Background File Only

USAF EXPERIMENTAL FLIGHT TEST PILOT SCHOOL

MISSION:

The mission of the USAF Experimental Flight Test Pilot School as stated in AFR 53-19, is to train selected pilots to monitor and to conduct flight tests of research, experimental and production aircraft. These tests are made to determine flight characteristics, performance, stability, control, and functional utility, and to obtain technical information on serviceability and efficiency of installed equipment and component parts.

To achieve a capability for all aerospace vehicles, the School is in the process of developing an Aerospace Research Pilot Course to train selected experienced test pilots to test and evaluate manned space vehicles. The students will receive instruction in basic and applied space theory and instruction and demonstration of applicable space flight techniques. They will plan and fly actual or simulated space flight tests, reduce flight test data, and write comprehensive flight test reports. Upon publication of the revised AFR 53-19, the USAF Experimental Flight Test Pilot School will be redesignated the USAF Aerospace Research Pilot School.

Students of the Experimental Test Pilot Course are well-qualified USAF pilots, personnel from the Air Forces of friendly foreign countries, aircraft contractors, both pilot and non-pilot, and personnel of the Federal Aviation Agency. Students of the Aerospace Research Pilot Course will, for the present, be Air Force officers only.

RESPONSIBILITIES:

"Commander AFSC is responsible for operation and supervision of the USAF Experimental Flight Test Pilot School in accordance with policies established by Hq USAF." (AFR 53-19) . "Commander AFFTC is delegated the responsibility for operation of the USAF Experimental Flight Test Pilot School". (ARDC SUP-1 to AFR 53-10).

HISTORY:

A test pilot training activity was organized in 1943 under the Air Materiel Command at Wright-Patterson AFB, Ohio. The activity utilized T-6's for the initial training program and by 1945 the inventory had expanded to P-51's and B-17's. The activity was officially designated the USAF AMC Flight Performance School in 1947. During February 1951 the School was moved to Edwards AFB, and continued operation as a Branch of the Directorate of Flight Test and Development, Air Force Flight Test Center.

The School was designated the ARDC Test Pilot School on 1 September 1952. The organization became an official USAF School on 1 January 1953, with a new title of USAF Experimental Flight Test Pilot School.

In eighteen years of operation the USAF Test Pilot training activity has trained over six hundred pilots.

TRAINING SCHEDULES AND SCHOOL GRADUATE REQUIREMENTS:

The present academic schedule is based upon two Experimental Flight Test Pilot classes a year which start each January and September. The classes are eight months in duration with a maximum number of sixteen students per class.

The Aerospace Research Pilot Course was initiated 5 June 1961 and will be six months in duration. This course will be expanded to an eight month duration and will provide training for a maximum of ten students.

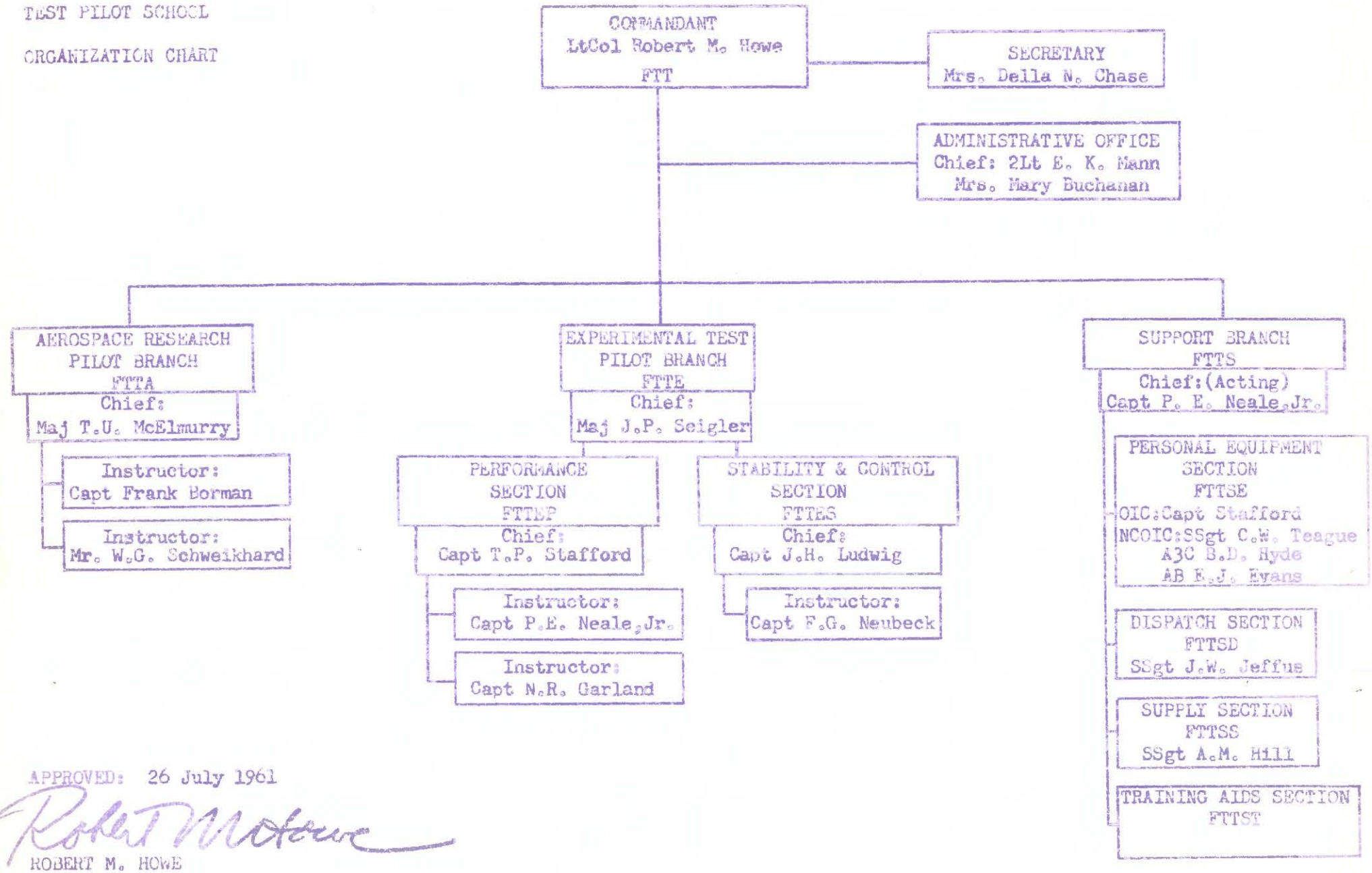
Estimated training requirements for School graduates for the period 1961-1965 are based on data supplied by Hq AFSC, local surveys at AFFTC, estimated attrition rates, and extrapolation of historical data. A firm requirement exists for the output of thirty students per year from the Experimental Test Pilot Course and will include those foreign pilots, FAA pilots, and civilian pilots mentioned previously. The present forecast requirements for future Aerospace Research Pilot Course graduates is eight per year.

ORGANIZATION:

The School is composed of two mission elements and a support element. The Aerospace Research Pilot Branch and Experimental Test Pilot Branch conduct respective student training. The Support Branch performs the planning and programming function for the School to include project work connected with securing those resources and facilities so vitally needed for the Aerospace Research Pilot training. This Branch also provides the operational and housekeeping support for the School.

USAF EXPERIMENTAL FLIGHT
TEST PILOT SCHOOL

ORGANIZATION CHART



APPROVED: 26 July 1961

Robert M. Howe

ROBERT M. HOWE
LtCol, USAF
Commandant

RESOURCES:

The resources of the USAF Experimental Flight Test Pilot School are as follows:

1. Instruction Staff. The most important resource of the School is the instructional staff. These are highly competent individuals who must be capable of instructing in both academics and flight test techniques. The must be extremely motivated and possess the ability to deal with all problems associated with the instructor-student relationship. The present authorized positions are:

a. Experimental Flight Test Pilot Branch

1. Performance Section - Two Captains

2. Stability and Control Section - Two Captains

b. Aerospace Research Pilot Branch

1. Two Captains and one Civilian GS-13

In addition the School Commandant and Branch Chiefs also serve as flight instructors and instructors in various academic subjects.

2. Aircraft Inventory:

a. Currently seventeen aircraft are assigned to the School. They are:

(5) T-28A's

(6) T-33A's

(3) B-57E's

(1) TF-102A

(1) F-104A

(1) F-104B

All the above aircraft are specially instrumented in order to perform the School mission.

b. Programmed Aircraft Inventory Modernization: AFSC aircraft programming action is as follows:

1. (5) T-38A's to replace (5) T-28A's during second half of FY 62

2. (3) F-104C's and (1) F-104D are programmed to be received in the last quarter of FY 63.

3. BUDGET:

A recent estimate of the operating cost of the Test Pilot School was approximately $817,000 per year which includes all military and civilian pay for staff members and employees, aviation POL cost, travel, material and aircraft manintenance cost. The figure does not include utilities and cost of aircraft depreciation and aircraft parts. The entire cost of operating the School constitutes approximately 2.0% of the AFFTC operating expense.

The present training cost per student is approximately $20,000.00. United States civilian contractor pilots receive training on a non-reimbursible basis. The training of other foreign personnel, both military and civilian, requires that reimbursement be paid by the country or company concerned.

a. The budget for FY 62 for the USAF Experimental Flight Test Pilot School amounts to $51,610.00 and is as follows:

CURRENT OBJECT CLASS	DESCRIPTION	FUNDS REQUESTED FY '62
11	Overtime	$ 400.00
21	TDY - Includes Field Trips by both the Experimental Test Pilot and Aerospace Pilot classes to Aircraft and Missile Manufacturing Facilities, Administrative Trips, and Familiarization Trips by School Staff Personnel	$ 37,000.00
23	Communication - Telephone call tolls	$ 500.00
25	Contracted Services - Maintenance, Overhaul, repair of special equipment	$ 2,000.00
26	Expendible Supplies - Text Books, Office and Engineering Supplies	$ 7,060.00
31	Equipment (Personal and Office) - Typewriters, tape recorders, desk calculators	$ 5,150.00
	TOTAL	$51,610.00

4. REAL ESTATE: This consists of the School building which is adequate for the present and future requirements.

EXPERIMENTAL FLIGHT TEST PILOT COURSE

COURSE OF INSTRUCTION:

The course of instruction is divided into a Performance Phase and a Stability and Control Phase. Each phase is sixteen weeks in duration and involves formal academic instruction and flight training. The level of instruction is comparable to that taught in the last two years of an engineering school but is more specialized in nature. Students normally find the academic instruction quite interesting since they have a chance to actually apply the theoretical classroom instruction to practical flight tests. Instruction is given by a highly competent staff of military personnel who double as flight and classroom instructors and are graduates of the Test Pilot School. Almost all instructors have had actual experimental flight test experience.

A. PERFORMANCE PHASE:

The Performance Phase is the initial phase of instruction received. The object of performance flight testing is to determine an aircraft's performance characteristics and to insure that the aircraft meets the performance specifications for which it was designed. The course is designed to give the student the engineering theory and flight test techniques for each test that is used in evaluating the performance of an aircraft. During this portion of the course the student will receive the following academic and flight instruction.

I ACADEMIC:

a. Introduction

b. Instrumentation

c. Calculus Review

d. Physics Review

e. Aerothermodynamics Review

f. Atmosphere and Airspeed System Theory

g. Lift

h. Drag

i. Moments

j. Drag & Power Characteristics

k. Performance Equations

l. Energy Concept

m. Electronic Data Processing Theory

n. Supersonic Aerodynamics

o. Propulsion Plants

In addition to the academic instruction listed above, classroom instruction on theory and flight tests techniques are given for each flight test flown.

II FLYING COURSE:

a. Airspeed System Calibration

1. Pacer

2. Low Altitude Speed Course

3. Tower Flyby

4. Smoke Trail

b. Climb Tests

1. Sawtooth Climb

2. Level Flight Acceleration

3. Check Climb

c. Level Flight Performance

1. Speed Power Constant W/δ

2. Range and Endurance

d. Take-off and Landing

e. Thrust Limited Turning Performance

f. Special Projects

Comprehensive three hour exams are given after approximately every ten hours of classroom instruction.

An engineering report is required on each of the flight tests.

B. STABILITY PHASE:

After the student has successfully completed the Performance Phase he graduates into Stability and Control phase. In this phase the sutdent is taught how to perform the test required to determine if an aircraft meets the minimum standards of flying qualities consistant with safety and acceptable control. The minimum standards are set forth in Military Specification F-8785. Basically, the student is being taught how to evaluate the handling qualities of an aircraft. During the Stability and Control course the student will receive the following academic and flight instruction:

I ACADEMIC:

a. Introduction

1. Types of Stability

2. Aircraft Handling Qualities

3. Military Specification F-8785

b. Weight and Balance

c. Instrumentation

1. Types

2. Operating principles and Procedures

d. Review of Aerodynamics

e. Technical Report Writing

f. Stalls

g. Longitudinal Static Stability

h. Maneuvering Flight Stability

i. Lateral-Directional Static Stability

j. Asymmetric Power

k. Trim Changes

l. Dynamic Stability

m. Spins

n. Control Systems Theory

o. High Speed Stability Theory

p. Rotary Wing Theory

q. Qualitative Flight Testing

r. Special Projects

II FLYING COURSE:

a. Stalls

b. Longitudinal Static Stability

c. Maneuvering Flight Stability

d. Sideslips

e. Aileron Rolls

f. Asymmetric Power

g. Trim Changes

h. Spins

i. Dynamics

j. Qualitative

k. Special Project

Academic examinations and flight test reports similar to the Performance phase are an intergal part of the Stability and Control course.

AEROSPACE RESEARCH PILOT COURSE

MISSION:

The Space Research Pilot Course is designed to provide the USAF with a pool of reseach pilots uniquely trained for the development and testing of manned space vehicles. Academic, simulator, and flying training of a highly specialized nature will provide these pilots with the engineering and flying skills peculiar to space vehicle design and flight testing. Extensive bio-astronautics training will enable them to cope with the alien space environment and will familiarize them with the stresses imposed by space flight.

HISTORY:

In 1959 the School Commandant established an in-house project to consider the requirements for space research pilot training and to make initial inputs into the Center Long Range Plan towards establishing such a training capability at AFFTC.

In July of 1960, at the request of Headquarters AFSC, a study was prepared by the School staff which proposed a re-orientation of the Test Pilot School training program to include space research pilot training. This study was revised and presented to General Schriever and his staff in October 1960. At that time, General Schriever gave a verbal directive to implement the first Aerospace Research Pilot Course as an AFSC in-house effort, pending USAF concurrence with the proposed School reorganization. As a consequence, the first Aerospace Research Pilot Course was started on 5 June 1961. With the publication of the new AFR 53-19 sometime within the next sixty days, the course will become a recognized Air Force course of instruction which will be conducted on an annual basis.

COURSE OF INSTRUCTION:

The present six months course of instruction is divided into four categories: Academic training, flying training, simulator training, and bio-astronautics training.

Academic training is generally conducted on a graduate level and provides a theoretical background as well as a working knowledge of space vehicle development and testing. A subject outline of the academic program to be given in the first course is as follows:

a. Review of Math and Basic Engineering Subjects

b. Physics of the atmosphere and space

c. Space flight

d. Re-entry Mechanics

e. Orbital Mechanics

f. Propulsion

g. Control

h. Communications

i. Guidance

j. Vehicle Systems

k. Instrumentation

l. Bioastronautics

m. Computers

n. Project Management

Flying training is accomplished in high performance aircraft that are modified to simulate flight conditions which will be encountered in aerospace vehicle testing. Aircraft currently used in the course are the F-104 and TF-102. These will be used to give flying instruction in the following areas during the first course:

a. Energy Management (Ascent)

b. Non-steady techniques of stability investigation

c. Reaction controls

d. Zero "g"

e. Variable stability

f. Energy Management (Descent and approach)

g. Space vehicle landing characteristics and techniques

h. Flight corridors

i. Composite flights

j. Aero Medical Physiological data acquisition

k. Dynasoar abort maneuver simulation

Simulator training is relied on to provide instruction and experience for flight phases which cannot be adequately duplicated in the flight training program. Simulators provide the student in a minimum period of time the knowledge of operating a wide range of space vehicles. Utilizing rented and borrowed equipment, during the first course, the following simulator training will be given:

a. Static simulation of X-15

b. Simulation of Dynasoar flight profile in a roll-pitch simulator

c. Dynamic simulation of ballistic re-entry vehicle

d. Static and dynamic simulation of reaction control vehicle

e. Static simulator investigation of vehicles with various combinations of stability and control effectiveness

Bioastronautics training prepares the student for the new and unknown space environment, defining and extending his ability to function under stress. This training is provided entirely by aero-medical personnel from within the Command, part being given at AFFTC and the remainder at other Centers. Examples of Bioastronautics training are:

a. Stress testing

b. Full pressure suit training

c. Aerospace Physiology

d. Physiological instrumentation

e. Physiological data acquisition and data reduction

The student body of the first class is composed of one student and four instructors from the permanent School staff who will continue to teach the course. For this reason several specialized courses are being given to the first class in order to enable the instructors to expand the course and meet the rapidly expanding technology of space flight. Examples of the specialized courses are as follows:

a. Orbital Mechanics and Re-Entry Vehicles. An intensive two week course given by the University of Michigan

b. Project Management. A course to be presented by the Aeronautical Systems Division at Wright-Patterson AFB

PROBLEM AREAS:

1. Personnel - The following manpower problems require immediate action by appropriate Center staff agencies.

a. Support Branch Chief - AFSC 1344. It has become increasingly evident within the School that considerable long range planning and programming action must be taken to secure the resources and facilities that are required to support the Aerospace Research Pilot training program. This project will be one of the major tasks of the Support Branch Chief. A well-qualified experimental test pilot with an aeronautical-engineering background should fill this vacancy.

An extremely well-qualified incumbent has recently been detailed to this position from within the School resources. However, this position has not been allocated a space within the Center's manning document. In order to properly assign this incumbent, a space must be authorized from other Center resources. The School does not have a space for this position. It should be noted that this requirement is approved by AFSC and is entered in AFSC manpower requirement records as "outstanding".

b. Training Aids Section - Illustrator - AFSC 22351. This manpower requirement for a qualified illustrator has become acute. The continual upgrading of both courses requires that an adequate training aid program be established. This second requirement has also been approved by AFSC and is entered as "outstanding". It is requested that the necessary space be allocated to this position from within Center resources, and that a qualified airman be assigned from those presently available within the Center.

c. Although not as pressing, the following manpower problem will require future Center manpower action:

(1) Experimental Test Pilot Branch - Civilian Instructors. A firm requirement exists for two qualified civilian aeronautical engineers to be academic instructors within the Branch. These civilian positons add stability and provide continuity to the instructional staff of the Experimental Test Pilot Course. The PCS transfers of two military School staff members during the preceding term resulted in one instructor for each phase of the Course. Prior to the recent reorganization, the Experimental Flight Test Pilot Branch was authorized six military instructors and one civilian instructor. In order to establish the Aerospace Research Pilot course, several positions were shifted from the Experimental Flight Test Pilot Branch to the new branch which in no way lessened the original requirements. The U.S. Naval Test Pilot School, the Empire Test Pilot School, and the French Test Pilot School all rely heavily on civilian personnel for academic instruction. The School is presently initiating action to obtain allocation for the two civilian spaces.

2. Aerospace Research Pilot Course

a. The most pressing problem, one which the School has been unable to cope with, and one which has become a serious threat to the success of the first Aerospace Research Pilot Course is the non-availability of F-104 aircraft. Two F-104's are assigned to the School, however little or no flying has been accomplished since the course began last June. The primary reason for this has been the grounding of all F-104A's due to the -3A engines. Because only two F-104's are assigned to the School, an in-commission rate of 80% or better must be maintained throughout the six months training period. This 80% rate would have allowed the present group to adequately complete the course. Today, even a 100% F-104 in-commission rate for the remaining four months would not be adequate. In order for the first Aerospace Research Pilot Course to be completed on schedule, a third F-104 must be made available to the School.

b. A second problem, and one of far greater magnitude, though not quite as pressing, is the non-availability of training aids and training devices. The School has a vital requirement for the following:

(1) Reaction control equipped aircraft, possibly of the F-104 type.

(2) Variable stability aircraft

(3) Specialized training aids

Both variable stability and reaction control aircraft are presently in existence within the U.S., though in very limited numbers. They are highly complex, specialized, experimental type aircraft that only exist in prototype form. These special systems incorporated within the aircraft are hand built, relatively unproven, and difficult to maintain. They are not designed with simplification in mind that is vitally required of a training vehicle. Those few variable stability and reaction control aircraft within this country have all been developed for special R&D test programs and, with the exception of a variable stability B-26 at Cornell Aeronautical Laboratory at Buffalo, N. Y., are fully committed and are not believed to be available to the School even on a temporary basis. To resolve the variable stability/reaction control problem it is presently envisioned that additional aircraft will have to be secured and extensively modified to incorporate those training features of reaction control and variable stability that are required for the Aerospace Research Pilot Course.

A wide variety of specialized training aids will be required to maintain a simulator training capability compatible with the advancing space vehicle technology. Examples of those presently required are a reaction control simulator and a space orientation simulator. The School is in the process of renovating a rudimentary reaction control simulator which was secured from NASA. Action is presently being initiated to secure a space orientation simulator.

Although several space orientation simulators are known to exist in this country, none are available to the School even on a rental basis. The available time on these simulators facilities is fully programmed by other high priority R&D programs.

c. The long range problems that pertain more to future courses are those that will arise in conjunction with the implementation of the future Center mission as envisioned in the latest Center long range planning. To develop the Air Force Flight Test Center into the planned test, control, and recovery center for manned spacecraft, and to train people to perform this mission, many long lead time devices must now be moved from the planning stages and placed into active project status. This action, if initiated immediately, will enable this Center to reach these presently planned goals and provide a vitally needed future test facility. This School is basing the future success of the Aerospace Research Pilot training program on the attainment of the Center long range planning objectives. The resources needed will be jointly shared with other Center organizations. These resources are:

(1) Centrifuge with computer tie-in

(2) Six degree of freedom static simulator facility with an instrumented cockpit.

(3) Space trainer - X-15 category

Obviously, such items as the centrifuge will not be available within the next two years. Until such facilities are available, we will be forced to rent equipment from other Services and civilian industry when such is available. To fulfill the space trainer requirement, the X-15 program must provide flight support. The non-availability of these resources at this time in no way lessens the School's requirements for them. They could be used just as effectively right now in the course curriculum as they will be used in the future.