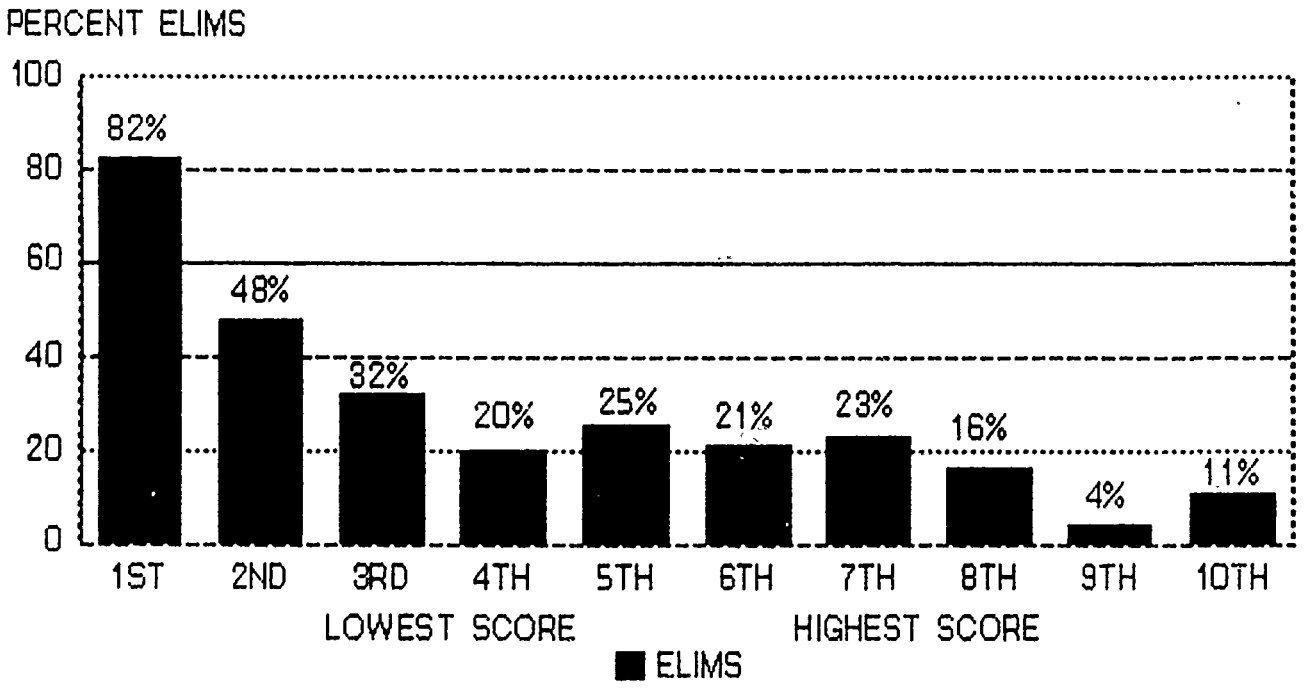


Figure 6-6 Source (8:19)

A combination of psychomotor screening and integrated selection models would apparently improve the accuracy of pilot candidate selection and prediction of success. This would also help reduce attrition and could be easily adapted to up-front track selection for SUPT. It would be as accurate a predictor of success as paper-and-pencil AFOQT and college GPAs are. It is impossible to say how many candidates that would graduate from UPT, are never selected for pilot training today because of the current selection criteria. The other problem is developing a job sample selection model that does not take too much time and money to implement. This was the problem the Navy experienced, in 1979, when they developed an Aptitude Measurement System that was never used because of time, accuracy and cost. (50:24) Picking the optimum selection model is the difficult task and the task the USAF must address to arrive at a better selection process for pilot candidates in the future.

Basic Attributes Test

Following the report on psychomotor screening and integrated selection models, AFHRL continued to try and derive better tests to predict flying aptitude. This was especially important since the IPCSM III did not correlate as a strong predictor of success. Also, the emphasis had started to swing from just measuring "head" (AFOQT and

college GPA) and "hands" (psychomotor or coordination), to also measuring "heart" (motivation). Along this line, AFHRL developed a series of psychomotor, decision-making and personality tests known as the Basic Attributes Tests or BAT. The Porta-Bat was the name given to the portable, computerized testing device used to test for these skills. (47:8) As mentioned earlier in this report, because of their concern about attrition in pilot training, the Air National Guard actually began using the Porta-Bat in October, 1986 to test their pilot candidates. Originally, the ANG was only using the results from the hand-eye coordination tests that were discussed in the previous section and could be tested on the Porta-Bat. They felt that these tests had been validated enough and that anyone scoring in the bottom 20% on the Porta-Bat had a low probability of making it through pilot training. (48:8) In this section, I will discuss the additional battery of tests that are still under evaluation by AFHRL.

Thomas R. Carretta, Ph.D. from the Manpower & Personnel Division at AFHRL, has published the most information on the BAT since 1987. The objective of using the BAT is to not only measure hand-eye coordination (psychomotor), but also to measure, " information processing, perceptual abilities, personality, and attitudes." (43:2) If the BAT can successfully measure these, then the true test to

measure head, heart and hands will be available. The BAT, eventually narrowed down to 12 computerized tests, took about three and one half hours to complete. (see figure 6-7.) The BAT measuring apparatus is a super-microcomputer and monitor built into a self contained unit with a glare shield and side panels. (see figure 6-8.) The subject responds to instructions by controlling joysticks on the left and right sides and a keyboard in the center of the unit. (51:5) After testing well over 2000 potential UPT candidates and UPT students on various combinations of the BAT, several of the tests were not found to be related to success in flight training. (52:8) These tests were then eliminated from the current BAT battery. The total number of valid tests has been reduced to eight taking about two and one half hours to complete. The current proposed battery of tests consists of the original two tests to measure the hands or psychomotor skills, Two-Hand Coordination and Complex Coordination. It consists of four tests to measure the head; Encoding Speed, Mental Rotation, Item Recognition and Time Sharing. Finally, it consists of two tests to measure the heart, Self-Crediting Word Knowledge and Activities Interest Inventory. As proposed by the personnel at AFHRL, these tests could be used for initial pilot candidate selection, along with the AFOQT. One example of such a weighted model can be seen in figure 6-9. The results could also be used for SUPT classification,

this time weighted as seen in figure 6-10. With the amount of information now available, AFHRL believes it would be a much more accurate pilot candidate selection process and a much better pilot classification system.

BASIC ATTRIBUTES TESTS (BAT) BATTERY SUMMARY

TEST NAME	LENGTH (mins)	ATTRIBUTES MEASURED
Test Battery Introduction:	15	Biographical Information
Two-Hand Coordination: (rotary pursuit)	10	Tracking & Time-Sharing Ability in Pursuit
Complex Coordination: (stick and rudder)	10	Compensatory Tracking Involving Multiple-Axes
Dot Estimation: Impulsiveness/Decisiveness	6	
Digit Memory:	5	Perceptual Speed
Encoding Speed:	20	Verbal Classification
Mental Rotation:	25	Spatial Transformation & Classification
Item Recognition:	20	Short-Term Memory, Storage, Search & Comparison
Risk Taking:	10	Risk Taking
Embedded Figures:	15	Field Dependence/Independence
Time Sharing:	30	Higher Order Tracking Ability, Learning Rate & Time Sharing
Self-Crediting Word Knowledge:	10	Self-Assessment Ability, Self-Confidence
Activities Interest Inventory:	10	Survival Attitudes

Figure 6-7 Source (43:3)

Figure 6-8

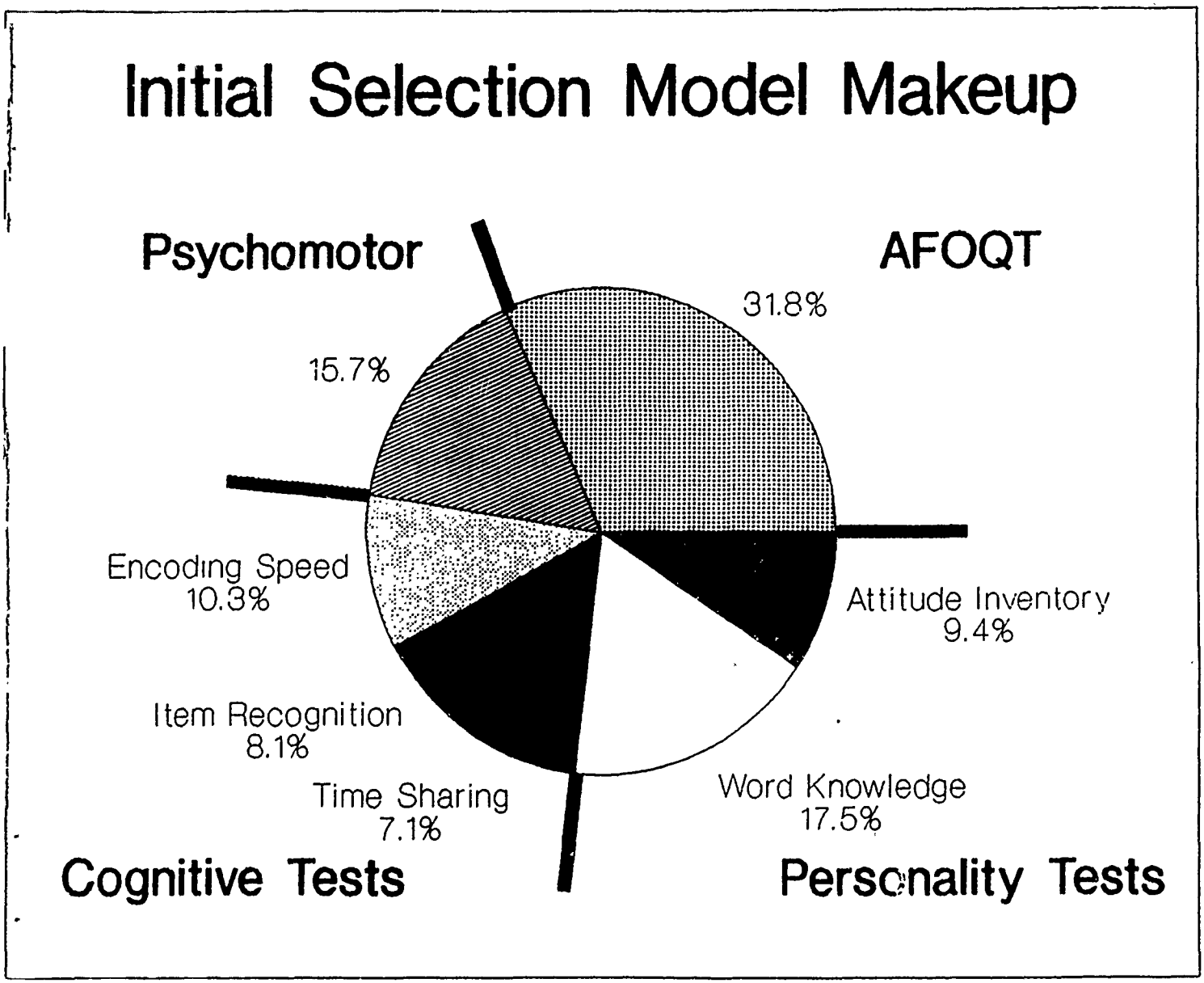


Figure 6-9 Source 53

Initial Classification Model Makeup

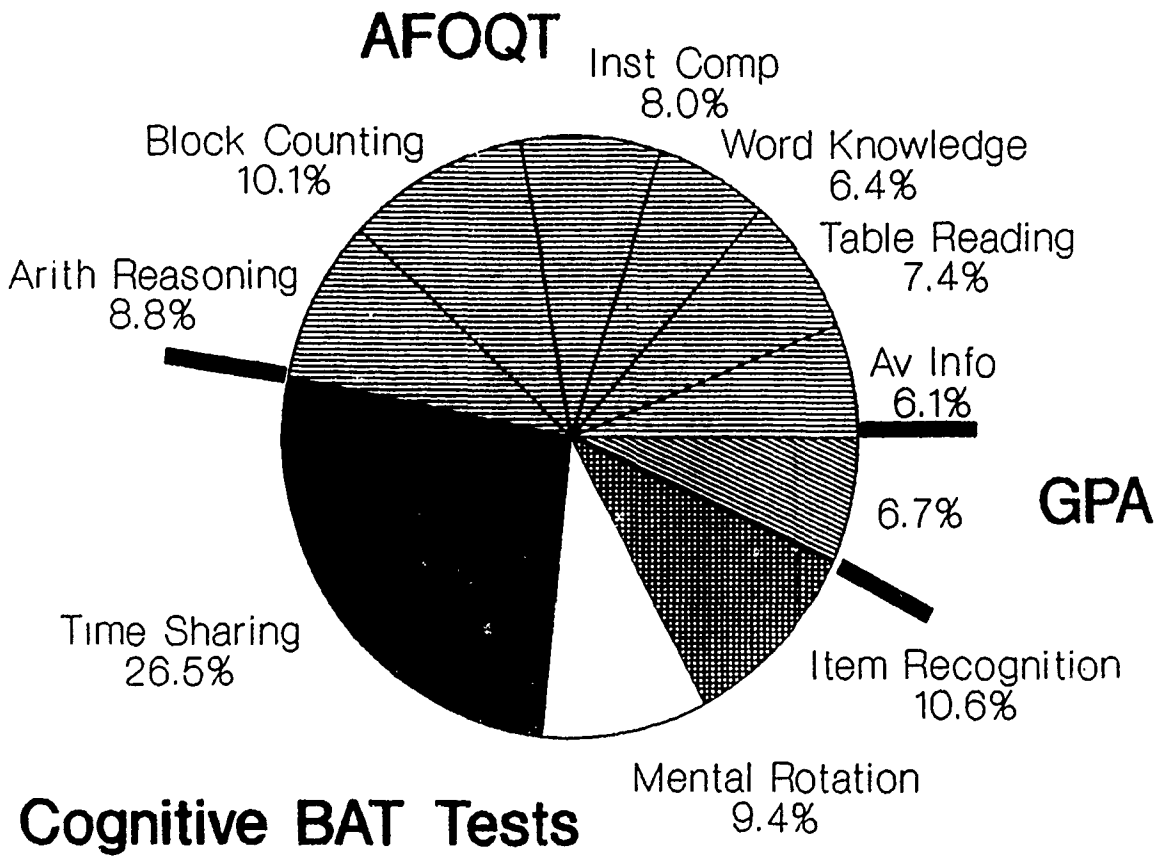


Figure 6-10 Source 53

CHAPTER VII

CONCLUSIONS AND RECOMMENDATIONS

Summary

The Air Force's goal for the future is an accurate pilot selection and classification system (PSACS) to complement Specialized Undergraduate Pilot Training . Much study has been done in this area over the last five decades. In the early 1940's, Aircrew Classification Battery (ACB) testing was done using mathematical ability, perceptual ability and mechanical comprehension to predict pilot training success. From this testing, pilot candidates were ranked in stanines from a high of nine to a low of one. (49:21) Mainly a pencil and paper test, the ACB proved accurate enough that it was later used to disqualify candidates from entering pilot training. (49:21)

When generalized UPT started in 1959, up-front track selection was no longer necessary. Although some psychomotor testing was used, most of the selection process had been based on pencil and paper tests like the one described in the previous paragraph. When testing equipment became too costly and difficult to maintain, psychomotor ability screening was discontinued altogether in 1955.

The Air Force Officer Qualifying Test now remained as the primary means of selecting pilot candidates. If a candidate scored high on the AFOQT and could pass the

physical examination, no other testing was required. Prior flying experience and later the candidate's age and a technical degree became factors in the selection process.

Although the AFOQT was and is an adequate method for pilot candidate selection, it has many shortfalls. It is not an accurate predictor when trying to predict UPT success. It would be difficult and would not be an accurate method for SUPT classification and up-front track selection. It is not an accurate predictor of what the ATRB results will be relative to FAR or TTB. This is another reason there is a need for a new and more valid pilot selection and classification system.

The commitment of the Air Force and Air Training Command is to implement a better pilot selection and classification system. The average cost of a UPT eliminee is now figured at over $67,000. This costs the Air Force over $30 million a year in pilot training eliminees. If SUPT begins as planned in FY92, it will be even more important to be able to accurately select and classify pilot candidates. The classification process will be held prior to the beginning of primary training and there will be no crossvoer from one track to the other. Decisions will have to be accurate and timely for both selection and classification. The selection tools available are many and varied and have been studied for years. The challenge is to pick the ones

that work to give the Air Force the best end product out of pilot training.

The current selection process consists of AFOQT, age, medical, and GPA inputs along with usually some sort of flight screening or flight indoctrination program. Several of these inputs are quite subjective and arguably have little or nothing to do with flying aptitude. The criteria for the future needs to be more specific, accurate and relative to what it is trying to measure.

The proposal of ATC is to continue to use AFOQT, GPA, flight screening and medical inputs but also add psychomotor and cognitive inputs through the use of the Porta-BAT tests. Currently there are 25 Porta-BAT units available and in use by AFHRL. More units would have to be procured and a standardized testing program developed. The information and knowledge is available to easily accomplish this. Additional criteria would include the use of positive predictors and interviews and surveys. Finally the pilot candidates preference would be taken into account. The goal is to measure the "head," "heart," and "hands" of each candidate and then make the selection of those that are sure bets to succeed, not only in pilot training but also in follow-on training. Much study has been done on the use of various attributes tests. However, little is known about the use of interviews or surveys and the significance of personality and

attitude when trying to predict UPT success.

Recommendations

Recommendations for change to pilot candidate selection must address factors which measure the "head," "hands," and "heart" of each candidate. Based on the conclusions arrived from the material in this study, some recommendations are offered which should improve the selection process. In addition, recommendations are included which will aid in classifying candidates as FARB or TT prior to primary training under the planned SUPT program. Recommendations are not included for two current selection factors (medical standards and age) as these factors should continue to be valid and are beyond the scope of this report.

The Air Force does an excellent job in evaluating a candidate's mental ability -- the "head." There are numerous tests and indicators available which can predict the candidate's ability to succeed academically with reasonable accuracy. The only real issue raised in this report is that Air Force places too much emphasis on academic achievement in selecting its pilot candidates. Although it relates only indirectly to pilot candidate selection, the authors recommend a review to determine if a college degree is a valid prerequisite for receiving a commission, and therefore, for entry into pilot training. Also, there should be little emphasis placed on GPA and a review of how much AFOQT scores

should be used to select pilot candidates. A weighted selection model, such as the one discussed in the previous chapter, would place the proper emphasis on AFOQT scores for entry into pilot training. The Air Force should start using other factors to a greater extent such as the ones discussed in the following paragraphs.

In the area of evaluating flying appitude or "hands," the Air Force should use more of the available tools and methods to evaluate the potential flying skills of its candidates. This need will be particularly critical when the Air Force implements SUPT. Specifically, the authors recommend the following:

1. Since previous flying experience directly correlates with success in pilot training, recommend that flying experience prior to UPT be improved by the following methods:

a. For AFA candidates: Increase PIP to 30 flying hours minimum -- higher if time is available in the AFA curriculum and enough airframes and flying hours are available.

b. For all OTS, ROTC, and Active Duty non-PPL candidates: Increase FSP to at least 30 flying hours. If flying hours and/or airframes are insufficient to support this increase in the near term, flying hours should be increased to the maximum extent possible. In addition, the ROTC initiative to contract for private pilot's licenses for

its pilot candidates should be implemented if the cost per candidate is similar to FSP. The ROTC initiative would reduce the FSP load and thereby, free-up flying hours and airframes to increase hours for the remaining candidates.

c. For candidates with PPLs: Add a requirement that PPL candidates must have a minimum of 50 flying hours.

2. Use the AFOQT for all candidates including AFA cadets who should at least take the pilot and navigator portions of the test.

3. Require that all pilot training candidates undergo psychomotor screening. This is currently the only tool available (other than the flight screening programs) to classify candidates for FARB or TT if classification is accomplished prior to entry into primary training. In addition, psychomotor testing could be used as part of pilot candidate selection -- using a minimum cutoff score such, as the ANG is doing, or using it as part of the integrated selection models as suggested by AFHRL.

The final measure of the pilot candidate's potential is his/her motivation or the "heart." This is the most difficult, and many people say most important, part of the equation to measure. While there is ongoing research in this area, the authors did not find any test or other device which can accurately measure a candidate's motivation to serve as an Air Force pilot. The following recommendations are

offered:

1. Recommend that Air Force personnel officials consider increasing the ADSC for pilot training to 10 years. Since there is currently no test available to measure motivation, the increased ADSC provides an "up front" test of the candidate's true desire. In addition, this recommendation appears to correlate well with OPD objectives and has implications in the pilot retention arena.

2. Recommend that Air Force training officials study the feasibility, affordability and need for a central pilot candidate selection and classification board. This would provide a more standardized, coherent and accurate system for selecting candidates. However, the potential cost and other factors may make this impractical.

3. The Air Force should continue its research on personality testing as a means of evaluating motivation and potential to complete pilot training. Pilot candidate interviews may also have some merit, but the process needs to be standardized.

Conclusion

In conclusion, SUPT offers the opportunity for improved, mission-oriented pilot training. However, the selection and classification process must be able to pick the candidates who can succeed in pilot training. It must also be able to predict which track (FARB or TT) candidates are best suited. The Air Force does a good job measuring

academic ability but the current system for measuring potential flying skills and motivation requires improvement if Air Force is to be able to accurately classify candidates for the appropriate track in SUPT. The recommendations in this report do not represent new and revolutionary ideas -- rather, they serve as a confirmation that methods are already available to improve the selection and classification system. While these ideas were derived as a means of solving pilot selection problems for SUPT, most would also improve the current UPT selection system. Some of these tests have been studied enough and the authors of this report believe they have merit. Psychomotor and Cognitive testing should be used to supplement current selection criteria. The bottom line is to produce high quality, well motivated pilots at the lowest cost. The recommendations in this report should result in picking well motivated candidates and minimizing attrition. Thus, the overall cost to the Air Force for new pilots would be reduced. Although many factors in the selection process are difficult to pin down, the Air Force must continue to refine this process if it is to continue producing the world's best qualified pilots.

PILOT CHARACTERISTICS SURVEY

This survey is being conducted in support of Undergraduate Pilot Training selection and classification research. The purpose is to examine whether certain characteristics are associated with flying training performance. The responses collected will be used for *research purposes only* and will have no effect on your opportunities with regard to UPT.

In order to best use the information from this survey, it will be necessary to track the training records of the respondents participating in this effort. Therefore, we ask that you provide your name and SSAN. Please note, however, that your answers will be kept *strictly confidential* . Your individual responses will not be shared with anyone else in your chain of command, and these data will not be used for personnel evaluations of any type.

General Instructions

Please use a **No. 2 pencil** and the enclosed machine scoreable answer sheet, GENERAL ANSWER SHEET TYPE C, for your responses to all of the following items. Print your name at the bottom of the box labeled NAME GRID and fill in the matching bubble in each column. In the box labeled DATE write today's date in the squares at the bottom of the box and fill in the matching bubbles in each column. In the NUMERIC GRID box write your SSAN in boxes 1 to 9 and fill in the matching bubbles in columns 1 through 9.

SKIP to column 18 of the NUMERIC GRID

Use the last three columns of the NUMERIC GRID, columns 18-20, to indicate your weapon systems preferences. Use column 18 to rank your choice for fighter aircraft. Use column 19 to rank your preference for flying bombers. In column 20, rank your preference for flying tanker/transport aircraft. Rank your most preferred weapon system with a "1." Give a rank of "3" to your least preferred weapon system. Finally, assign a "2" to the remaining weapon system, the one that is neither your most preferred nor your least preferred.

	Fighter	Bomber	Tanker/ transport
NUMERIC GRID	Col 18	Col 19	Col 20
Rank 1, 2 or 3			

In the SEX box, indicate your gender by filling in the bubble.

Note: Remember to use a No. 2 pencil and please do not mark in the booklet.

Now go to Part A of the questionnaire on the next page.

Privacy Act Statement. U S C. 8012, Secretary of the Air Force, Powers, Duties, Delegation by Compensation. E.O 9397, 22 Nov 43, Numbering System for Federal Accounts Relating to Individual Persons Information provided by respondents will be used solely for Air Force personnel research purposes. All information provided by individual respondents will be treated confidentially Disclosure of this information is voluntary. No adverse action may be taken against any individual who elects not to participate. However, failure to provide information could detract from the Air Force's ability to improve its personnel policies

Part A

The following statements ask about what kind of person you think you are. Each item consists of a pair of characteristics, with the letters A through E in between. For example:

Not at all artistic A B C D E Very artistic

Each pair describes contradictory characteristics -- that is, you cannot be both at the same time, such as Very artistic and Not at all artistic.

The letters form a scale between the two extremes. You are to choose a letter that describes where you fall on the scale. For example, if you think you have no artistic ability, you would choose A. If you think you are pretty good, you might choose D. If you are only medium, you might choose C, and so forth.

Now go ahead and answer the questions on the answer sheet. Be sure to answer every question, even if you're not sure, and use a #2 pencil.

---

1. Not at all aggressive A B C D E Very aggressive
2. Not at all independent A B C D E Very independent
3. Not at all gullible A B C D E Very gullible
4. Not at all arrogant A B C D E Very arrogant
5. Not at all emotional A B C D E Very emotional
6. Very submissive A B C D E Very dominant
7. Very boastful A B C D E Not at all boastful
8. Not at all excitable in a major crisis A B C D E Very excitable in a major crisis
9. Very passive A B C D E Very active
10. Not at all egotistical A B C D E Very egotistical

PLEASE GO TO NEXT PAGE

11. Not at all able to devote self completely to others	A	B	C	D	Very able to devote self completely to others E
12. Not at all spineless	A	B	C	D	Very spineless E
13. Very rough	A	B	C	D	Very gentle E
14. Not at all complaining	A	B	C	D	Very complaining E
15. Not at all helpful to others	A	B	C	D	Very helpful to others E
16. Not at all competitive	A	B	C	D	Very competitive E
17. Subordinate self to others	A	B	C	D	Never subordinate self to others E
18. Very home oriented	A	B	C	D	Very worldly E
19. Very greedy	A	B	C	D	Not at all greedy E
20. Not at all kind	A	B	C	D	Very kind E
21. Indifferent to other's approval	A	B	C	D	Highly needful of other's approval E
22. Very dictatorial	A	B	C	D	Not at all dictatorial E
23. Feelings not easily hurt	A	B	C	D	Feelings easily hurt E
24. Don't nag	A	B	C	D	Nag a lot E
25. Not at all aware of feelings of others	A	B	C	D	Very aware of feelings of others E
26. Can make decisions easily	A	B	C	D	Have difficulty making decisions E

PLEASE GO TO NEXT PAGE

27. Very fussy	A	B	C	D	Not at all fussy E
28. Give up very easily	A	B	C	D	Never give up easily E
29. Very cynical	A	B	C	D	Not at all cynical E
30. Never cry	A	B	C	D	Cry very easily E
31. Not at all self-confident	A	B	C	D	Very self-confident E
32. Do not look out only for self; principled	A	B	C	D	Look out only for self; unprincipled E
33. Feel very inferior	A	B	C	D	Feel very superior E
34. Not at all hostile	A	B	C	D	Very hostile E
35. Not at all understanding of others	A	B	C	D	Very understanding of others E
36. Very cold in relations with others	A	B	C	D	Very warm in relations with others E
37. Very servile	A	B	C	D	Not at all servile E
38. Very little need for security	A	B	C	D	Very strong need for security E
39. Go to pieces under pressure	A	B	C	D	Stand up well under pressure E
40. Very whiny	A	B	C	D	Not at all whiny E

END OF SECTION A

PLEASE GO TO PART B ON NEXT PAGE

Part B

The following items describe reactions to conditions of work and challenging situations. For each item, use the scale below to indicate how much you agree or disagree with each statement by choosing from the scale the appropriate letter on the scale: A, B, C, D or E. You should choose A if you strongly agree with the item, and you should choose E if you strongly disagree with the item. B, C or D should be chosen if you slightly agree, neither agree nor disagree, or slightly disagree with the item. Read each statement carefully. When you have decided on your answer, fill in the letter on the answer sheet next to the item number. The scale will appear at the top of each page.

A	B	C	D	E
Strongly agree	Slightly agree	Neither agree nor disagree	Slightly disagree	Strongly disagree

41. I would rather do something at which I feel confident and relaxed than something which is challenging and difficult.

42. I enjoy working in situations involving competition with others.

43. When a group I belong to plans an activity, I would rather direct it myself than just help out and have someone else organize it.

44. I would rather learn easy fun games than difficult thought games.

45. It is important to me to perform better than others on a task.

46. If I am not good at something I would rather keep struggling to master it than move on to something I may be good at.

47. Once I undertake a task, I persist.

48. I prefer to work in situations that require a high level of skill.

49. I feel that winning is important in both work and games.

50. I more often attempt tasks that I am not sure I can do than tasks that I believe I can do.

51. It annoys me when other people perform better than I do.

52. I like to be busy all the time.

53. I try harder when I'm in competition with other people.

54. It is important for me to do my work as well as I can even if it isn't popular with my co-workers.

55. I find satisfaction in working as well as I can.

56. There is satisfaction in a job well done

PLEASE GO TO NEXT PAGE

A	B	C	D	E
Strongly agree	Slightly agree	Neither agree nor disagree	Slightly disagree	Strongly disagree

57. I find satisfaction in exceeding my previous performance even if I don't outperform others.

58. I like to work hard.

59. Part of my enjoyment in doing things is improving my past performance.

60. My general level of activity is higher than most people's.

61. When a person is talking and takes a long time to get to the point, I often feel like hurrying the person along.

62. I get irritated very easily.

63. I have a quick temper.

64. I put more effort into the things I do than most people.

65. I tend to do most things in a hurry.

66. I take life in general more seriously than most people.

67. When I have to wait in line, such as at a restaurant or the movies, I often feel impatient and refuse to wait very long.

68. I take my work more seriously than most people.

69. College really stirs me into action.

70. When I get involved in an activity, I am very hard-driving.

Comments:

HOW TO RETURN YOUR QUESTIONNAIRE AND ANSWER SHEET: Place both the questionnaire and the answer sheet in the envelope provided. Seal the envelope. Give the envelope to the AFROTC/LATR Class Commander at the time you outprocess.

Thank you for your cooperation with this research effort.

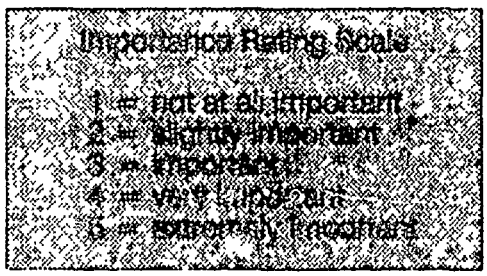
SUPT
PILOT SKILLS SURVEY

This questionnaire is designed to identify the relative importance of personal abilities required to complete tasks unique to flying your aircraft and missions. Your answers will help us to develop a selection and classification system for specialized UPT.

INSTRUCTIONS

On the next several pages you will find a list of characteristics that have been identified as being associated with pilot performance. Your task is to judge how important each characteristic is with regard to performance within your weapon system. To provide this information you should:

1. Read the definition of each characteristic to make sure you understand it. Then rate its importance to your weapon system using the scale below.



2. Please note that raters sometimes make errors of judgment when using forms such as this. To avoid such errors:

   a. use the high and low numbers (1 and 5) of the scale whenever appropriate

   b. avoid excessive use of the middle number (3) of the scale

3. Note that the characteristics are grouped into three categories. psychomotor skills, information processing abilities, and personality/attitudes. After rating all of the separate characteristics, please indicate how much each of these three categories contributes to performance in your weapon system.

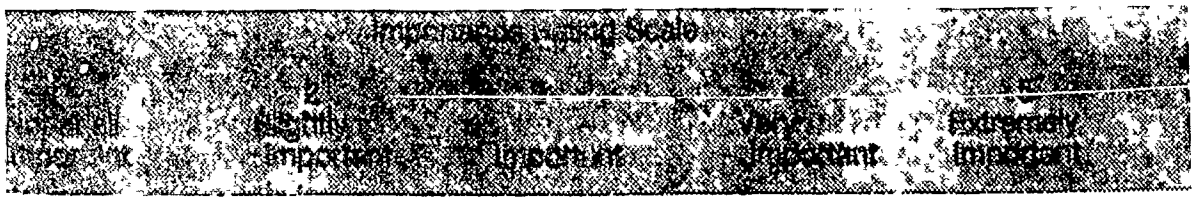
4. A blank space is provided at the end of the survey for your comments. Please feel free to respond with any other information you think may be important to this research. Thank you.

Privacy Act Statement. 10 U.S.C. 8012, Secretary of the Air Force, Powers, Duties, Delegation by Compensation; E.O. 9397, as Nov 43, Numbering System for Federal Accounts Relating to Individual Persons. Information provided by respondents will be used solely for Air Force personnel research purposes. All information provided by individual respondents will be treated confidentially. Disclosure of this information is voluntary. No adverse action may be taken against any individual who elects not to participate. However, failure to provide information could detract from the Air Force's ability to improve its personnel policies.

Importance Rating Scale				
1 Not at all important	2 Slightly important	3 Important	4 Very important	5 Extremely important

CATEGORY I. INFORMATION PROCESSING ABILITIES

___ SITUATIONAL AWARENESS	The state of constant mental readiness to respond to situational changes.
___ MEMORIZATION	The ability to remember information, such as words, numbers, pictures, and procedures.
___ REASONING	The ability to combine separate bits of information and to apply general rules in order to derive logical answers or form conclusions.
___ PERCEPTUAL SPEED	The ability to perceive quickly and accurately small details in patterns and configurations.
___ TIME SHARING	The ability to do more than one thing at a time.
___ ORAL COMPREHENSION	The ability to understand spoken English words and sentences.
___ SELECTIVE ATTENTION	The abiliy to concentrate on a single task in the presence of one or more distractions.
___ RESPONSE ORIENTATION	The ability to choose between two or more movements quickly and accurately when two or more different signals (lights, sounds, pictures) are given. The ability is concerned with the speed with which the right response can be started with the hand, foot or other parts of the body.
___ SPATIAL ORIENTATION	The ability to tell where you are in relation to the location of some object or to tell where the object is in relation to you.
___ WRITTEN EXPRESSION	The ability to use English words or sentences in writing so others will understand.
___ DIVIDED ATTENTION	The ability to shift back and forth between two or more sources of information.
___ FLEXIBILITY OF CLOSURE	The ability to identify relevant information in a complex perceptual field.
___ INFORMATION ORDERING	The ability to correctly follow a rule or set of rules to arrange things or actions in a certain order.

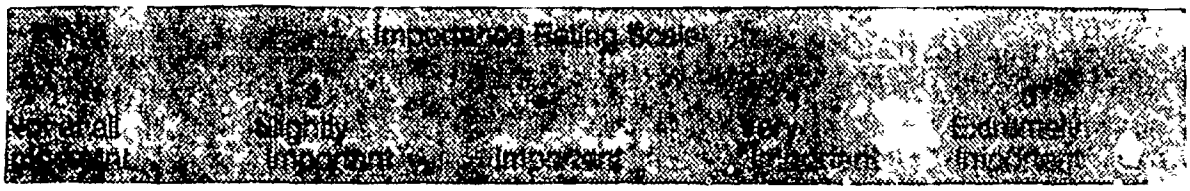


CATEGORY I. INFORMATION PROCESSING ABILITIES (continued)

___ NUMBER FACILITY	Involves the degree to which adding, subtracting, multiplying and dividing can be done quickly and correctly.
___ WRITTEN COMPREHENSION	The ability to understand written sentences and paragraphs.
___ VISUALIZATION	The ability to imagine the movement of objects in three dimensional space.
___ ORAL EXPRESSION	The ability to use English words or sentences in speaking so others will understand.
___ OTHER (describe)	_____
	_____
	_____

CATEGORY II. PSYCHOMOTOR SKILLS

____ PSYCHOMOTOR COORDINATION	The ability to co-ordinate movements of two or more limbs, such as in moving equipment controls.
___ RATE CONTROL	The ability to adjust an equipment control in response to changes in the speed and/or directions of a continuously moving object or scene.
___ CONTROL PRECISION	The ability to move controls of a machine or vehicle. This involves the degree to which these controls can be moved quickly and repeatedly to exact positions.
___ OTHER (describe)	_____
	_____
	_____



CATEGORY III. PERSONALITY/ATTITUDES

___ LEADERSHIP	The ability to lead men based on personal behavior, uthority, and he ability to convince others. Personnel management skilis.
___ RISK TAKING	Willingness to take bold decisions based on adequate recognition of dangerous situations.
___ CO-OPERATIVENESS	Willingness to co-operate with other people.
___ ACHIEVEMENT MOTIVATION	Willingness and determination to work towards goals
___ AGGRESSIVESNESS.	The abilitv to decide rapidly on an appropriate action and to carry it out immediately.
___ EMOTIONAL STABILITY	Emotionally mature and stable.
___ ASSERTIVENESS	Belief in one's own capabilities. Self-assured and possessing a willingness to defend one's own opinions.
___ OTHER (describe)	_____
	_____
	_____

Contribution of Each Category to Pilot Performance

Instructions: Assign a percentage to each category. The total percentage should add to 100%.

Psychomotor Skills	Information Processing Abilities	Personality/ Attitudes	Other (list) _____

_____ __ + _____ + _____ + _____ = 100

Please describe your weapons system experience and circle the aircraft described in previous items:

Aircraft	Position (PIC/Co-pilot/IP)	Hours (PIC/Co-Pilot/IP)
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Comments:

Two-Hand Coordination Procedures

The first of the tests - Two-Hand Coordination - presented a triangular-shaped target and a cross-shaped pipper on the CRT (Figure 1). The computer moved the target in an elliptical path and with varying speeds (faster near the 4 o'clock position and slower near the 11 o'clock position). The subject moved the pipper using the two small joysticks. The left joystick controlled the pipper only in the up-down, or vertical, axis whereas the right joystick controlled the pipper in the left-right, or horizontal, axis. The subjects were instructed to use both joysticks simultaneously in a coordinated manner to move the pipper, keeping it as close as possible to the target on the CRT.

PSYCHOMOTOR TESTS

TEST I

- **LEFT — RIGHT HAND COORDINATION**
- **10 MINUTES**

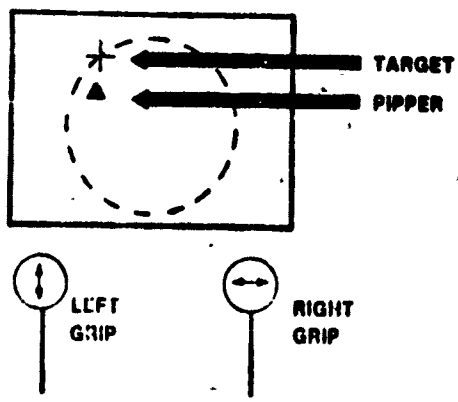


Figure 1. Two-Hand Coordination Test Depiction.

Sixty times each second, the computer measured in inches the absolute distance from the pipper to the target as both moved around the CRT. The horizontal and vertical components of this error measurement were computed and accumulated during the 5-minute test period. The two scores obtained from Two-Hand Coordination were the cumulative horizontal (X_1) and cumulative vertical (Y_1) error scores.

Source (8:3)

Complex Coordination Procedures

The second test - Complex Coordination - presented a set of cross-hairs centered on the CRT, a dot-shaped pipper, and a thin vertical bar at the bottom of the CRT (Figure 2). The subject controlled the pipper, both horizontally and vertically, using the floor-mounted joystick. The control responses were the reverse of what is traditionally required on aircraft (i.e., left movement of the joystick moved the pipper to the right, back movement of the joystick moved the pipper downward, etc.). This arrangement was intentionally selected to reduce the advantage of a subject with prior flying experience. In the same way, the vertical bar was moved horizontally to the left by pressing the right foot pedal and to the right by pressing the left foot pedal. The subjects were instructed to use the joystick to center the pipper horizontally and vertically on the intersection of the cross-hairs and simultaneously press the appropriate rudder-style pedal to center the "rudder bar" over the lower part of the vertical cross-hair. The computer randomly changed the gain on the input controls, which drove the pipper and rudder bar off their marks, requiring the subject to constantly compensate for the forced displacement.

Sixty times each second the computer measured in inches and accumulated during the 5-minute test period the absolute distance from the pipper to the intersection of the cross-hairs and from the rudder bar to the vertical cross-hair. The three scores obtained from the Complex Coordination test were the cumulative horizontal error component for the pipper (X_2), the cumulative vertical error component for the pipper (Y_2), and the cumulative horizontal error for the rudder bar (Z_2).

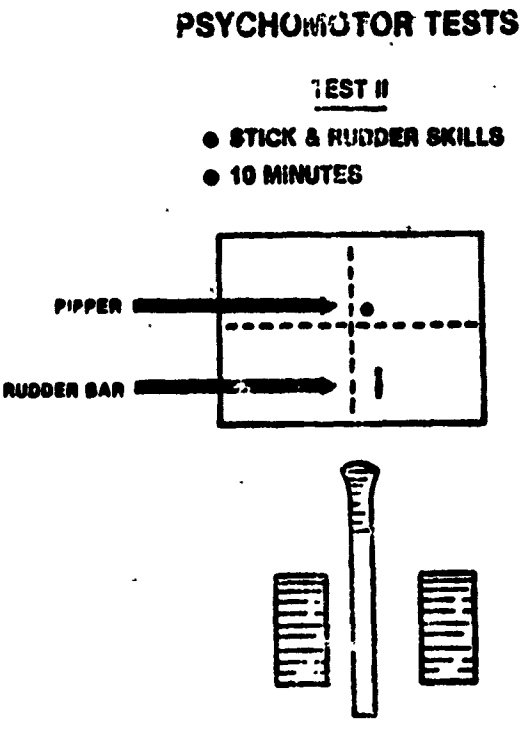


Figure 2. Complex Coordination Test Depiction. Source (8:4-5)

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GLOSSARY

ACB	Aircrew Classification Battery
ADSC	Active Duty Service Commitment
AFA	Air Force Academy
AFB	Air Force Base
AFHRL	Air Force Human Resources Laboratory
AFMPC	Air Force Military Personnel Center
AFOQT	Air Force Officer Qualifying Test
AFR	Air Force Regulation
AFRES	Air Force Reserve
AFROTC	Air Force Reserve Officer Training Corps
AFSC	Air Force Systems Command
ANG	Air National Guard
ATC	Air Training Command
ATC/DOPR	Air Training Command/Deputy Chief of Staff for Operations and Readiness, Resource and Programming Division
ATRB	Advanced Training Recommendation Board
BAT	Basic Attributes Test
BFT	Basic Flying Training
CAPSS	Canadian Automated Pilot Selection System
ENJJPT	Euro-NATO Joint Jet Pilot Training
FAC	Forward Air Controller
FAR	Fighter, Attack, Reconnaissance
FARB	Fighter, Attack, Reconnaissance, Bomber
FSP	Flight Screening Program

FY	Fiscal Year
GPA	Grade Point Average
HQ	Headquarters
HSD	Human Systems Division
IPCSM	Integrated Pilot Candidate Selection Model
LATR	Light Aircraft Training for ROTC
MAC	Military Airlift Command
MAJCOM	Major Air Command
MBTI	Myers-Briggs Type Indicator
MIF	Maneuver Item File
NAMRL	Naval Aerospace Medical Resources Laboratory
NATO	North Atlantic Treaty Organization
OPD	Officer Professional Development
OTS	Officer Training School
PIP	Pilot Indoctrination Program
PORTA-BAT	Portable Basic Attributes Testing Device
PPL	Private Pilot's license
PSACS	Pilot Selection and Classification System
RAF	Royal Air Force
ROTC	Reserve Officer Training Corps
SAC	Strategic Air Command
SUPT	Specialized Undergraduate Pilot Training
SAT	Scholastic Aptitude Test
TAC	Tactical Air Command
TT	Tanker, Transport

TTB	Tanker, Transport, Bomber
TTTS	Tanker-Transport Training System
UPT	Undergraduate Pilot Training
USAF	United States Air Force
USAF/DPPE	USAF Education and Training Programs Division
VGAT	Visual General Aviation Trainer
WPSS	Weighted Pilot Selection System