

DOCUMENT RESUME

ED 050 348

AC 010 341

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TITLE The Pilot Training Study: Advanced Pilot Training.
INSTITUTION Rand Corp., Santa Monica, Calif.
SPONS AGENCY Department of the Air Force, Washington, D.C.
REPORT NO RM-6085-PR
PUB DATE Dec 69
NOTE 59p.

EDRS PRICE EDRS Price MF-\$0.65 HC-\$3.29
DESCRIPTORS *Advanced Programs, *Aircraft Pilots, *Cost Effectiveness, *Educational Programs, *Military Personnel

IDENTIFIERS *Advanced Pilot Training, APT, Project RAND

ABSTRACT

An overview is presented of advanced pilot training and of the formal advanced pilot training program that constitutes the primary means of providing this training. Section I deals with the various phases of advanced pilot training that a pilot may encounter during his career; Section II deals with the types of aircraft that require some form of advanced pilot training; Section III describes organizational frameworks for the conduct of the formal courses; Section IV describes the general contents of the formal training courses; Section V discusses the variations in course lengths, lead-in courses, and the pilot qualifications required for entry; Section VI presents a general equation relating course length to training hours; and Section VII deals with the problem of determining the resources that contribute to the cost of pilot training. A bibliography and glossary are included. For related documents, see AC 010 340 and AC 010 342-347. (Author/DB)

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MEMORANDUM
RM-6085-PJ
DECEMBER 1968

THE PILOT TRAINING STUDY: Advanced Pilot Training

P. J. Kennedy

PREPARED FOR:

UNITED STATES AIR FORCE PROJECT RAND

The **RAND** Corporation
SANTA MONICA • CALIFORNIA



ED050348

MEMORANDUM

RM-6085-PR

DECEMBER 1969

**THE PILOT TRAINING STUDY:
Advanced Pilot Training**

P. J. Kennedy

This research is supported by the United States Air Force under Project RAND—Contract No. F41620-67-C-0015—monitored by the Directorate of Operational Requirements and Development Plans, Deputy Chief of Staff, Research and Development, Hq USAF. Views or conclusions contained in this study should not be interpreted as representing the official opinion or policy of the United States Air Force.

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PREFACE

In April 1967, the Office of the Assistant Secretary of Defense (Manpower and Reserve Affairs) formed a Pilot Advisory Committee to study "Pilots as a National Resource." The Committee consisted of the Assistant Secretary and a representative of each of the three Services. Staff members from Rand were invited to attend the early meetings of the Committee. The outgrowth was that the Air Force member requested Rand to accept responsibility for examining the Air Force pilot training process. The objective of the Rand Pilot Training Study was to develop a series of computer models for use in estimating the resources required to produce pilots and the costs of training them. Further, the models were to be designed for sensitivity analyses and long-range planning.

For the convenience of readers whose interests may not extend to all aspects of the pilot training process, the results of the study are presented in eight volumes, as follows:

Volume

- | | | |
|------|------------|--|
| I | RM-6080-PR | The Pilot Training Study: Personnel Flow and the PILOT Model, by W. E. Mooz. |
| II | RM-6081-PR | The Pilot Training Study: A User's Guide to the PILOT Computer Model, by Lois Littleton. |
| III | RM-6082-PR | The Pilot Training Study: Precommissioning Training, by J. W. Cook. |
| IV | RM-6083-PR | The Pilot Training Study: A Cost-Estimating Model for Undergraduate Pilot Training, by S. L. Allison. |
| V | RM-6084-PR | The Pilot Training Study: A User's Guide to the Undergraduate Pilot Training Computer Cost Model, by Lois Littleton. |
| VI | RM-6035-PR | The Pilot Training Study: Advanced Pilot Training, by P. J. Kennedy. |
| VII | RM-6086-PR | The Pilot Training Study: A Cost-Estimating Model for Advanced Pilot Training, by L.E. Knollmeyer. |
| VIII | RM-6087-PR | The Pilot Training Study: A User's Guide to the Advanced Pilot Training Computer Cost Model (APT), by H. E. Boren, Jr. |

This Memorandum, Volume VI of the series, describes advanced pilot training (APT) in the USAF in terms of types of aircraft, formal training courses, organization and mission areas, bases, and commands. Only the active USAF is considered; advanced pilot training for the Air National Guard and the Air Force Reserve is not included.

The main purpose of this memorandum is to provide the user of the advanced pilot training cost model (described in Volume VII) with an understanding of the general framework and complexities of the training program and of the types and sources of information necessary for effective use of that simulation model. Volume I should also be read because it explains the part that advanced pilot training plays in the total process of training USAF pilots. It is believed that these two memorandums provide a base from which even those with limited knowledge of advanced pilot training may proceed.

SUMMARY

The intent of this Memorandum is to provide the user of the model, described in Volume VII, A Cost-Estimating Model for Advanced Pilot Training (APT),* with an overview of advanced pilot training and a more specific understanding of the formal advanced pilot training program that constitutes the primary means of providing this training.

Section I, General Description, deals with the various phases of advanced pilot training that a pilot may encounter during his career, i.e., from the time he receives his Pilot rating until he leaves active flying status. The reasons for selecting certain training phases and a range of formal courses, appropriate for simulation, are discussed.

Section II, Active Aircraft in the USAF Inventory, deals with the types of aircraft that require some form of advanced pilot training. The aircraft for which there are formal advanced pilot training courses are identified. The ways in which pilots are trained for the remaining aircraft, that is, for aircraft for which formal training courses are not provided, are also explained.

Section III, Organization and Mission Areas, describes organizational frameworks for the conduct of the formal courses. A table is provided for each major air command listing the formal advanced pilot training by aircraft type. This table identifies the training unit, training location and intermediate command concerned. In another table, the formal training is displayed by major mission area (e.g., strategic, tactical, airlift) and by the type (specific mission, design and series) of aircraft for which the training is offered.

Section IV, Formal Training Courses, describes the general contents of the formal training courses. It provides tables of current and recent courses by major command, aircraft, and course type, duration and training hours. The lists of courses are not definitive, in that courses are changed, added, and deleted according to the requirements of the operational force. The lists are intended to provide a base that may be updated, in whole or in part, by the user of the APT cost model. Several typical course outlines are also provided.

* See Preface.

Section V, Course Complexity and Entry Qualifications, discusses the variations in course lengths, lead-in (preliminary) courses, and the pilot qualifications required for entry. A table of courses and typical requirements for entry is provided.

Section VI, Course Lengths and Training Hours, presents a general equation relating course length to training hours. The variables and elements comprising this equation are described so that a more complete understanding of the composition of a course and the factors affecting its length may be obtained.

Section VII, Analysis of Resource Consumption, deals with the problem of determining the resources that contribute, in whole or in part, to the cost of pilot training.

A bibliography has been prepared for those requiring more detailed information concerning advanced pilot training.

The glossary contains descriptions of terms that may be unfamiliar to the reader, with particular emphasis on terms with specific connotations as used in this document.

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I. GENERAL DESCRIPTION

Flying training is an all-inclusive term applied to the instruction of students in the specialized arts or skills (primarily those of pilot, navigator and bombardier or weapons system operator) needed to man USAF aircraft. This Memorandum deals only with pilots, specifically with their advanced training in formal courses. In order to place formal advanced pilot training in the proper context and to explain why it has been selected for study and simulation, the other forms and phases of pilot training are briefly described.

Pilot training in the Air Force is now divided into two major phases: undergraduate pilot training (UPT) which provides training in the basic aeronautical skills required for qualification as a military pilot, and advanced pilot training (APT) which provides the supplemental knowledge and flying skills required to qualify as a pilot for a particular type of mission or for a specific type of aircraft.

Upon successful completion of UPT, the trainee receives the aeronautical rating of Pilot. The pilot's training does not cease at this point, but continues throughout his flying career. There are four phases of flying training subsequent to UPT.

Phase I is the flying and ground training required to qualify an individual to perform basic aircrew duties in the unit equipment (UE) aircraft. This phase is known as transition training.

Phase II is the designation given to the flying and ground training that is required to qualify an aircrew member to perform combat or support missions, as applicable, in the UE aircraft. This training is also known as mission-qualification or combat-readiness training. It includes pilot-instructor and weapons-instructor training.

Phase III is the flying and ground training required to ensure that combat-ready or mission-qualified aircrews maintain proficiency in the employment of the weapon or support system or the performance of the particular mission assigned. This phase is known as continuation training.

Phase IV consists of flying training for aircrew members who are assigned to command and staff positions and who do not occupy Unit Manning Document (UMD) authorized aircrew positions. Phase IV involves two aircrew categories: "mission capable" and "proficiency." Mission capable aircrews fly the primary mission aircraft and complete continuation training (Phase III) as prescribed in the applicable manuals. Proficiency aircrews perform flying training solely to maintain basic aeronautical skills. Proficiency crew flying is usually scheduled so that the flight provides some form of mission support, rather than being flown exclusively to maintain flying proficiency.

When a pilot is assigned to a type of aircraft or mission with which he is not familiar, he is given the appropriate Phase I and II training. If only the mission is unfamiliar to him, he may be required to complete only the Phase II training for mission qualification. This depends on his experience in the particular aircraft and the policy of the command conducting the training. He is given Phase III training in an operational unit when he is assigned as a primary aircrew member, or if he is a Phase IV "mission-capable" pilot.

Phase I and Phase II training is generally referred to as advanced pilot training. In most cases, pilots qualify to operate a specific aircraft by completing the prescribed formal training course as listed in the USAF Formal Schools Catalog (AFM 50-5). For this study, a formal training course is defined as one that is authorized and approved by competent authority, that meets certain standards concerning course content, length of instruction periods and qualifications of instructors, and that has a specified course duration. In virtually every case, training is the instructors' primary duty.

When such courses are not available, informal aircrew training is conducted in accordance with Air Force or major air command training manuals.* The major commands also publish informal aircrew training directives for miscellaneous type aircraft, that is, aircraft that they alone use or that they possess in very limited numbers. Although the course contents are specified and the training programs are conducted in a formal manner, this training does not meet all the criteria for

* AFM 51 series or major air command 51 series of manuals.

formal courses as defined above. It does not have the full-time instructors, full-time students, and fixed course durations that characterize established formal schools.

As stated, the Advanced Pilot Training (APT) study is concerned with formal advanced pilot training. More specifically, it deals with formal Phase I (transition) training and with the basic mission qualification portion of formal Phase II training. Subsequent stages of Phase II training, that is, instructor pilot training, weapons instructor training and other special training courses, are not included.

Because the primary means of providing advanced pilot training is through formal schools, formal advanced pilot training has been selected for study and simulation. The advanced pilot training that does not meet the above-stated formal course criteria does not lend itself to simulation because of the considerable variation in the amount of time devoted to the training program. An additional complication is that the training may be accomplished during a routine mission for another purpose. This presents the problem of determining the costs and resources devoted to training that has no regular pattern and that involves costs that may be properly attributed in whole or substantial part to another mission.

Formal advanced pilot training is conducted by units variously referred to as Combat Crew Training Schools (CCTS), Replacement Training Units (RTU), Transport Training Units (TTU), or simply as Advanced Pilot Training (APT) units. The designations, CCTS, RTU, and TTU, reflect the nature of the training and the desires of the major air command that conducts the training.

RTUs are formed when increased training requirements (e.g., during periods of high pilot turnover) exceed the capacity of established training units. The basic difference between RTU and the other formal advanced pilot training units is that the RTU is an operational unit tasked to provide the training while maintaining its operationally ready state. During the period that an operational unit is acting as an RTU, its primary mission is training. The other units conducting formal advanced pilot training have been created primarily for training, although they can be used operationally under certain conditions.

The following sections will develop the various aspects of this general description more specifically in terms of types of aircraft, mission areas, formal courses, bases, and commands.

II. ACTIVE AIRCRAFT IN THE USAF INVENTORY

The current USAF Aerospace Vehicle and Flying Hour Program* listed 88 types of aircraft for which advanced pilot training must be provided in the FY 1970 through FY 1975 time period. The listing, shown below, obviously will change as aircraft are added to and dropped from the active aircraft inventory.

| | | | |
|------------------------|------------------|--------------------|----------------------|
| <u>Attack</u> | Cargo, | <i>C-132</i> | <u>Trainer</u> |
| A-1 | Transport, | C-133 | T-28 |
| A-7D | <u>Tanker</u> | <i>C-135</i> | <i>T-29</i> |
| A-37A/B | C-5A | <i>KC-135</i> | <i>T-33</i> |
| | C-7A | <i>RC-135</i> | <i>AT-33</i> |
| <u>Bomber</u> | VC-6A | <i>VC-137</i> | T-37 |
| B-52 | C-9A | C-140 | T-38 |
| <i>B-57C</i> | C-10A | C-141 | T-39 |
| <i>EB-57D/E</i> | C-47 | | T-41 |
| <i>RB-57E</i> | <i>AC-47</i> | <u>Helicopters</u> | |
| RB-57F | <i>EC-47</i> | <i>TH-1F</i> | <u>Miscellaneous</u> |
| EB-66 | <i>HC-47</i> | <i>UH-1F</i> | O-1 |
| FB-111 | C-117 | <i>CH-3</i> | <i>O-2A</i> |
| | C-54 | <i>HH-3E</i> | <i>O-2B</i> |
| <u>Fighter, Inter-</u> | <i>HC-54</i> | OH/UH-13 | OV-10A |
| <u>ceptor, Recon</u> | C-97 | H/UH-19 | HU-16B |
| <i>F-4</i> | C-118 | H/CH-21 | U-1 |
| <i>RF-4C</i> | <i>C-119</i> | HH-43 | U-2 |
| F-5** | <i>AC-119G/K</i> | H/CH-53 | U-3 |
| SR-71 | <i>C-121</i> | | U-4 |
| F-100 | <i>EC-121</i> | | U-6 |
| <i>F-101B</i> | <i>C-123</i> | | U-10 |
| <i>RF-101</i> | <i>UC-123B</i> | | |
| F-102 | <i>IC-123K</i> | | |
| <i>F-104A/B</i> | <i>C-130</i> | | |
| <i>F-104C/D</i> | <i>AC-130</i> | | |
| <i>F-104G**</i> | <i>DC-130</i> | | |
| F-105 | <i>HC-130</i> | | |
| F-106 | <i>RC-130</i> | | |
| F-111 | <i>WC-130</i> | | |

* PA-71-4, USAF Aerospace Vehicle and Flying Hour Program, Vol. 1, Aircraft and Flying Hours by M/D/S (U), Sept. 1969 (Secret). (Note: Only unclassified information has been extracted.)

** The F-5 and F-104G aircraft are primarily for the support of other nations.

With three exceptions, the types of aircraft that are grouped by italics and that have the same design number are of the same basic type, e.g., the B-57C, EB-57D/E, and the RB-57E are of the same basic type. The three exceptions are the C-117 which is a C-47 type, the VC-137 which is a C-135 type, and the T-29 which is a C-131 type. The RB-57F is not shown in italics because of major differences between it and the basic B-57 type.

In respect to advanced pilot training, the 88 aircraft types fall into three categories.

- o Category 1. Aircraft with formal advanced pilot training courses.
- o Category 2. Aircraft related by type, but not mission, to those with formal training courses.
- o Category 3. Aircraft that have no formal courses and that are not related by basic type with aircraft in Category 1.

The aircraft types for which formal advanced pilot training courses are provided are listed below.

| | | | |
|---------|---------|-----------|---------|
| A-1 | RF-101 | C-47 | C-141 |
| A-7D | F-102 | AC-47 | TH-1F |
| A-37A/B | F-104G* | EC-47 | UH-1F |
| B-52 | F-105 | AC-119G/K | CH-3 |
| B-57C | F-106 | EC-121 | HH-3E |
| EB-66 | F-111 | C-123 | HH-43 |
| FR-111 | T-28 | UC-123B | H/CH-53 |
| F-4 | T-29 | UC-123K | O-1 |
| RF-4C | T-33 | C-130 | O-2A |
| F-5* | AT-33 | AC-130 | O-2B |
| SR-71 | C-5A | HC-130 | OV-10A |
| F-100 | C-7A | C-131 | U-2 |
| F-101B | C-9A | KC-135 | U-10 |

The second group consists of aircraft systems that have no formal training courses but are related by basic type to those that do, that is, to those in the first group. Training requirements for these aircraft are met within the operational units, either by providing the Phase I and Phase II training specified by Air Force and major command manuals, or by conducting Phase II mission qualification training for

* Training primarily for the support of other nations.

pilots who hold ratings for a related-type aircraft. A list of the aircraft systems related by type to systems that have formal training courses follows.

| | | | |
|----------|-------|--------|--------|
| EB-57D/E | T-38* | C-119 | WC-130 |
| RB-57E | T-41* | C-121 | C-135 |
| F-104A/B | HC-47 | DC-130 | EC-135 |
| F-104C/D | C-117 | RC-130 | RC-135 |
| T-37* | | | VC-137 |

The third category consists of aircraft, listed below, that have no formal training course and that are not related by basic type with those in the first of the groups listed above.

| | | | |
|--------|-------|----------|-----|
| RB-57F | HC-54 | C-140 | U-1 |
| T-39 | C-97 | OH/UH-13 | U-3 |
| VC-6A | C-118 | H/UH-19 | U-4 |
| C-10A | C-133 | H/CH-21 | U-6 |
| C-54 | | HU-16B | |

In general, it is not practical to establish formal schools for aircraft listed in this category because they constitute less than five percent of the total active inventory. Some of these, such as the C-54 and the C-97, are being eliminated gradually from the force. They are currently used for mission support, such as the transport of cargo and passengers, as well as in specialized roles, such as weather reconnaissance, rescue, and test support. The others are relatively new, light-to-medium aircraft used for executive transport and mission support airlift, primarily of personnel. In the absence of formal training schools for these aircraft, replacement pilots are given the required transition training within the operating unit. The extent and type of training they receive varies considerably, depending on the experience level of the pilot, the aircraft type, and its availability for training purposes. Frequently, the replacement pilots have had previous experience in the aircraft and can readily be re-qualified during routine missions. With the light-to-medium transport aircraft, transition training can be accomplished within a relatively short period, with much of the training being given during routine missions.

* Used in the undergraduate pilot training program.

The remainder of this memorandum deals only with the formal advanced pilot training courses associated with the aircraft types listed as Category 1. These are the courses for which the APT cost-estimating model and computer program, described in Volumes VII and VIII, respectively, were developed.*

* See Preface.

III. ORGANIZATION AND MISSION AREAS

The major USAF commands that have formal advanced pilot training as part of their mission are:

Strategic Air Command (SAC)
Tactical Air Command (TAC)
Aerospace Defense Command (ADC)
Military Airlift Command (MAC)
Air Training Command (ATC)

As shown in Tables 1 through 5, the commands differ in the organizational structures through which the training is accomplished. These tables list the types of aircraft, the training units and their locations, and the intermediate headquarters for each major command relative to the formal advanced pilot training courses listed in the USAF Formal Schools Catalog (AFM 50-5).^{*} Although the organizational patterns may change from time to time, the data are included as a general explanation of the advanced pilot training structure. It should be noted that the only organizations shown are those directly involved in the training, i.e., the training units and the headquarters in the chain of command to the major command headquarters.

The Tactical Air Command organization, depicted in Table 1, is the most complex and widespread of the advanced pilot training programs. There are two numbered Air Forces, the Special Operations Force, six air divisions, and 17 wings in its chain of command. Formal advanced pilot training is conducted at 19 Air Force bases for 30 types of aircraft. At two of the bases, the training units are tenants of another command. Additionally, two Air Force Reserve units, each located on an Air Force Reserve base, provide Phase I training in support of TAC. The number of aircraft types for which training is conducted on a particular base ranges from one to ten. The number of bases on which training courses are conducted for a given type aircraft ranges from one to four. Although one organization is responsible for training in ten types of aircraft at one base, one to three types per organization and base is the more common range.

^{*}Plus a few courses that have not yet appeared in the catalog.

Table 1

TACTICAL AIR COMMAND (TAC) ORGANIZATION FOR APT

| Aircraft Type | Training Unit | Location (AFB) | Intermediate Command |
|----------------------|------------------------|-------------------------|------------------------|
| F-100 | 4510 CCTWg | Luke, Ariz | 12 AF |
| F-100 | 27 TFWg | Cannon, N.M. | 832 AD, 12 AF |
| F-100 | 4454 CCTWg | Myrtle Beach, S.C. | 833 AD, 9 AF |
| F-105 | 23 TFWg | McConnell, Kan | 835 AD, 12 AF |
| F-4 | 4453 CCTWg | Davis-Monthan, Ariz | 12 AF |
| F-4 | 479 TFWg | George, Calif | 831 AD, 12 AF |
| F-4 | 15 TFWg | MacDill, Fla | 836 AD, 9 AF |
| F-4 | 4531 TFWg | Homestead, Fla | 836 AD, 9 AF |
| A-7D | 4510 CCTWg | Luke, Ariz | 12 AF |
| F-104G ^a | 4510 CCTWg | Luke, Ariz | 12 AF |
| F-5 ^a | 4510 CCTWg | Williams, Ariz | 12 AF |
| B-57 | 4424 CCTS | MacDill, Fla | 836 AD, 9 AF |
| RF-101 | 4414 CCTS | Shaw, S.C. | 363 TRWg, 833 AD, 9 AF |
| RF-4C | 4415 CCTS | Shaw, S.C. | 363 TRWg, 833 AD, 9 AF |
| RF-4C | 75 TRWg | Bergstrom, Tex | 831 AD, 12 AF |
| RF-4C | 67 TRWg | Mt Home, Idaho | 831 AD, 12 AF |
| EB-66 | 4417 CCTS | Shaw, S.C. | 363 TRWg, 833 AD, 9 AF |
| F-111A | 4527 CCTS | Nellis, Nev | 474 TFWg, 12 AF |
| C-7A | 4442 CCTWg | Sewart, Tenn | 839 AD, 9 AF |
| C-130A | 705 TALS ^e | Ellington, Tex | --- |
| C-130B/E | 4442 CCTWg | Sewart, Tenn | 839 AD, 9 AF |
| T/AT-33 ^b | 4454 CCTWg | Myrtle Beach, S.C. | 833 AD, 9 AF |
| T/AT-33 ^c | 140 TFWg | Cannon, N.M. | 832 AD, 12 AF |
| T-33 ^d | 363 TRWg | Shaw, S.C. | 833 AD, 9 AF |
| T-33 ^d | 75 TRWg | Bergstrom, Tex | 831 AD, 12 AF |
| UH-1F | 4408 CCTS | Eglin, Fla ^f | 1 SOPWg, USAF SOF |
| C-123B/K | 4408 CCTS | Eglin, Fla ^f | 1 SOPWg, USAF SOF |
| UC-123K | 4408 CCTS | Eglin, Fla ^f | 1 SOPWg, USAF SOF |
| A-1E | 4407 CCTS | Eglin, Fla ^f | 1 SOPWg, USAF SOF |
| U-10 | 4410 CCTS | Eglin, Fla ^f | 1 SOPWg, USAF SOF |
| O-1 | 4410 CCTS | Eglin, Fla ^f | 1 SOPWg, USAF SOF |
| O-2A | 4410 CCTS | Eglin, Fla ^f | 1 SOPWg, USAF SOF |
| O-2B | 4410 CCTS | Eglin, Fla ^f | 1 SOPWg, USAF SOF |
| OV-10A | 4409 CCTS | Eglin, Fla ^f | 1 SOPWg, USAF SOF |
| T-28 | 4407 CCTS | Eglin, Fla ^f | 1 SOPWg, USAF SOF |
| AC-119G/K | 302 TALWg ^e | Clinton County, Ohio | --- |
| AC-119G/K | 4413 CCTS | Lockbourne, Ohio | 1 SOPWg, USAF SOF |
| AC-130A | 4413 CCTS | Lockbourne, Ohio | 1 SOPWg, USAF SOF |
| C/AC-47 | 4412 CCTS | England, La | 1 SOPWg, USAF SOF |
| A-37A/B | 4532 CCTS | England, La | 1 SOPWg, USAF SOF |
| EC-47 | 4412 CCTS | England, La | 1 SOPWg, USAF SOF |

^a Primarily support of other nations.

^b Familiarization and currency training lead-in for operational training.

^c Air Liaison Officer/Forward Air Controller training.

^d Familiarization and currency training lead-in for reconnaissance and electronic warfare training.

^e Air Force Reserve unit providing Phase I training for TAC.

^f All TAC training at Eglin AFB is conducted at Auxiliary Field 9.

As shown in Table 2, the Aerospace Defense Command has five units that conduct formal advanced pilot training at four Air Force bases for six types of aircraft. There are three numbered Air Forces, four wings, and an air base group in the chain of command. Training in three aircraft types is conducted on one base. Another base provides training in two types of aircraft. The remaining bases each provide training in one type of aircraft. These organizations are designated as combat crew training units. One organization is a tenant on an Air Force Logistics Command base; the others are on ADC bases.

Table 2

AEROSPACE DEFENSE COMMAND (ADC) ORGANIZATION FOR APT^a

| Aircraft Type | Training Unit | Location (AFB) | Intermediate Command |
|-------------------|---------------|----------------|----------------------|
| F-101B | 4756 CCTS | Tyndall, Fla | 4756 ABGp, 14 AF |
| F-106 | 4756 CCTS | Tyndall, Fla | 4756 ABGp, 14 AF |
| F-102 | 4780 ADWg | Perrin, Tex | 14 AF |
| EC-121 | 4753 ADS | Otis, Mass | 551 AEWwg, 1 AF |
| T-33 ^b | 4780 ADWg | Perrin, Tex | 14 AF |
| T-33 ^b | 4756 FTS | Tyndall, Fla | 4756 ABGp, 14 AF |
| B-57 ^c | 4677 DSES | Hill, Utah | None |

^aAll ADC units are designated combat crew training units.

^bPre-Interceptor familiarization and currency training.

^cPhase I training for the tactical B-57.

Table 3 shows the Strategic Air Command organization. SAC conducts formal advanced pilot training for five types of aircraft at four of its bases. Training is provided for two types of aircraft at one base; for one type of aircraft at each of the other three bases. All of the organizations are designated combat crew training units. There are two numbered Air Forces, four air divisions, three wings, and one group in the chain of command from Strategic Air Command Headquarters.

Tables 4 and 5 pertain to the Military Airlift Command (MAC) and the Air Training Command (ATC), respectively.

Table 3

STRATEGIC AIR COMMAND (SAC) ORGANIZATION FOR APT

| Aircraft Type | Training Unit | Location (AFB) | Intermediate Command |
|---------------|---------------|---------------------|-------------------------|
| B-52 | 4017 CCTS | Castle, Calif | 93 BWg, 47 AD, 15 AF |
| KC-135 | 4017 CCTS | Castle, Calif | 93 BWg, 47 AD, 15 AF |
| FB-111 | 4007 CCTS | Carswell, Tex | 340 BGp, 19 AD, 2 AF |
| U-2 | 349 SRS | Davis-Monthan, Ariz | 100 SRWg, 12 SAD, 15 AF |
| SR-71 | 9 SRWg | Beale, Calif | 14 SAD, 15 AF |

Table 4

MILITARY AIRLIFT COMMAND (MAC) ORGANIZATION FOR APT

| Aircraft Type | Training Unit | Location (AFB) | Intermediate Command |
|---------------|---------------|-----------------|----------------------|
| C-141 | 443 MALWg | Altus, Okla | None |
| C-5A | 443 MALWg | Altus, Okla | None |
| C-9A | 11 AMALS | Scott, Illinois | 375 MALWg |
| HH-3E | 48 ARRS | Eglin, Fla | AARS |
| HH-53B | 48 ARRS | Eglin, Fla | ARRS |
| HC-130H/P | 48 ARRS | Eglin, Fla | ARRS |

Table 5

AIR TRAINING COMMAND (ATC) ORGANIZATION FOR APT

| Aircraft Type | Training Unit ^a | Location (AFB) | Intermediate Command |
|---------------|----------------------------|----------------|----------------------|
| CH-3C/E | 3630 FTWg | Sheppard, Tex | None |
| H-43B | 3630 FTWg | Sheppard, Tex | None |
| TH-1F | 3630 FTWg | Sheppard, Tex | None |

^a Referred to simply as Advanced Pilot Training (APT).

The Military Airlift Command conducts training in six types of aircraft on three bases. At one base, training is conducted in two aircraft types. Another base trains in one aircraft type. The Air Rescue and Recovery Service trains in three aircraft types at one base. The air rescue training organizations are designated as Advanced Pilot Training (APT) units; the remaining training organizations are designated as Transport Training Units (TTU). Two wings and the Air Rescue and Recovery Service are in the chain of command between these training bases and the Military Airlift Command Headquarters.

The formal pilot training conducted by the Air Training Command is devoted primarily to Undergraduate Pilot Training (UPT). However, ATC does conduct advanced pilot training in three types of aircraft at one of its bases. There are no intermediate commands between the Air Training Command Headquarters and the wing that conducts the training.

Another view of formal advanced pilot training is provided by Table b which lists the major mission areas for which pilots are trained and the aircraft utilized for the various mission sub-tasks. This table, together with Tables 1-5, points to the organizational complexity of formal advanced pilot training. Flight instruction in as many as ten different aircraft may be given at a single base. Conversely, one course may be taught at four different bases. Some training units are tenants of another command. These diversities must be recognized when one undertakes to estimate costs and resources required for formal advanced pilot training in specific courses and specific aircraft types.

Table 6

MISSION TRAINING AREAS AND AIRCRAFT

| Mission | Aircraft Type |
|---------------------|--|
| Strategic | Bomber: B-52, FB-11 Tanker: KC-135 Reconnaissance: SR-71, U-2 |
| Airlift | Heavy: C-141, C-5A Aeromedical: C-9A |
| Tactical | Fighter: F-100, F-105, F-4, F-111A, A-7D, F-5, F-104G Bomber: B-57 Reconnaissance: RF-101, RF-4C Tactical Electronic Warfare Support: EB-66 Airlift: C-7A, C-130 Special Operations Forces: Strike: A-1, A-37, T-28, AC-47, AC-119, AC-130, TH-1F Psychological Warfare: U-10, O-2B, C-47 Airlift: C-123 Forward Air Control/Air Liaison: O-1, O-2A, OV-10A Electronic Warfare Support: EC-47 Defoliation: UC-123 |
| Air Defense | Interceptor: F-101B, F-102A, F-106 Airborne Early Warning and Control: EC-121 |
| Rescue and Recovery | Helicopter: HH-43B, HH-3E, HH-53B Aircraft: HC-130H/P |
| Other | Pre-Operational Training: T/AT-33 Helicopter: TH-1F, CH-3 |

IV. FORMAL TRAINING COURSES

Formal advanced pilot training courses are established to provide advanced training and retraining of pilots to meet the needs of the Air Force for pilots for specific types of aircraft and missions. The courses are described as "formal" because they are authorized and approved by competent authority and meet prescribed standards regarding course content, length of instruction periods, qualification of instructors, and course duration. The courses are designated as "advanced" because they are attended subsequent to Undergraduate Pilot Training (UPT). A pilot may attend several different types of these courses during his career, due to the needs, rotational policies, and career development programs of the Air Force.

The operation of the schools and training units conducting these courses is a joint Headquarters USAF and major air command effort. The major air command determines the types of courses to be conducted, establishes the associated resource requirements, outlines the course content* and supervises the operation of the schools and training units. Headquarters USAF validates and justifies the resource requirements, approves courses of instruction, supervises the training program, and establishes priorities for training in relation to the available resources and the overall advanced pilot training program. The content of the courses is tailored to the aircraft type and operational requirements. A corollary to this is that the type aircraft and mission may dictate the need for students of a particular kind and level of experience. The availability of aircraft for training is also a consideration affecting the extent of the program. All of these factors relate to the various levels of training to be accomplished. These levels vary from course to course and from time to time as the needs of the operational force change.

A list of current courses (and some that are noncurrent but very recent) is contained in Tables 7-12. These tables show training hours

*The detailed syllabus and the training materials are developed by personnel in the particular school.

Table 7

TACTICAL TRAINING COURSES

| Aircraft Type | Course Number | Course Type | Training Hours | | | Training Days | Approx Duration (wks) |
|---------------|----------------------|-------------|----------------|-----------|--------|---------------|-----------------------|
| | | | Ground | Simulator | Flying | | |
| F-100 | 111105B | (a) | 228 | 13 | 120 | 102 | 21 |
| F-105 | 111106B | (a) | 228 | 16 | 131 | 108 | 24 |
| F-105 | 111506B | (a) | 231.5 | 16 | 103 | 90 | 21 |
| F-4 | 111507B | (a) | 264.5 | 13.5 | 120 | 102 | 22 |
| F-111A | 111108C | (a) | 74.5 | 10 | 49 | 40 | 11 |
| A-7D | 111503C | (a) | (f) | (f) | (f) | 46 | 10 |
| B-57 | 122510A ^b | (a) | (f) | (f) | 30 | 41 | 9 |
| F-104G | 111104MB | (a) | 269.5 | 15 | 125 | 135 | 31 |
| T/AT-33 | 111501E | (c) | (f) | --- | 11 | 21 | 3 |
| AT-33 | 111501F | (a) | (f) | --- | 63 | 54 | 12 |
| RF-101 | 132101D | (d) | 196 | 14 | 95 | 95 | 22 |
| RF-4C | 132105F | (d) | 196 | 14 | 100 | 101 | 26 |
| EB-66 | 132102B | (e) | (f) | (f) | 68 | 72 | 15 |
| T-33 | 111501ER | (g) | (f) | --- | 12 | 10 | 2 |
| A-1 | 111101Z | (i) | 98 | --- | 50 | 45 | 11 |
| T-28 | 111103Z | (i) | (f) | --- | 40 | 39 | 9 |
| A-37 | 111504Z | (i) | (f) | --- | 37 | 36 | 9 |
| A-37 | 111504A | (i) | (f) | --- | 60 | 65 | 13 |
| U-10 | 104101Z | (i) | 56 | --- | 39 | 27 | 7 |
| O-1 | 144101 | (i) | 117 | --- | 36 | 40 | 9 |
| O-2A | 144104 | (i) | 115 | --- | 35 | 40 | 9 |
| OV-10A | 144103A | (i) | (f) | --- | 40 | 45 | 10 |
| OV-10A | 144103B | (i) | 155 | --- | 54 | 53 | 12 |
| O-2B | 144102B | (i) | 60 | --- | 28 | 24 | 7 |
| C/AC-47 | 104102Z | (i) | 75 | --- | 60 | 25 | 6 |
| EC-47 | 104107Z | (i) | 46 | --- | 35 | 18 | 4 |
| C-123 | 105101A | (i) | 89 | --- | 64 | 36 | 7 |
| UC-123 | 105106A | (i) | (f) | --- | 28 | 22 | 5 |
| AC-119 | 1041102 ^h | (a) | 48 | 16 | 50 | 27 | 6 |
| AC-119 | 104120Z ^b | (a) | (f) | --- | 44 | 23 | 5 |
| AC-130 | 104130Z | (a) | (f) | --- | 54 | 35 | 7 |
| UH-1c | 10201D | (i) | 56 | --- | 17 | 18 | 4 |
| C-130 | 1051B-C | (j) | (f) | (i) | 45 | 30 | 7.5 |
| C-7A | 1055E-1 | (j) | 48 | --- | 60 | 25 | 6 |

^aOperational.

^bPhase II training.

^cLead-in, familiarization and currency training.

^dReconnaissance.

^eElectronic warfare (reconnaissance).

^fData unavailable.

^gReconnaissance familiarization.

^hPhase I training.

ⁱSpecial operations.

^jTactical airlift.

Table 8

AIRLIFT TRAINING COURSES

| Aircraft Type | Course Number | Course Type | Training Hours | | | Training Days | Approx Duration (wks) |
|---------------|---------------|-------------|----------------|-----------|--------|---------------|-----------------------|
| | | | Ground | Simulator | Flying | | |
| C-141 | Unnumbered | (a) | 112.5 | 32 | 42 | 41 | 8 |
| C-141 | Unnumbered | (a) | 59 | 32 | 42 | 27 | 5 |
| C-9A | Unnumbered | (a) | 108 | 27 | 32 | (b) | (b) |
| C-5A | (b) | (a) | (b) | (b) | (b) | (b) | (b) |

^aTransport aircraft.

^bData unavailable.

Table 9

AIR DEFENSE TRAINING COURSES

| Aircraft Type | Course Number | Course Type | Training Hours | | | Training Days | Approx Duration (wks) |
|---------------|-------------------------|-------------|----------------|-----------|--------|---------------|-----------------------|
| | | | Ground | Simulator | Flying | | |
| F-102A | 112500D | (a) | 98 | 24 | 81 | 72 | 16 |
| F-102A | 112501D | (a) | 98 | 22.5 | 60 | 54 | 12 |
| F-102A | 112502D | (a) | 98 | 18 | 45 | 45 | 10 |
| F-101B | 112500C | (a) | (c) | (c) | 30 | 36 | 8 |
| F-101B | 112501C | (a) | 120 | 15.5 | 56.2 | 54 | 12 |
| F-106 | 112500F | (a) | 120 | 16.5 | 36.8 | 36 | 8 |
| EC-121R | Unnumbered | (b) | (c) | (c) | (c) | 63 | 14 |
| T-33A | 112500Z | (d) | (c) | (c) | 40 | 18 | 4 |
| T-33A | 112501Z | (d) | 38 | 10 | 24 | 22 | 5 |
| B-57 | Unnumbered ^e | (a) | 32 | -- | 20 | 23 | 5 |

^aFighter-Interceptor.

^bAirborne early warning and control.

^cData unavailable.

^dPre-Interceptor training.

^ePhase I training for the tactical B-57.

Table 10

STRATEGIC TRAINING COURSES

| Aircraft Type | Course Number | Course Type | Training Hours | | | Training Days | Approx Duration (wks) |
|---------------|---------------|-------------|------------------|-----------------|-----------------|------------------|-----------------------|
| | | | Ground | Simulator | Flying | | |
| FB-111 | 123103Z | (a) | (b) | (b) | (b) | 63 | 15 |
| B-52 | 123100C | (a) | 188 | 27 | 103 | 65 | 13 |
| KC-135 | 106101KC | (c) | 126 | 24 | 76 | 58 | 11 |
| U-2 | Unnumbered | (d) | 152 ^e | --- | 64 ^e | 66 ^e | 14 ^e |
| SR-71 | Unnumbered | (d) | 144 ^e | 12 ^e | 41 ^e | 120 ^e | 24 ^e |

^aBomber.

^dReconnaissance.

^bData unavailable.

^eData approximate.

^cTanker

Table 11

AIR RESCUE TRAINING COURSES

| Aircraft Type | Course Number | Course Type | Training Hours | | | Training Days | Approx Duration (wks) |
|---------------|---------------|-------------|----------------|-----------|--------|---------------|-----------------------|
| | | | Ground | Simulator | Flying | | |
| HH-3E | 1025E-1 | (a) | (b) | --- | 53 | 26 | 6 |
| HH-53B | 1025Z-1 | (a) | (b) | --- | 56 | 34 | 8 |
| HC/130H/P | 1035B-1 | (a) | (b) | --- | 73 | 26 | 6 |

^aAir rescue.

^bData unavailable.

Table 12

HELICOPTER TRAINING COURSES

| Aircraft Type | Course Number | Course Type | Training Hours | | | Training Days | Approx Duration (wks) |
|---------------|---------------|-------------|----------------|-----------|--------|---------------|-----------------------|
| | | | Ground | Simulator | Flying | | |
| H-43B | F-V5F-D | (a) | 90 | --- | 70 | 51 | 12 |
| H-43B | F-V5F-C | (b) | 40 | --- | 35 | 26 | 6 |
| TH-1F | F-V5F-F | (a) | 75 | --- | 70 | 51 | 12 |
| TH-1F | F-V5F-G | (b) | 45 | --- | 35 | 26 | 6 |
| CH-3 | F-V5F-E | (a) | 100 | --- | 70 | 51 | 12 |
| CH-3 | F-V5F-B | (b) | 50 | --- | 35 | 26 | 6 |

^aConversion pilot training.

^bTransition training.

and course duration and include most, but not all, of the formal advanced pilot training courses as defined in Section I. The listings are not definitive because courses are changed, added and deleted in accordance with requirements of the operational force. The tables do, however, provide an overview of formal advanced pilot training in terms of the number and types of courses offered. They also serve as a base that may be updated, in whole or in part, to suit the specific purpose of the user of the APT cost model.

A formal advanced pilot training course includes ground training and flying training. The ground training portion consists of academic training and, usually, simulator or synthetic training.

Simulator (synthetic) training is conducted in machines or apparatus that artificially create the conditions or situations that may be encountered in flight and in the performance of a mission requiring the use of a particular aircraft and its associated mission equipment.

The complexity of modern aircraft systems requires a high degree of skill and intensive training. Maintenance of sophisticated systems results in increased operating costs and reduced availability of aircraft. On the other hand, simulator maintenance and operating costs are relatively small. Additionally, errors made by a student in a simulator do not result in a hazard to personnel or in the loss or damage of expensive equipment, as might occur in an aircraft. Still further the only practicable method of teaching certain skills, such as emergency procedures, is in a simulator. For these several reasons, simulators are an attractive supplement to the pilot training programs.

Normally, simulator training is given both prior to and during flying training. The basic instruction in aircraft operation is always given in the simulator in advance of the actual flying training. Additional simulator training is given at intervals during flying training.

In addition to the airborne instruction, flying training consists of individual briefings and debriefings for each mission, and classroom lectures on operation and employment of aircraft and other mission-related subjects.

The hours devoted to ground, simulator, and flying training vary among courses depending upon such factors as system complexity, course composition and length, and student experience and aptitude.

A very complex aircraft weapon or support system and mission will require a longer course than a relatively simple system. For example, the F-4 tactical fighter training requires a 22-week course consisting of 265 ground hours, 135 simulator hours, and 120 flying training hours; the O-1 forward air control aircraft course of 9 weeks consists of 117 ground hours, no simulator hours, and only 36 flying training hours.

Courses of different lengths may be given for a specific type aircraft and mission depending on the type and level of the pilot's experience* and the subsequent course he is to attend. For example, F-102A interceptor pilot training is given in 16-, 12-, and 10-week course lengths. The longest of the three courses is designed to train pilots who have a jet instrument rating, but whose experience is limited--e.g., recent graduates from Undergraduate Pilot Training (UPT). The intermediate-length course is given to pilots with limited fighter experience, preparatory to their entry into F-101B or F-106 interceptor pilot training. The short course is used to qualify experienced jet fighter pilots as operationally ready F-102A pilots or for entry into F-101B or F-106 training. Pilots without a current jet instrument rating, or who are not current in fighter-interceptor aircraft, are sent to a pre-interceptor training course in the T-33 aircraft.

Other types of aircraft (e.g., the F-105, F-4, B-52, C-141, F-101F, and CH-3) may have one or more course lengths and lead-in (preparatory) courses as appropriate. As in the case of the F-102A courses described above, the course length is dependent upon the experience levels of the students to be trained and the subsequent courses to be attended.

Instruction plans and course lengths are geared to the average student. The level of instruction and time devoted to various portions of the training may be varied, within limits, to meet the needs of the individual students--i.e., the time allowed to less capable students may be increased and the time required of the more proficient students

* Experience requirements for the respective courses are prescribed in the USAF Formal Schools Catalog (AFM 50-5) and in applicable course syllabuses.

may be reduced provided that they demonstrate the skills, knowledge, and levels of proficiency prescribed for the course.

Sample course descriptions for the O-2A, F-100, B-52, and the C-141 are contained in Tables 13, 14, 15, and 16, respectively. A more detailed commentary on the composition of formal advanced pilot training courses is presented in Section VI, Course Lengths and Training Hours.

Table 13

SAMPLE COURSE DESCRIPTION

Course Title: Special Operations Training Course, O-2A.

Course No.: 144104.

Purpose: To train pilots to operate the O-2A aircraft and gain experience as airborne forward air controllers.

Duration: 31 training days.

| | | Time (hr) |
|---|----------|--------------|
| Academic and Ground Training | | |
| Southeast Asia Orientation Course (SEAOC) | | 20.0 |
| Air Ground Operations School (AGOS) | | 56.0 |
| O-2A Aircraft General | | 8.0 |
| Squadron Air Crew Ground School | | 8.0 |
| Small Arms | | 5.0 |
| Physical Training | | <u>18.0</u> |
| Total | | 115.0 |
| Flying Training | | |
| | Sorties | |
| Transition | 5 | 8.7 |
| Instruments | 1 | 1.7 |
| Transition Proficiency Evaluation | 1 | 1.7 |
| Navigation | 3 | 5.3 |
| FAC Duties | 5 | 8.7 |
| Tactical Proficiency Evaluation | 1 | 1.7 |
| Day Ordnance Indoctrination Mission | 2 | 2.0 |
| Night Ordnance Indoctrination Mission | <u>1</u> | <u>1.0</u> |
| Total | 19 | 30.8 |

NOTE: Associated ground time, briefings, debriefings, etc., are not included in the times shown.

Table 14

SAMPLE COURSE DESCRIPTION

Course Title: USAF Operational Training Course, F-100.
 Course No.: 111105B.
 Purpose: To train pilots for combat in the F-100 Weapons System.
 Duration: 102 training days.

| | Time (hr) |
|--|--------------|
| Academic and Ground Training | |
| Aircraft General | 29.0 |
| Fire Control System | 10.0 |
| Air Combat Maneuvers | 3.0 |
| Non-Nuclear Weapons and Deliveries | 31.0 |
| Weapons Effects | 5.0 |
| Nuclear Weapons | 24.0 |
| Combat Mission Planning | 12.0 |
| Instrument Refresher | 6.0 |
| Air Ground Operations | 8.0 |
| Radar Homing and Warning/ECM | 4.0 |
| Intelligence | 21.0 |
| Survival and Personal Equipment | 11.0 |
| Current Intelligence | 6.0 |
| Phase Briefings | 28.0 |
| Flying Safety | 30.0 |
| Simulator | <u>13.0</u> |
| Total | 241.0 |

| Flying Training | Sorties | |
|--------------------------------------|----------|------------|
| Instruments | 11 | 22.0 |
| Transition | 9 | 11.4 |
| Formation | 5 | 7.5 |
| Basic Flight Maneuvers | 5 | 5.0 |
| Air Combat Maneuvers | 2 | 2.0 |
| Air Attack | 4 | 5.2 |
| Nuclear Weapons Delivery | 2 | 2.4 |
| Ground Attack | 20 | 24.0 |
| Combat Profile Missions | 3 | 6.0 |
| Air Refueling | 4 | 9.8 |
| Ground Attack (Tactical) | 11 | 18.7 |
| Ground Attack Night | 4 | 4.8 |
| Ground Attack Night (Tactical) | <u>1</u> | <u>1.2</u> |
| Total | 81 | 120.0 |

NOTE: Associated ground time, briefings, debriefings, etc., are not included in the times shown.

Table 15

SAMPLE COURSE DESCRIPTION

Course Title: SAC Combat Crew Training Course, B-52.
 Course No.: 123100C.
 Purpose: Training in the procedures and techniques of operating B-52 aircraft.
 Duration: 69 training days.

| | Time (hr) |
|---|--------------|
| Academic and Ground Training | |
| Aircraft Systems | 44.0 |
| Normal Procedures | 6.0 |
| Orientation Flight | --- |
| Emergency Procedures | 14.0 |
| Performance | 26.0 |
| Air Refueling | 3.0 |
| Instrument Procedures | 16.0 |
| Allied Crew Familiarization | 3.0 |
| Terrain Avoidance | 12.0 |
| Positive Control Procedures and Combat Reports | 16.0 |
| SAC Tactical Doctrine | 8.0 |
| Manuals and Regulations | 4.0 |
| Examinations and Critique | 6.0 |
| G/H Differences | 22.0 |
| AGM-28 | 4.0 |
| ADM-20 | 4.0 |
| Simulator and Instrument Trainer | <u>33.0</u> |
| Total | 221.0 |

| | Missions | |
|--|----------|------------|
| Flying Training | | |
| Familiarization | 2 | 16.0 |
| Low Level, Terrain Avoidance | 1 | 8.0 |
| Terrain Avoidance, Low Level Bombing | 2 | 18.0 |
| Night Sortie | 1 | 8.0 |
| Night Low Level | 1 | 8.0 |
| Low and High Altitude Bombing | 1 | 9.0 |
| Optimum Altitude | 1 | 8.0 |
| Standardization/Evaluation Practice | 1 | 10.0 |
| Initial Qualification Check | 1 | 10.0 |
| Unsupervised Flight | <u>1</u> | <u>8.0</u> |
| Total | 12 | 103.0 |

NOTE: Associated ground time, briefings, debriefings, etc., are not included in the times shown.

Table 16

SAMPLE COURSE DESCRIPTION

Course Title: Pilot Advanced Flying Course, C-141 Transport Aircraft.
 Purpose: To qualify C-141 pilots in ground school, flight simulator, and aircraft transition.
 Duration: 41 training days.

| | Time (hr) |
|---------------------------------|--------------|
| Academic and Ground Training | |
| Airplane General | 12.0 |
| Environmental Systems' | 12.0 |
| Electrical | 14.0 |
| Instruments | 6.0 |
| Engines | 12.0 |
| Hydraulics | 16.0 |
| Communications/Navigation | 8.0 |
| Avionics | 10.0 |
| Aircraft Performance | 16.0 |
| Weight and Balance | 2.0 |
| Pilot Judgment | 2.0 |
| Final Examination | 2.0 |
| Simulator | <u>32.0</u> |
| Total | 144.0 |

| Flying Training ^a | Missions | |
|---|----------|------------|
| Familiarization | 1 | 4.5 |
| Transition and Flight Characteristics | 2 | 9.0 |
| Transition and Emergencies | 1 | 4.5 |
| Instruments and Emergencies | 5 | 20.0 |
| Evaluation | <u>1</u> | <u>4.0</u> |
| Total | 10 | 42.0 |

NOTE: Associated ground time, briefings, debriefings, etc., not included in the times shown.

^a During flying training, 15 hours additional ground training are given.

V. COURSE COMPLEXITY AND ENTRY QUALIFICATIONS

The multiplicity of aircraft types and missions and the range of pilot qualifications and experience levels necessitates that courses be designed to fit student qualifications and experience and, conversely, that the student selection criteria be compatible with the demands of the course. Table 17 is a listing of typical student entrance criteria and of lead-in (preparatory) training requirements for particular APT courses.*

There are wide variations in student qualification and experience, course length, and lead-in training requirements. Qualification and experience range from that possessed by a pilot recently graduated from UPT to that of a pilot with considerable experience in a related-type aircraft and mission. Course lengths vary from 2 weeks to 31 weeks. Lead-in training may involve as many as two flying training courses in two different aircraft as well as ground training courses. The terms used in Table 17 to describe pilot qualifications give only a very general indication of the required experience level. Precise descriptions of the prerequisites for each course are given in the USAF Formal Schools Catalog (AFM 50-5) and the course syllabuses.

The F-100, F-111A, and C-141 courses are cited in explanation of the reasons for differences in course lengths, student entry qualifications, and lead-in courses.**

Although students with widely diverse experience and qualifications are accepted for the F-100 course, the course length is fixed at 21 weeks. Its function is to provide combat-ready crews. Pilots who have jet fighter or jet trainer backgrounds, including recent graduates of UPT schools, enter the course directly. Pilots without experience in jet fighter or jet trainer aircraft and pilots whose

* Numerous courses require that a student be a recent graduate of a survival school. For a description of this type of training, refer to the appendix entitled "Survival School" in Vol. IV, A Cost-Estimating Model for Undergraduate Pilot Training.

** See bibliography for references to sources of more detailed information concerning course lengths and entry requirements.

Table 17

TYPICAL STUDENT INPUT CRITERIA AND LEAD-IN COURSES

| Aircraft Type | Duration (wks) | Qualifications ^a | Lead-in Training | |
|----------------------|----------------|---|------------------|------------|
| | | | Type | Weeks |
| F-100 | 21 | UPT and experienced pilots Non-jet qualified/non-current | None AT-33 | --- 3 |
| F-105 | 24 | UPT and experienced pilots Non-jet qualified/non-current | None AT-33 | --- 3 |
| F-105 | 21 | Selected pilots Non-current jet pilots | None AT-33 | --- 3 |
| F-4 | 22 | UPT and experienced pilots Non-jet qualified/non-current | None AT-33 | --- 3 |
| F-111A | 11 | Qualified fighter pilots | None | --- |
| T/AT-33 ^b | 12 | UPT and experienced pilots | None | --- |
| F-104G | 31 | UPT and experienced pilots | None | --- |
| AT-33 ^c | 3 | Rated pilots | None | --- |
| RF-101 | 22 | Non-jet qualified/non-current Qualified jet pilots | T-33 None | 2 --- |
| RF-4C | 26 | Non-jet qualified/non-current Qualified jet pilots | T-33 None | 2 --- |
| RF-4C | 8.5 | Selected jet pilots | None | --- |
| EB-66 | 15 | Non-jet qualified/non-current Qualified jet pilots | T-33 None | 2 --- |
| T-33 ^b | 2 | Rated pilots | None | --- |
| O-1 | 9 | Fighter and other rated pilots | None | --- |
| O-2A | 9 | Fighter and other rated pilots | None | --- |
| OV-10A | 10 | Jet fighter qualified pilots | None | --- |
| OV-10A | 12 | Rated pilots | None | --- |
| O-2B | 2 | Rated pilots | None | --- |
| U-10 | 7 | Rated pilots | None | --- |
| C/AC-47 | 6 | Rated pilots | None | --- |
| EC-47 | 4 | Rated pilots | None | --- |
| A-1 | 11 | Rated pilots | None | --- |
| T-28 | 9 | Rated pilots | None | --- |
| A-37 | 9 | Qualified fighter pilots | None | --- |
| A-37 | 13 | Qualified jet pilots Non-jet qualified/non-current | None AT-33 | --- --- |

Table 17 (Cont)

| Aircraft Type | Duration (wks) | Qualifications ^a | Lead-in Training | |
|---------------------|----------------|---|--|---------------------|
| | | | Type | Weeks |
| C-123 | 7 | Qualified pilots | None | --- |
| UC-123 | 5 | C-123 experienced pilots Other rated pilots | None C-123 | --- 7 |
| UH-1F | 4 | Rated helicopter pilots | None | --- |
| C-130B/E | 7.5 | Rated pilots | None | --- |
| C-7A | 6 | Rated pilots | None | --- |
| C-141 | 8 | Rated pilots | None | --- |
| C-141 | 5 | Experienced pilots | None | --- |
| FB-111 | 15 | Experienced pilots | None | --- |
| B-52 | 13 | Experienced pilots and other rated pilots | None | --- |
| KC-135 | 11 | Experienced pilots and other rated pilots | None | --- |
| F-102A ^d | 16 | Jet qualified pilots and UPT Non-jet qualified/non-current | None T-33 | --- 5 |
| F-102A ^d | 12 | Inexperienced fighter pilots Non-jet qualified/non-current | None T-33 | --- 5 |
| F-102A ^d | 10 | Experienced jet fighter pilots Non-current | None T-33 | --- 5 |
| F-101B | 8 | Jet fighter aircraft commander Non-current | None T-33 | --- 5 |
| F-101B | 12 | UPT and jet qualified pilots Inexperienced fighter pilots | (1) T-33 (2) F-102A (1) F-102A | 5 12 12 |
| F-106 | 8 | UPT and jet qualified pilots Inexperienced fighter pilots Non-ADC fighter experience F-105 pilots/ADC fighter experience | (1) T-33 (2) F-102A (1) F-102A (1) F-102A | 5 16 12 10 |
| T-33 ^e | 4 | Non-current jet instruments or jet fighters | None | --- |

Table 17 (Cont)

| Aircraft Type | Duration (wks) | Qualifications ^a | Lead-in Training | |
|-------------------|----------------|--------------------------------------|-----------------------|--------|
| | | | Type | Weeks |
| T-33 ^e | 5 | Qualified jet fighter or jet trainer | None | --- |
| HH-3E | 6 | Qualified helicopter pilots | CH-3 | 6 |
| HH-53B | 8 | Qualified helicopter pilots | (1) H-43B (2) CH-3 | 6 6 |
| HC-130 | 6 | Qualified pilots | C-130E | 7.5 |
| H-43B | 12 | Rated pilots | None | --- |
| H-43B | 6 | Qualified helicopter pilots | None | --- |
| TH-1F | 12 | Rated pilots | None | --- |
| TH-1F | 6 | Qualified helicopter pilots | None | --- |
| CH-3 | 12 | Rated pilots | None | --- |
| CH-3 | 6 | Qualified helicopter pilots | None | --- |

^aSee glossary for definitions.

^bFamiliarization and currency training.

^cForward air controller/air liaison officer training.

^dPilots who do not meet F-101B and F-106 course entry requirements must complete one of the three F-102A courses.

^ePre-interceptor training.

whose experience is not current and who consequently need refresher training are required to attend a 3-week AT-33 familiarization course to meet the course entry requirements.

The 11-week, F-111A course is given only to combat ready mission capable aircrews of tactical jet fighter or bomber aircraft. Its purpose is to provide transition training and weapons systems familiarization. (The graduate obtains his combat and mission qualification training in his operational unit.) Since the students are well qualified, the course is short, i.e., short in comparison with the 21-week F-100 course that accepts recent graduates of UPT.

The 5-week, C-141 course is designed as an accelerated training program for pilots who are currently proficient in multi-engine jet aircraft and who have logged at least 1900 flying hours, to include alternative minimums of 200 flying hours in the C-141, or 500 in any other 4-engine jet aircraft. This is in contrast to the 8-week, C-141 course that requires only that the student be a rated pilot. (Lead-in courses are not required for either the 5-week or 8-week course.)

VI. COURSE LENGTHS AND TRAINING HOURS

An effort was made to produce estimating relationships concerning course length and training hours based on the information contained in course syllabuses regarding the number of training days and the hours devoted to flying training, ground training, and simulator and other synthetic training. The considerable variation in these course components^{*} due to differences in aircraft type, mission, level of training, student experience, course objective and in emphasis due to particular force requirements (such as for Southeast Asia), precluded the construction of estimating relationships that could be used with confidence. Although the coefficient of correlation was very high, in the vicinity of 95 percent, the variation was plus or minus 15 percent. For example, if the syllabus for a course known to require 100 training days were used to estimate training days, the estimate would indicate a minimum of 85 days and a maximum of 115 days. This would be too great a variation for planning and cost-estimating purposes. A reliable estimating relationship can no doubt be produced, but it would require more data (e.g., aircraft utilization rates, flying hours per student per day and length and number of sorties) than are contained in the average course syllabus.

The six factors^{**} that relate course length to training hours are expressed in the following general equation:

$$D_T = D_A + D_G + D_S + D_F + D_R$$

where D_T = total training days,

D_A = academic training days,

D_G = ground training days,

D_S = synthetic training days,

* Refer to Tables 7 through 17 for examples of the variations.

** Each of these variables and their respective components is, in turn, expressed in equations. These equations are presented in further explanation of the factors that affect the composition and length of an advanced pilot training course.

D_F = flying training days,

D_R = residual training days.

"Training day" units are full or fractional working days. The workday is usually scheduled for eight hours but the schedule may vary (be increased or decreased) with the type of training being given. Because of the technical nature of much of the flight training, students normally are not expected to assimilate eight consecutive hours of classroom instruction. A lesser number of hours (e.g., six hours) is usually scheduled for days when only academic training is given. (The remaining hours are ground-training or residual hours, as explained later in this section.) Conversely, during the flying training phase, the workday may be longer than eight hours due to aircraft scheduling limitations or the length of the missions. Simulator training, given on a flying or academic training day, may also extend the workday beyond the normal eight hours. These possible variations must therefore be considered when converting syllabus hours to full or fractional training days.

The length of a course in calendar days is the sum of workdays and non-workdays. In peacetime, weekends and holidays are not workdays. In emergency situations, such as in wartime, work may be performed seven days a week.

Academic training days (D_A) are based on scheduled classroom hours. Some difficulty is found in obtaining a representative number for this term because of the manner in which the hours are distributed throughout various courses. In courses in which all academic training is given prior to flying training, the classroom hours per day can be divided into the total academic hours to obtain training days. The solution, however, is seldom this simple. In the usual case, some academic training is given prior to any airborne instruction and the remaining classroom hours are interspersed with the flying training hours. Additionally, synthetic and other ground training may be given during both the academic and flying portions. The following equation describes academic training days in terms of hours:

$$D_A = K_1 a_1 + K_2 a_2 + K_3 a_3 ,$$

where a_1 = academic hours prior to flying training,

a_2 = academic hours during flying training,

a_3 = academic hours on days during which synthetic training is given,

K_1, K_2, K_3 = factors to convert hours to whole or fractional workdays.*

Ground training days (D_G) are based on the hours devoted to training that may or may not be rigidly scheduled, but that are required and relate to the course, the mission, or flying in general. Examples are flying safety, physical training, small arms training and intelligence. These hours are usually distributed throughout the course. An equation describing ground training days in terms of hours is as follows:

$$D_G = K_4 g_1 + K_5 g_2 + K_6 g_3 ,$$

where g_1 = ground training hours during primarily academic days,

g_2 = ground training hours during days that have both synthetic and academic training,

g_3 = ground training hours during days in which flying training is given,

K_4, K_5, K_6 = factors to convert hours to whole or fractional workdays.*

Synthetic training days (D_S) are based on the hours given in simulators, instrument trainers, and trainers for various types of weapons and systems. The following equation describes synthetic training in terms of hours:

* If the length of the workday does not change during the course, the factors are the same. When variations occur in the length of the workdays, as described earlier, the appropriate factors must be determined.

$$D_s = K_7(s_1 + s_{1B}) + K_8(s_2 + s_{2B})$$

where s_1 = mission time in trainer 1,

s_2 = mission time in trainer 2,

s_{1B} = briefing, debriefing and other time for trainer 1,

s_{2B} = briefing, debriefing and other time for trainer 2,

K_7, K_8 = factors to convert hours to whole or fractional workdays.*

Briefing and debriefing times for simulator missions are functions of the number of sorties, such as 0.5 hours per sortie or 1.5 hours per sortie, rather than a function of sortie length. These times vary according to the course and the mission. Other time that is included relates to certain courses that require a student to observe with an instructor while another student performs a trainer mission.

Flying training days (D_F) are based on actual flying hours, briefing and debriefing time, and associated ground time such as that provided for film assessing, aborted missions, cockpit familiarization, and flight line orientation. An equation describing flying training days in terms of hours is as follows:

$$D_F = K_9f_1 + K_{10}f_2 + K_{11}f_3,$$

where f_1 = actual flying hours,

f_2 = briefing and debriefing time,

f_3 = associated ground time,

K_9, K_{10}, K_{11} = factors to convert hours to whole or fractional workdays.*

Briefing and debriefing times for flying missions are based on a specified number of hours per sortie. These times vary according to the course and the mission. An hour per sortie may be used for a familiarization course. A fighter-reconnaissance course may require over four

* If the length of the workday does not change during the course, the factors are the same. When variations occur in the length of the workdays, as described earlier, the appropriate factors must be determined.

hours per sortie. Strategic bomber missions may require that the major portion of a briefing be done on the prior day because of the complexity and length of those briefings.

Flying hours are a major determinant of course length. The availability of aircraft hours per student, per day, is a function of the aircraft type and mission, and the programmed aircraft-utilization rate for training. The length of the missions flown may cause student availability to be a major factor; that is, it may not be possible to schedule a training flight because the crew must be allowed adequate rest between training missions. A related factor affecting student availability is the time required for mission planning and post-flight reporting. When programmed utilization rates are low, the course may be quite long in comparison to similar courses given by units that do not have full-time instructor pilots or that have an alert function, which limits aircraft availability. Allowances must also be made for days that will be lost due to poor flying weather. According to the USAF Weather Day Calendar, there are 216 training days per year, a training day being a scheduled workday on which good flying weather can be expected. Further modification may be required to allow academic, ground, or synthetic training to be integrated into the flying training program. All of these factors must be taken into account in calculating the number of days of flying training.

Most courses have an allowance for various types of ground time associated with flying. The pilot must spend several hours familiarizing himself with the cockpit before making his first flight. Time is also allowed for flight-line orientation, and for assessing film taken during gunnery missions.

Aborted missions is another time-loss factor. Usually an abort factor, based on prior experience, is used in conjunction with the number of sorties to determine the allowance for aborted missions.

Residual training days (D_R) are based on all the hours not accounted for in the foregoing equations. These include items such as fitting of personnel equipment, various administrative activities relating both to the course and to the military in general, in and out processing, and non-productive time due to the various constraints of

scheduling. An equation describing residual time in terms of hours is as follows:

$$D_R = K_{12}r_1 + K_{13}r_2 + K_{14}r_3 ,$$

where r_1 = a course total of the hours during academic training that remain available during the working day, related to the scheduled training hours per day a student can assimilate,

r_2 = a course total for the non-productive time in a working day related to the scheduling of synthetic training,

r_3 = a course total for the non-productive time in a working day related to the scheduling of flying missions,

K_{12}, K_{13}, K_{14} = factors to convert hours to whole or fractional workdays.*

*If the length of the workday does not change during the course, the factors are the same. When variations occur in the length of the workdays, as described earlier, the appropriate factors must be determined.

VII. ANALYSIS OF RESOURCE CONSUMPTION

As explained in the preceding sections, the complexity of the advanced pilot training program is due to many interrelated factors, i.e., to differences in training organizations, types of aircraft and missions, mix of students, and composition and duration of training courses. Because of these variables, the resources required for the training vary from course to course.

For planning and budgeting, the estimates of resource requirements must be expressed in terms of quantity and cost. The quantities of resources that will be consumed is dependent on the particular course syllabus and the number of students to be trained.

The analyst must first identify all of the resources that contribute to the training of pilots. This task is complicated because some courses involve the training of both pilots and non-pilots (e.g., navigators) and, consequently, the portion of the resources chargeable to pilot training must be determined. This often presents a difficult allocation problem. The analyst is next confronted with the problem of distributing resources on an individual student-pilot basis so as to show how changes in student strength affect resource requirements.

Three typical types of advanced pilot training courses have been selected to illustrate how resource consumption is charged to pilot training and, then, converted to a per-student-pilot basis. In each of the examples, the workload factor flying hours^{*} is used to illustrate the processes used, first, to identify the resources that will be required; then, to allocate the estimated resource consumption between pilot and non-pilot student categories; and, finally, to distribute the student-pilot resource consumption among individual student pilots.

The first example (Table 18) shows an aggregated syllabus for a tactical fighter course in which only pilots are trained. The aircraft is single seated and is supplemented by a two-seat series aircraft so

* Flying hours is used in these illustrations because it is a major factor in determining resource requirements, e.g., organizational, field and depot maintenance, POL and other materiel for aircraft, number of instructor pilots, and aircraft attrition are all determined as functions of flying hours.

Table 18

TACTICAL FIGHTER FLYING TRAINING COURSE

(Type: Single-seat series supplemented by two-seat series)

| Mission | | Individual Mission Information | | | | | Lead and Tow Hours | |
|------------------|-----------|--------------------------------|-------------------|-------------------------------------|------------|-------------------------|--------------------|-------------|
| Type | No. Flown | Flying Hours Dual | Flying Hours Solo | Student-Instruc. Ratio ^a | Tow Hours | Lead ^b Hours | Total | Per Student |
| Instruments | 11 | 2.0 | --- | 1:1 | --- | --- | --- | --- |
| Day transition | 6 | 1.3 | --- | 1:1 | --- | --- | --- | --- |
| Day transition | 1 | --- | 1.3 | 1:1 | --- | 1.3 | 1.3 | 1.3 |
| Day transition | 1 | 1.1 | --- | 1:1 | --- | --- | --- | --- |
| Night transition | 1 | 1.5 | --- | 1:1 | --- | --- | --- | --- |
| Formation | 2 | 1.4 | --- | 4:4 | --- | --- | --- | --- |
| Formation | 1 | --- | 1.4 | 2:2 | --- | 2.8 | 2.8 | 1.4 |
| Formation | 2 | --- | 1.4 | 3:1 | --- | 1.4 | 2.8 | 0.9 |
| Flight maneuvers | 1 | 1.1 | --- | 2:2 | --- | --- | --- | --- |
| Flight maneuvers | 4 | --- | 1.1 | 1:1 | --- | 1.1 | 4.4 | 4.4 |
| Combat maneuvers | 2 | 1.1 | --- | 4:4 | --- | --- | --- | --- |
| Air-to-air | 1 | 1.7 | --- | 4:4 | 0.5 | --- | 0.5 | 0.1 |
| Air-to-air | 3 | --- | 1.7 | 2:1 | 0.9 | 1.7 | 7.8 | 3.9 |
| Nuclear weapons | 1 | 1.7 | --- | 4:4 | --- | --- | --- | --- |
| Nuclear weapons | 1 | --- | 1.7 | 3:1 | --- | 1.7 | 1.7 | 0.6 |
| Ground attack: | | | | | | | | |
| Day | 5 | 1.0 | --- | 4:4 | --- | --- | --- | --- |
| Day | 19 | --- | 1.0 | 3:1 | --- | 1.0 | 19.0 | 6.3 |
| Night | 2 | 1.7 | --- | 4:4 | --- | --- | --- | --- |
| Night | 2 | --- | 1.7 | 3:1 | --- | 1.7 | 3.4 | 1.1 |
| Tactical | 1 | 1.7 | --- | 4:4 | --- | --- | --- | --- |
| Tactical | 6 | --- | 1.7 | 3:1 | --- | 1.7 | 10.2 | 3.4 |
| Tactical (night) | 1 | --- | 1.7 | 3:1 | --- | 1.7 | 1.7 | 0.6 |
| Combat profile | 1 | 1.7 | --- | 4:4 | --- | --- | --- | --- |
| Combat profile | 2 | --- | 1.7 | 3:1 | --- | 1.7 | 3.4 | 1.1 |
| Air refueling: | | | | | | | | |
| Day | 1 | 3.0 | --- | 2:2 | --- | --- | --- | --- |
| Day | 2 | --- | 3.0 | 3:1 | --- | 3.0 | 6.0 | 2.0 |
| Night | 1 | 3.0 | --- | 1:1 | --- | --- | --- | --- |
| Total | 81 | 59.7 | 60.4 | | 3.2 | 61.8 | 65.0 | 27.1 |

Total student flying hours:^c 120.1

^aRatio of student pilots to instructor pilots.

^bOnly the solo flying hours for the instructor pilot in a lead or supervisory capacity are shown.

^cOne student pilot.

that an instructor pilot may fly with the student. Table 18 shows the type and number of missions flown, the flying hours per mission and whether dual or solo.* The ratio of student pilots to instructor pilots is also shown. Since, in this example, only student pilots are involved, no allocation between pilot training and nonpilot training is involved. Therefore, the flying hours chargeable to pilot training is the sum of the dual and solo hours flown by the students plus the hours flown by the instructor pilots in separate lead or tow target aircraft.** The syllabus for this course requires that each student pilot fly 120.1 hours (59.7 dual and 60.4 solo), and that 65 hours be flown by lead and target-towing aircraft.

The three air-to-air mission flights of the Table 18 syllabus may be used to demonstrate how these lead and tow hours are distributed to arrive at total hours per student. The 2:1 student-instructor ratio means that two students and one instructor participate in each of the three flights. Because the missions are flown solo, there are three aircraft in each mission flight, i.e., two of the aircraft are flown by students and the third, the lead aircraft, is flown by their instructor. Each of the three mission flights requires 1.7 hours. Each student is, therefore, charged with 5.1 flying hours plus an equal share of the time flown by the lead and tow aircraft. In this example, the lead time assessed against each student is 0.85 hours (1.7 hours divided by 2) for each mission flight, or 2.55 hours for all three missions. A tow aircraft is flown 0.9 hours in support of each of the three mission flights, for a total of 2.7 hours or 1.35 hours per student. Therefore, each of the benefitting students is charged with a total of 9 hours, i.e., with the 5.1 hours that he himself flies, plus an equal share (3.9 hours) of the time flown by the lead and tow aircraft.

* On dual missions, the instructor flies in the same aircraft as the student. On solo missions, the student is alone in the aircraft.

** A lead aircraft is flown by an instructor pilot, who accompanies solo student aircraft in a flight. A tow aircraft is flown to provide realistic simulation of aerial attack and airborne intercepts with live ordnance. A gunnery sleeve or radar reflective target is attached to the two aircraft by a cable sufficiently long to provide safety to the towing aircraft.

Each mission (or appropriate grouping of missions) is treated in this manner to arrive at the number of flying hours directly chargeable to pilot training and, in turn, chargeable to each student pilot. Indirect or "other flying hours,"* such as for test and ferry flights that are flown in support of the pilot training program but that do not directly involve students, are then added to obtain the total flying hours chargeable to pilot training. Thus, for the tactical flying training course shown in Table 18, the equation is:

$$\begin{aligned} \text{Total flying hours} &= (\text{number of students})(120.1 \text{ dual and solo hours}) \\ &+ (\text{number of students})(27.1 \text{ lead and tow hours}) \\ &+ \text{"other flying hours."} \end{aligned}$$

A somewhat different situation exists in training courses such as for two-seat fighter reconnaissance aircraft because the hours flown can benefit both a pilot and a non-pilot student. The flying hours also can benefit more than one student pilot when more than one aircraft is involved in a mission. On some missions, the student pilot and an instructor pilot or instructor navigator fly as a crew. On other missions, a student pilot and a student navigator fly together. On formation missions, which involve two or more aircraft, at least one of the crews consists of an instructor pilot and a student pilot. The crew composition of the other aircraft in the formation flight may be any of those described.

The number of flying hours chargeable to an individual student is obtained by dividing the total hours flown by the number of benefiting students. This applies irrespective of the student mix (as between pilots and non-pilots). As an example, assume a flight of three aircraft with a student pilot and an instructor in the first aircraft, two student pilots in the second, and a student pilot and an instructor navigator in the third. The flight is airborne for two hours, a

* See p. 33 of Vol. VII (RM-6086-PR) of The Pilot Training Study for a detailed explanation of "other flying hours."

total of six hours for the three aircraft. Because all four students are pilots, the full six hours is charged to pilot training and each student is charged with 1.5 flying hours. If the crew of the second aircraft consisted of one student pilot and one student non-pilot, only 4.5 hours would be charged to pilot training but the charge per student pilot would still be 1.5 flying hours.

Table 19 shows the flying hours that would be charged to a student pilot, for a typical training course for a two-seat fighter aircraft. Although the pilot flies 33.4 hours, he is charged with only 27.2 hours because some of the flying time is shared with non-pilot students.

Table 19

FIGHTER RECONNAISSANCE FLYING TRAINING COURSE

(Type: Two-seat fighter aircraft)

| Type Mission | Individual Mission Information | | | Total Hours | Allo- cated Hr Per Student |
|-------------------------|--------------------------------|-----------------|--|-------------|-------------------------------------|
| | Number Flown | Flying Hours | Student- Instruc. Ratio ^a | | |
| Day transition | 2 | 1.7 | 1:1 | 3.4 | 3.4 |
| Night transition | 1 | 1.7 | 1:1 | 1.7 | 1.7 |
| Instruments | 1 | 1.8 | 1:1 | 1.8 | 1.8 |
| Low altitude navigation | 1 | 1.8 | 1:1 | 1.8 | 1.8 |
| Formation | 1 | 1.8 | 1:1 ^b | 1.8 | 1.8 |
| Navigation system: | | | | | |
| Familiarization | 1 | 1.8 | 1:1 | 1.8 | 1.8 |
| Pre-solo check | 1 | 1.8 | 1:1 | 1.8 | 1.8 |
| Formation | 1 | 1.7 | 2:1 ^b | 3.4 | 1.1 |
| Combat profile mission | 3 | 1.8 | Student crew ^c | 5.4 | 2.7 |
| Combat profile mission | 1 | 2.0 | Student crew ^c | 2.0 | 1.0 |
| Combat profile mission | 1 | 1.6 | 1:1 | 1.6 | 1.6 |
| Refueling and formation | 1 | 2.8 | 1:1 ^b | 2.8 | 2.8 |
| Refueling and formation | 1 | 2.8 | 2:1 ^d | 5.6 | 1.9 |
| Refueling and formation | 1 | 3.0 | 2:1 ^d | 6.0 | 2.0 |
| Total | 17 | 33.4 | | 40.9 | 27.2 |

Total student pilot hours: 33.4

^a Ratio of student pilots to instructor pilots.

^b Only student pilots and instructor pilots on these missions.

^c Consists of one student pilot and one student non-pilot.

^d Flight of two aircraft--one with a crew consisting of a student pilot and student navigator and one with a student pilot and an instructor pilot.

For this syllabus, the flying hours to be charged to pilot training is calculated as follows:

$$\text{Total flying hours} = (\text{number of student pilots})(27.2 \text{ allocated hours}) + \text{"other flying hours."}$$

The most difficult flying-hour allocations are those for training in large, multi-member crew aircraft such as the B-52 and the KC-135. Because crew coordination is an important aspect of such training, all of the syllabus hours are flown by the complete crew. One method, which produces a reasonable allocation, is to examine each sortie to determine the time each crew member is actually performing his duties. For example, when the pilots are practicing landings, the other crew members, such as the navigator and the electronic warfare officer, are not performing in their specialty. Landing practice time would be charged wholly to the pilots. Other parts of the mission may require all crew members to perform in their specialty.

A sample allocation for one such mission is shown in Table 20.

Table 20

MULTI-MEMBER CREW BOMBER FLYING TRAINING COURSE: SINGLE MISSION

| Activities ^a | Man-Hours of Flying Activities | | | | |
|----------------------------------|--------------------------------|------------|------------|------------|------------|
| | Pilot | Co-Pilot | Navigator | EWOb | Gunner |
| Landings | 1.0 | 1.0 | --- | --- | --- |
| Aerial refueling | 1.0 | 1.0 | 1.0 | --- | --- |
| Instruments | 3.0 | 3.0 | 1.0 | 1.0 | 1.0 |
| Terrain avoidance/ navigation | 2.0 | 2.0 | 2.0 | 2.0 | --- |
| Radar bombing | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| Total | 9.0 | 9.0 | 6.0 | 5.0 | 3.0 |

Total syllabus mission hours: 9.0

Total man-hours: 32.0

^aMission activities are aggregates prepared for the example. An actual syllabus would show mission activities in detail for each crew member.

^bElectronic Warfare Officer.

The pilots and co-pilots are each allocated the full mission time on a man-hour basis. The time to be charged to each of the other crew members is determined by analyzing the individual activities during the mission. This is done for all of the missions.

The sum of the hours in which each of the several crew members is active during the training flights is the total flying training man-hours for the course. Table 21 shows the distribution of flying training man-hours among a multi-member crew bomber-flying training course with a 12-mission syllabus of 103 hours. The percentage of the total

Table 21

DISTRIBUTION AMONG CREW MEMBERS OF FLYING TRAINING MAN-HOURS

| Mission | Syllabus Hours | Man-Hours of Flying Activities ^a | | | | |
|---------|----------------|---|----------|-----------|------------------|--------|
| | | Pilot | Co-Pilot | Navigator | EWO ^b | Gunner |
| 1 | 8 | 8 | 8 | 3.8 | 3 | 2 |
| 2 | 8 | 8 | 8 | 3 | 2.5 | 1 |
| 3 | 8 | 8 | 8 | 4 | 3 | 1 |
| 4 | 9 | 9 | 9 | 6 | 5 | 3 |
| 5 | 9 | 9 | 9 | 6 | 5 | 3 |
| 6 | 8 | 8 | 8 | 6 | 3 | 2 |
| 7 | 8 | 8 | 8 | 5 | 4 | 3 |
| 8 | 9 | 9 | 9 | 5 | 4 | 4 |
| 9 | 8 | 8 | 8 | 5 | 4 | 3 |
| 10 | 10 | 10 | 10 | 9 | 6 | 4 |
| 11 | 10 | 10 | 10 | 9 | 6 | 4 |
| 12 | 8 | 8 | 8 | 7 | 5 | 4 |
| Total | 103 | 103 | 103 | 68.8 | 50.5 | 34 |

^aTotal man-hours: 359.3.

^bElectronic Warfare Officer.

flying man-hours applicable to each crew member becomes the basis for allocating the portion of the 103 flying hours charged to training each as shown in Table 22. The pilot and co-pilot are each allocated the full mission time on a man-hour basis, since they are always performing their function. This is equivalent to 29.6 hours, each, of the 103 syllabus flying hours. Therefore the total hours to be charged to pilot training would be 59.2 hours (2 x 29.6). Thus, the following equation

Table 22

ALLOCATION OF TOTAL FLYING HOURS AMONG CREW MEMBERS

| Item | Pilot | Co-Pilot | Navi-gator | EWO ^a | Gunner | Total |
|---------------------------------|-------|----------|------------|------------------|--------|-------|
| Total syllabus hours | 103 | 103 | 68.8 | 50.5 | 34 | 359.3 |
| Percent of total syllabus hours | 28.7 | 28.7 | 19.1 | 14.0 | 9.5 | 100.0 |
| Allocation of 103 flying hours | 29.6 | 29.6 | 19.7 | 14.4 | 9.8 | 103.0 |

^aElectronic Warfare Officer.

is used to calculate the total flying hours to be charged to pilot training for this course:

Total flying hours = (number of student pilots)(29.6 allocated hours)
+ other hours.

VIII. CONCLUSION

The intent of this document has been to describe concisely the advanced pilot training program of the USAF, with particular emphasis on formal training courses. It is hoped that the immensity and complexity of the training program, in terms of aircraft types, courses, organizations, and missions has been made apparent.

The user of the advanced pilot training cost model (described in Volume VII) should have an understanding of the general framework and complexities of the training program and of the types and sources of information necessary for use of that simulation model. He should be aware of the pitfalls that may be encountered in determining the resources that should be considered as contributing, in whole or in part, to the cost of advanced pilot training.

GLOSSARY

| | |
|-----------------------|--|
| active aircraft | A ready aircraft in the inventory requiring manning, i.e., not in storage. |
| AD | Air Division |
| ADC | Aerospace Defense Command |
| ADW | Aerospace Defense Wing |
| AEWwg | Airborne Early Warning and Control Wing. |
| AF | Numbered air force. A unit which is at a level between a major air command and an air division. |
| AGOS | Air-Ground Operations School |
| ALO | Air Liaison Officer |
| AMALS | Aeromedical Airlift Squadron |
| APT* | Advanced Pilot Training |
| ARRS | Air Rescue and Recovery Service or Squadron |
| ATC | Air Training Command |
| BGp | Bomb Group |
| BWg | Bomb Wing |
| CCTS | Combat Crew Training School or Squadron |
| chain-of-command | The succession of commanding officers from superior to subordinate through which command is exercised. |
| checkout | Instruction or training given a pilot to familiarize him with a given aircraft. |
| continuation training | The flying and ground training required to ensure that combat ready or mission qualified aircrews maintain proficiency in the employment of the weapon or support system or the particular mission assigned. |
| conversion training | The training given to convert a pilot from one species of aerospace vehicle to another, i.e., to convert a fixed wing pilot to rotary wing. |
| currency training | Training given to pilots who have not flown in a particular category of aircraft for a specified period of time and who, consequently, need refresher training. |

NOTE: Terms and abbreviations followed by an asterisk are those that have meanings peculiar to the text, or that are more restrictive more general than the standard USAF definition.

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| current | The term applied to a pilot who has met the flying requirements, as outlined in the applicable manuals, for a particular aircraft. |
| dual mission* | A flying mission with a crew consisting of a student and an instructor pilot. |
| DSES | Defense Systems Evaluation Squadron. |
| ECM | Electronic Countermeasures. |
| experienced pilots* | Pilots having a specified minimum number of flying hours and qualifications in certain categories of aircraft deemed suitable in relation to the training to be received. (Propeller, turboprop, helicopter, and jet; multi-engine and single engine; fighter, bomber, interceptor, transport, and trainer are words that are used in combination to describe categories of aircraft.) |
| FAC | Forward Air Controller |
| familiarization training* | Training given to acquaint a person with a piece of equipment and its operation, e.g., a short course given to a propeller or turboprop aircraft pilot, usually in a jet trainer, to prepare him for entry into an advanced jet aircraft course. |
| formal training* | Training courses that are authorized and approved by competent authority and meet certain standards regarding course content, length of instruction periods, qualification of instructors, and course duration. |
| FTWg | Flying Training Wing |
| inexperienced fighter pilots* | Pilots whose fighter experience is considered insufficient for direct entry into a particular course. |
| informal training | Training that does not meet all the criteria of formal training. |
| lead-in training | Training required to adequately prepare a student for entry into a course. |
| MAC | Military Airlift Command |
| MALS | Military Airlift Squadron |
| MALWg | Military Airlift Wing |
| mission capable* | Used in reference to aircrews who fly primary mission aircraft and complete the prescribed continuation training, but do not occupy authorized aircrew positions. These persons are usually in command and staff positions. |

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| mission qualification training* | Training required to qualify an aircrew member to perform combat or support missions, as applicable in the Unit Equipment (UE) aircraft. Phase II training. |
| non-jet qualified * | Rated pilots who are qualified in propeller or turboprop aircraft only. |
| non-current * | Pilots who have not flown in a particular category of aircraft for a specified time period and need refresher training. |
| Phase I training | The flying and ground training required to qualify an individual to perform aircrew duties in the Unit Equipment (UE) aircraft. This phase is called transition training. |
| Phase II training | See Mission Qualification Training. |
| Phase III training | See Continuation Training. |
| Phase IV Training | This consists of flying training for aircrew members who are assigned to command and staff positions and who do not occupy Unit Manning Document (UMD) authorized aircrew positions. Phase IV involves two aircrew categories: Mission Capable and Proficiency Training. |
| proficiency training | Flying training performed by aircrews solely to maintain basic aeronautical skills. See Phase IV training. |
| qualified pilots * | Rated pilots who have experience in aircraft and missions similar to those used in the training course they are to enter. |
| RTU | Replacement Training Unit. |
| rated pilots * | All pilots who have a current pilot rating. |
| SAC | Strategic Air Command. |
| SAD | Strategic Aerospace Division |
| SEAOC | Southeast Asia Operations Course. |
| selected pilots * | Rated pilots who meet certain experience and qualification requirements which make them eligible for shorter courses or particular types of missions. |
| simulator | See synthetic training. |
| SOF | Special Operations Forces. |
| solo mission * | A mission in which a student pilot or pilot flies without an instructor pilot or other pilot. |
| SOP | Special Operations. |
| SRS | Strategic Reconnaissance Squadron. |

SRWg Strategic Reconnaissance Wing.

support system An entity consisting of techniques, skills, and equipment used to support a weapon system.

synthetic training Training conducted in machines or apparatus that artificially create the conditions or situations that may be encountered in flight and in the performance of a mission in terms of the particular aircraft and mission equipment. Equipment in this category are simulators, whose cockpits closely resemble those of the aircraft they represent and which realistically simulate aircraft operation and employment; trainers that simulate instrument flying; and trainers for various types of weapons and systems.

TFWg Tactical Fighter Wing.

trainer See synthetic training.

transition training The training given a pilot to qualify him in the basic aircrew duties of a specific aircraft and enable him to become proficient in the operation of that aircraft under different conditions of flight, e.g., night or instrument flying conditions.

TRS Tactical Reconnaissance Squadron.

TTU Transport Training Unit.

UE Unit Equipment.

UPT Undergraduate Pilot Training.

weapon system A total entity consisting of an instrument of combat, such as a bomber or guided missile, together with all related equipment, supporting facilities, and services, required to bring the instrument upon its target or to the place where it carries out the function for which it was built.

Wg Wing.

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