HISTORY OF THE

METROLOGY TRAINING DIVISION

Prepared By

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June 1989

CONTENTS

JULY - DECEMBER 1959

Headquarters ATC assigned Lowry AFB responsibility for providing Precision Measurement and Calibration Traveling Teams to service FACAF. (Att Nr 6, Page 2, *10)

The Department of Fighter Systems identified the following problem areas:

1. Change 1 to AFM 35-1, effective 21 December 1957, assigned AFSC 32470 as Armament Systems Test Equipment Technician. However, Change M, effective 31 August 1958, changed the identity of this AFSC to Precision Measuring Equipment Technician and made completion of course bearing the-latter identification mandatory for award of this AFSC. These two specialties, although similar, are not comparable. It is not considered practical, economical, or feasible to include maintenance of specialized test equipment functions at an Air Force Base Laboratory under the scope and responsibilities required of Armament Systems Test Equipment technician at unit level. A thorough analysis of the two courses was made: and a report, with recommendations, was submitted to Headquarters ATC. (Page 15)

PME Technician ALR 32470 142 graduates (Appendix 5)

Headquarters ATC has approved a plan to add two weeks of training to Course Number ABB32470, Precision Measuring Equipment Technician. The two weeks additional time will be spent on the maintenance and calibration of radiac instruments. (Appendix 6, #5)

The Base requested 20 Philco Engineering Instructors for the Calibration Courses. They are required to train students and instructors at this base and should remain here for approximately one year. (Att Nr 6, Page 4)

A highly successful conference of the year-old air Force Committee of Calibration of Precision Measurement Equipment was held 27-29 May 1959 at Lowry Air Force Base which conducts the Air Force's Precision Measurement Equipment Technical School. The committee, headed by Col Richard Stolle, Air Material Command Headquarters at Wright-Patterson, supports a program designed to assist commands in establishing base shops capable of calibrating and repairing and repairing test equipment of all kinds. (Folder II-I)

JULY - DECEMBER I960

The Base PMEL facility, Building 354, was completed in time to support the Martin Company the Titan I and C Phase. However, the Base PMEL must be fully manned before that organization can repair, calibrate, and certify all of this Center's, precision measuring equipment on schedule. Action is being taken to accomplish this manning. ATC and AMC Headquarters were informed of this critical situation. Action was initiated to fill the PMEL vacant positions with qualified maintenance personnel (Pg. 24, #6)

The facility, building 357A ***(375A),*** to support the Precision Measuring Equipment training was completed and the PME training program progressed on schedule, the major obstacle in the program is the maintenance of training equipment utilized in the Precision Measuring equipment Technician Course Nr ALR32470. Action is being taken to either allocate maintenance positions to the Technical school or obtain and assign sufficient qualified maintenance personnel to the Base PMEL to man that organization fully. The accomplishment of either of these two actions will help to provide the classroom training equipment to support this training program, (pg 24, #7)

3415th Technical School, USAF
Course ALR32470. Precision Measuring Equipment Technician: The ALR32470 course has made very good progress during the past six months. This is attributable largely to an appointed task force by this school to explore problem areas and to take concrete corrective actions. The quality of instruction has increased with a concentrated training program and we are getting many more favorable comments from graduates. Due to the continuous changes, this course will require continued concerted effort. We are anticipating an increased student load in the near future and additional equipment is being received or forecast constantly. As a result, the course will experience more problems and require much more effort of all concerned. (pg 31, #4)

Special and Factory Training Section		Implemented
ACC32470-4	AN/TRM-3 Radio Test Set	8 Aug 60
AXC32470-5	Atomichron Repair & Alignment	12 Sep 60
ACC32470-11	Hewlett Packard Equipment Calibration and Repair	16 Nov 60
ACC32470-12	RF Calibration and Repair	1 Feb 61
ACC32470-13	Repair and Calibration of Tektronix Equipment	28 Nov 60
AXC32470-13	Dead Weight Tester	13 Sep 60
ACC32470-15	Jetcal Analyzer	2 Nov 60
ACC32470-17	Sealer Analyzer Operation and Calibration	26 Sep 60
ATS32470-1	MA-1 WCS Test Equipment Technician	20 Jul 60
ATS32470-2	Radiac Instrument Calibration and Repair	17 Aug 60
ASX32470-1	PMEL Techniques	1 Jun 60
AXC32470-6	MA-1 Data Link and Communication Test Equipment	22 Jun 60

(page 40)

Maintenance Branch

Repair and Calibration of Test Equipment

a. On 10 March 1960, a meeting was held at this center to spell out PMEL responsibilities, particularly in view of the impact the SAC Missile Wing would have on the PMEL workload. Representatives from USAF, ATC AEDC, SAC, and the Technical School were present. Captain Turner of ATC was approached by CMSgt McNamme, School Material Division, on the question of Technical School maintenance of test equipment used in Basic courses. Captain Turner was noncommittal and kept referring to ATC Supplement 1 to AFM 66-1 which authorized maintenance only by PMEL, except in certain specific instances. This office previously queried ATC (20 December 1959) on this matter, but never received an answer.

b. Under normal operating policy, equipment used by Department of Basic Technical Training has highest priority; however, during the past year, this had to be temporarily set aside due to special requirement for MA-1 test equipment which arrived on Base from Hughes Aircraft Company, and a backlog in the ALR324XX course. (pg 52, #2)

The Pre-Entrance Examination for Course Nr. ALB32470, Precision Measuring Equipment Technician was revised and distributed to all major command headquarter. (pg 57, #9)

Problem Areas:

Personnel within the Precision Measurement Equipment Laboratory. The number of trained personnel is not enough to handle the workload assigned to PMEL, which is authorized 45 (35 assigned with 10 of 35 assigned in school). Present for Duty: 25. Their recurring backlog averages 7000 manhours per month. When authorized personnel are assigned this problem area should be eliminated. (page 70)

PME Technician	Course length: 18 weeks
ALR32470	Graduates: 379
	Eliminations: 6

(Appendix 7)

JANUARY - JUNE 1961

Planning is being accomplished to increase the duration of the course from 18 to 28 weeks, (pg 38)

During this reporting period Course ALR32470 reached a peak training load of 285 students. The average training load was 260 students through fiscal quarters 3/61 and 4/61. In February 1961, a meeting was held at Headquarters, USAF for. review of training requirements and training philosophy for the forthcoming calendar years of 1962, 63 and 64. Decisions were reached to initiate planning for a revision of Precision Measurement Equipment Training. Examination was made of the possible requirements for Special Training and Field Training Teams. It was determined that the future training requirement in this period would level off with an annual requirement of 200 to 250 324X0 personnel needed to compensate for attrition in the career field. It was also pointed out that changes should be initiated in the training program to provide a trained technician with firm understanding of the principles of Metrology. This changed the training philosophy of the courses from an equipment oriented course to a principle-oriented course. The annual meeting of the USAF Calibration Committee at MOAMA in April 1961 and the annual SAC PMEL Supervisor Conference in May 1961 further substantiated and accepted the need for this change of training philosophy. This change was principally based on the addition of new and more complex measurement standards and a projected increase in computed measurement procedures associated with the more sophisticated weapon systems. Course personnel prepared a proposed JTS and accomplished preliminary course control documents for a 28-week course to revise the current ALR32470 course. This revised course was coordinated with the National Bureau of Standards and Headquarters, USAF Calibrations Divisions at Dayton AF Depot. This planning was in final stages for submission to Headquarters ATC at the close of this reporting period.

JANUARY - JUNE 1962

Course ALR32430 Precision Measuring Equipment Specialist: 94 graduates

This School is engaged actively in developing a capability for programmed learning. The subject of programmed learning received its first major impetus in a meeting held at Headquarters ATC in mid-November 1961. In response to ATC message, ATTTP-M 41799, 21 November 1961, six personnel were nominated to attend special training courses to provide the initial capability in programmed course materials. The initial subject areas selected were a 12 hour block of instruction on radiation detection, an 18 hour block of instruction on the A-28 Camera Mount, and Course ECI2320 Photographic Fundamentals. In subsequent meetings and in response to additional correspondence from Headquarters ATC, subjects were expanded to include instructor training, electronics fundamentals and concerns remedial training, and OJT Package Course JA32470, Precision Measuring Equipment (mechanical standards). A total of eleven personnel are scheduled for special training, of which four personnel already have completed training. (pg 44)

IV. Significant Facts: The following courses were planned, implemented, or discontinued during this reporting period:

Course Nr.	Course Title	Implemented	Status
ACC32470-29	Digital Multimeter & Voltmeter (T-121, DVA-510. 351D) Repair & Calibration	19 Feb 62	Active
ACC32470-30	Multimeter & Voltmeter (M-24, V-34/35, V481A) Repair & Calibration	5 Mar 62	Active
ATS32470-2	Radiac Instruments Calibration & Repair	1 Mar 62	Active
ATS32470-37	System Error Bridge, Model D-158, D/O	6 Feb 62	Active
ACC32470-13	Tektronix Equipment and Calibration	11 Jun 62	Active
ACC32470-36	MB Vibration System, Operation and Maintenance		Active
ACC32470-40	Study in Vibration		Planned
ACC32470-44	Vibration Testing Resonant Free Test Fixtures	12 Jun 62	Completed
ATC32470-32	Cubic Digital Voltmeter, Calibration, and Repair	16 Apr 62	Completed
AXC32470-38	GAR-8 Missile D/0 Test Equipment (Electro-Mechanical)	14 May 62	Active
AXC32470-39	GAR-8 Missile D/0 Test Equipment (Electronic)	14 May 62	Active
ATS32470-37	Depot Maintenance of System Error Bridge, Model D-158		Completed

(Pgs 48-52)

Technical Writing Branch

This Branch also received the responsibility of preparing certain projects under the new programmed-learning concept. Included is ECI Course 2320, Photographic Fundamentals, which is the only ECI course to be programmed in ATC during this test period. Also included is OJT package JA 32470, Precision

Measuring EquipmentTechnician, Volume 1. This type of instructional material is still in the experimental stage, but it may have far-reaching effects on future project assignments. (pg 58a)

The Precision Measurement Equipment Laboratory (PMEL) inventory was increased during this period by 838 items, bringing the total to 6,486 items for which PMEL has maintenance responsibility. Martin Company personnel assigned to PMEL during the I and C Phase of the Titan Missile Installation completed their assignment and moved out of the lab on 11 May 62. (pg 87)

3. Operations: The following courses were planned, developed, or implemented during the reporting period:

Course Nr.	Course Title	Implemented	Status
ACC32470-13	Tektronix Equipment & Calibration	23 Oct 62	Active
ACC32470-40	Study in Vibration	6 Aug 62	Completed
ACC32470-48	Optical Instrument Calib & Maint	Planned	
ACC32470-49	MB Electronics Vibration Seminar		Completed
ACC32470-51	Environmental Testing		Active
ACC32470-58	Calibration- High Signal Source Generator (O&M)		Active
ATC32470-46	Precision Measuring Equip Infrared Calibration	Planned	
AXC32470-53	C.E.C. Lightbeam Oscillographs	Planned	
AXC32470-54	Temperature-Measuring Techniques	Planned	
AXC32470-55	Accelerometer & Vibration Sensing Sys	Planned	
AXC32470-56	Flow Sensing Devices	Planned	
ATS32470-43	Tektronix Test Equipment, Calibration, and Repair	10 Oct 62	
ATS32470-45	Precision Measuring Equipment, F&O Maintenance	15 Aug 62	
ALR32430	Precision Measuring Equipment Specialist Training Plan submitted 27 Sep 62		Planned
ATS32450-50	Electrical Standards Console Training Plan submitted 19 Nov 62		Planned
ATS32470-50	AN/UPM-98, Radar Test Set, Calibration and Repair; Tng Plan submitted 17 Oct 62		Planned

(Section 10)

Problem Areas

d. Precision Measuring Equipment Branch

(1) A problem exists in the control of some 1800 items of test equipment as they are moved from one training lab to another. These items also require periodic maintenance and calibration. Request for a position, AFSC 32470, was rejected, but the request was resubmitted in November 1962. (Section 10)

5. Significant Changes

d. Precision Measuring Equipment Branch

(1) Course ALR32430, Precision Measuring Equipment Specialist, received an approval for change in course length from 28 to 35 academic weeks. This additional time requirement was due to the weakness of students in the electronic fundamentals area. This weakness resulted in a large elimination rate from the course. (Section 10)

3. Operations. The following courses were planned, developed, implemented, or reactivated during the reporting period:

Course Nr	Course Title	Implemented	Status
ACC32470-61	Gisholt S/U Balancing Machines Repair & Calibration	11 Feb 63	Active
ACC32470-63	Lavoie Robotester	21 May 63	Active
ACC32470-	Radiation Test Receiver & Transmitter	Cancelled	
AXC32470-48	Optical Instrument & Calibration Maintenance	Cancelled	
AXC32470-53	C.E.C. Lightbeam Oscillographs Speed-0-Max	25 Mar 63	Active
AXC32470-54	G&H Graphic Recorders	11 Mar 63	Active
AXC32470-55	Accelerometer & Vibration Sensing Systems	18 Mar 63	Active
AXC32470-56	Flow Sensing Devices	1 Apr 63	Active
AXC32470-57	Temperature Measuring Techniques and Equipment	8 Apr 63	Active
AXC32470-62	Vibration Equipment Maint & Calib.	6 May 63	Active
AXC32470-69	AWM-13 Test Set D/0 & Calib.	26 Jun 63	Active
ADS32470-60	Audio Voltage Standard (AVS-321/323)	4 Jun 63	Active
ADS32470-67	Electrical Standards Console		Planned
ADS32470-68	Rotary Balancing Machines	22 Apr 63	Active
ATS32470-2	Radiac Instrument Calib & Repair	13 May 63	Active
ATS32470- (Section 10)	Radiological, Radiographic Training		Planned

3415th Technical School

e. Bomber and Photo Training Data:

(6) The 4th.Annual Army, Navy, and Air Force (Tri-Service) Calibration Conference held at the US Navy Air Station, Washington DC, was attended by representatives from course ALR32430 and the Resident Training Section. Compatibility of the three services calibration training was discussed.

(7) The development of an electronic standards console to upgrade the capabilities of base PMELs resulted in a resident supplementary course. This course, AZR32470-3, is three weeks in duration. Approximately 300 personnel are presently earmarked for this course.

Implementation of Special Training Course ATS32470-70, Precision Measuring Equipment Technician, Dimensional and Electromechanical Standards (Programmed) was approved by HQ ATC. Purpose of this course was to evaluate the effectiveness and quality of the programmed instruction materials (linear frames) for OJT Package JA32470, Precision Measuring Equipment Technician. The course was eight days in duration and conducted by the Technical Writing Branch. (Section 10)

b. JTS Annotation Due to Supply:

(1) Problem

At the close of this reporting period, only two courses are being annotated due to lack of supply items. One each Platinum thermometer is required for Course ALR32430, Precision Measuring Equipment Specialist.
(Section 10)

3. Operations.

a. Courses Newly implemented

(4). AZR32470-3, Electrical Standards Console, effective 19 Jun 63.
(5) ADS32470-68, Rotary Balancing Machines, effective 22 Apr 63
(7) ADS32470-60, Audio Voltage Standard (AVS321/323), effective 4 Jun 63

e. Precision Measuring Equipment Branch.

(1) The ALR32430 Course, Precision Measuring Equipment Specialist, was increased from 28 to 35 weeks in 2 January 1963. This increase of seven weeks was in the fundamentals portion of the course and has resulted in a greatly decreased elimination rate. (Section 10)

5. Problem Areas.

c. Precision Measuring Equipment Branch.

(1) The calibration TO for the calibration of the Electrical Standards Console, scheduled to be delivered with the console in May 1963 has not been received. Message was sent to Newark AFS 4 June 1963 requesting immediate delivery of TO.

(2) Due to daily use, many of the 1800 items of test equipment have deteriorated below laboratory specifications. Newark AFS is being contacted on this. (Section 10)

Captain Harold L. Neufeld has been replaced as Branch Chief by First Lieutenant Howard R. Shaffer. (Section 10)

Program Control Branch, Programming Division

i. Entry of Navy Students Into Precision Measuring Equipment Training.

(1) At the request of the Department of the Navy, USAF and ATC and Lowry Technical Training Center agreed to prepare a special 19-3/5 week course to train 18 Navy personnel in the techniques of repairing precision measurement equipment. Three classes of six Navy students were scheduled to begin training 12 November 1963, 27 November 1963, and 11 December 1963.

(2) Only four Navy students were actually entered in each of the four classes. Some of these students did not possess the proper background and are having trouble maintaining satisfactory academic standards.

(3) A special meeting is planned to be held at Lowry during January 1964 to work out procedures to insure that Navy personnel, in the future, possess the proper prerequisites when they are entered in this training. There is a strong possibility that approximately 100 Navy personnel will be trained each year in this area. (Section 2)

USN Message

1. UTILIZATION OF AIR FORCE CALIB TRNG SCHOOL AT LOWRY TECH TRNG CENTER. DENVER, COLO., RECOMMENDED AS INTERIM MEASURE VICE ARMY ORDINANCE SCHOOL. ABERDEEN PROVING GROUND FOR FOLLOWING REASONS-

A. ARMY CRSE EXCESSIVELY EQUIPMENT ORIENTED WHICH WILL RESULT IN NAVY TECHNICIANS LEARNING OPERATION, MAINTENANCE, AND REPAIR OF CALIBRATION EQUIPMENT NOT USED IN NAVY CAL LABS.

B. ARMY CRSE PROVIDES INSUFFICIENT ACADEMIC TRAINING TO ENABLE NAVY CALIB TECHNICIANS TO RECOGNIZE AND RESOLVE DISCREPANCIES IN TEST EQUIPMENTS NOT SPECIFICALLY COVERED IN CRSE.

C. AIR FORCE CRSE PROVIDES EXCELLENT BALANCE BETWEEN ACADEMIC TRAINING IN MEASUREMENTS THEORY AND OPERATION AND FAMILIARITY OF BOTH TEST AND CALIBRATION EQUIPMENT. (Section 2)

3. Operations. The following courses were planned, developed, implemented, or reactivated during the reporting period:

Course Nr	Course Title	Implemented	Status
ADS32470-59	AN/UPM98 Radar Test Set	12 Oct 62	Active
ADS32470-60	Audio Voltage Standard (AVS 321/323)	4 Jun 63	Active
ADS32470-67	Electrical Standards Console	31 May 63	Active
ATS32470-2	Radiac Instrument Calibration and Repair	13 May 63	Active
ATS32470-	Radiological, Radiographic Training		Planned

(Section 10)

3415 Technical School

3. Operations:

b. Bomber and Photo Training Data:

(5) Increased TPR in Course ALR32430, Precision Measuring Equipment Specialist for FY's 64 and 65. The increased entry would increase the peak load of the course from the current 318 to 420 students. (Section 10)

MATERIEL DIVISION

5. Problem Areas:

b. ALR32430 - Precision Measuring Equipment Specialist. Platinum Thermometer. Message, MAHRA21L15, 28 November 1963, from 2802d IG&C, advises that subject thermometers will not be available from contract until May 1964 at the earliest. (Section 10)

Department of Bomber Training

3. Operations.

a. Courses Newly Implemented.

(1) AZR32470-1, Electronic Test Equipment Calibration and Repair, effective 17 Jul 63. (Section 10)

(2) Military Construction Program (Proposed)

(b) F.Y. 1968 - - - construct a new precision measurement equipment training laboratory. (Section 2)

SPECIAL AND FACTORY TRAINING:

3. Operations: The following courses were planned, developed, implemented, or reactivated during the reporting period:

Course Nr	Course Title	Implemented	Status
ACC32470-74	Cox Master Nozzle Set	30 Nov 64	Active
ACC32470-75	Static Pressure Measurement	6 Apr 64	Active
ACC32470-76	Leak Detection Equip, Calib & Repair		Planned
ACC32470-77	Mech-Dimensional Test Equip Calib & Repair	11 Jan 65	Active
AXC32470-74	Cox Master Nozzle Set	9 Sep 64	Active
ATS32470-2	Radiac Instrument Calibration and Repair	13 May 63	Active
ATS32470-	Microwave Measurements		Planned
ATS32470-	Radiological, Radiographic Tng		Planned
ATS32470-65	Digital Voltmeters		Planned
ADS32470-59	AN/UPM 98 Radar Test Set	12 Oct 62	Active
ADS32470-60	Audio Voltage Standard (AVS 321/323)	4 Jun 63	Active
ADS32470-68	Rotary Balancing Machines		Planned
ASN32470-81	Physical & Mech Meas and Dimensional and Optical Tool Measurement	4 Jan 65	Active

(Section 10)

Department of Avionics Training

3. Operations.

a. Courses newly implemented:

(5) ATS32470-65, Digital Voltmeters Repair and Calibration, effective 23 Sep 64.

(6) AZR32470-2, Electronic Test Equipment Calibration and Repair (Hewlett-Packard) (MDAP Only), effective 29 Jul 64. (Section 10)

d. Branch Operations:

(1) Precision Measuring Equipment Training Branch. The increased student entry rate has resulted in a 105X increase in Course ALR32430. The augmented student entry rate in the course has necessitated moving the first four blocks of instruction to Building 869. The PME Branch has been advised that a new PME school facility has been approved by Hq ATC and funding for the

facility has been moved forward from FY68 to FY67. The Instructional Systems Development Team, with the help of five PME instructors, began preparation on programmed packages for Course ALR32430 which is expected to save two academic weeks of instruction. Two personnel from the Branch attended Type V training courses, Electrical-Electronic Measurement Course of five weeks duration and Microwave Course of three weeks duration at Metrology Engineering Center, Bureau of Naval Weapons Representative, Pomona, California. (Section 10)

3415 Technical School, USAF Department of Avionics Training

d. Courses discontinued

(4) ALE32430-2, Precision Measuring Equipment Specialist (Optical), effective 26 May 65

(5) ALR32430-3, Precision Measuring Equipment Specialist (Mechanical), effective 19 May 1965
(Volume 1, Section 10)

Branch Chief. Richard G. Taubinger, 1st Lt.

a. Course Nr. ALR 32430, Precision Measuring Equipment Specialist (35 weeks):

(1) Revisions to control documents:

(a) Revision to JTS 32430/70, 15 Dec 61, was submitted for approval of all major commands. The tentative JTS is dated 10 Mar 65.

(b) First revision to course chart, 6 Jan 64, 2 Mar 64 (R-l) was implemented with class section 25034 initiating the laboratory-lecture concept. Approximately ten class sections are still in school. The second revision to the course chart. 12 Feb 65 (R-2) began with class section 06015 to test programmed learning packages for the purposes of standardizing the training and decreasing the academic time required in the mathematics and first electronics blocks of instruction. The third revision dated 7 Apr 65 was initiated with class section 07045, realigning the training times of Blocks I and II to 90 hours each so the students of shifts A and C could be trained using the conventional methods and compared with shift B's programmed learning concept. The comparison proved the programming to be satisfactory enough to put all three shifts on programming with class 07075 and tested for six more classes before revising the course chart in October.

(2) Readjustments of entry rate. Beginning with class 06015, the USAF student entry rate dropped from 12/1 to 9/1.

(3) Improvement of elimination and washback rates and average training weeks:

(a) Since Jan 65, the elimination rates have dropped from 137.5% to 126.6%.

(b) The washback rates have dropped from better than 200% to 66.6% since Jan 65.

(c) The average training weeks per graduate, peaking at 36.8 in Feb 65, have slowly dropped to 35.5

b. Course Nr ALR 32430-1. Precision Measuring Equipment Specialist (19 3/7 weeks). The entry rate of this course combined with the readjusted rate of Course Nr ALB 32430, given in paragraph 3a(2) above, reduces the class section size in Blocks I and V thru X of Course Nr. ALR 32430 to twelve students. The revisions to the control documents of Course Nr ALS 32430. given in paragraph 3a(1) above, apply to Course Nr. ALR32430-1.

c. Course Nr AZR 32430-4. Precision Measuring Equipment Specialist (Electronics). Per agreement MEC-LTTC Conference on the Development of a Navy PME Course, 11 May 65, LAFB, this training will be identified as three separate courses from programming purposes. The first course will be ten academic weeks in length and identified as Course Nr AZH 32470-4. Advanced PME Specialist (Electronics). The second (first six weeks of AZR 32470-4) will be AdvancedElectrical-Electronics Measurement. Course Nr AZR 32470-5 and third (last four weeks of AZR 32450-4) will be Advanced Microwave Measurements, Course Nr AZR32470-6.

d. Course ALR 32430-2. Precision Measuring Specialist (Optical), and ALR 32430-3. Precision Measuring Specialist (Mechanical). During the MEC-LTTC Conference cited in paragraph c above, it was tentatively agreed that this training would by identified as three separate courses. The first course, Precision Physical, Optical and Dimensional Measuring Specialist, Course Nr ALR32430-4, duration is 12 Academic weeks. The second (first three and last three weeks, Blocks I and IV, of Course Nr ALR 32430-4) will be Precision Physical Measuring Specialist, Course Nr ALR 32430-3. The Operational Training Plan for Course Nrs. ALR 32430-2, ALR 32430-3, and ALR 32430-4 will be submitted to the Department on or before 16 Jul 65.

e. AZR 32470-1. Electronic Test Equipment Calibration and Repair (Tektronix) (3 weeks). In January of this year a separate EAID for Course Nr AZR 32470-1 was approved. All of the equipment required to support this training has been requisitioned. A FEW of these requisitioned have been received.

f. AZR 32470-2. Electronic Test Equipment Calibration and Repair (Hewlett-Packard) MAP ONLY (8 weeks). As in paragraph e above, a separate EAID for this course has been approved, the required equipment has been requisitioned, and some of the equipment has been received. When all of the equipment items for this course and AZR 32470-1 has been received, many of the equipment shortages plaguing Course Nr ALR 32430 will be eliminated.

g. AZR 32470-3. Electrical Standards Console (3 weeks). Due to the fact that two additional consoles are expected to be received by the PME Branch in the near future and that this training will be integrated into Course Nr ALR32430, the EAID approved for this course was transferred Course Nrs AZR32470-4, AZR 32470-5, and AZR 32470-6. However, requisitions for the additional item of equipment required to support this training, against the ALR32430 EAID have been submitted to the Department.

h. Special Training:

(1) ATS32470-2. Nuclear Radiation Measurements (48 hours): ATS 32470-31. Physical Measurements (132 hours): and ATS 32470-30, Microwave

Measurements (180 hours). Special AMA Civilian Personnel enter selected blocks of instruction of Course Nr ALR32430 and are awarded the appropriate Certificate of Training.

(2) ATS 32470-65. Digital Voltmeter Repair and Calibration (90 hours). The digital Voltmeter training was originally schedule to phase out in July. However, additional training slots have been requested and approved extending this training until December 1965.

i. Traveling Team Instruction. Course Nr ADS 32470-67, Electrical Standards Console (90 hours), has been discontinued. However, the following course will be taught when so directed by Hq ATC:

(1) ADS 32470-61. Rotation Balancing Course (80 hours).

(2) ADS 32470-71. AN/AWM-13. Test Set Maintenance and Calibration (120 hours).

4. Equipment. Since the last Historical Data Report, 224 separate equipment requisitions have been submitted and a few of these items have been received. Upon reception of all of these items, most of the equipment problems for Course Nr ALR 32430 will have been resolved. At the present an extensive equipment (and the hours each item is used) survey is being made by the PME Branch. Any equipment shortage, not resolved by the separate EAID route, when identified by this survey will be requisitioned immediately.

5. Problem Areas. The three distinct problem areas stipulated in the last Historical Data Report (facilities, equipment, and training literature) still exist. The new PME training facility has been tentatively disapproved, initiating a survey to identify an existing facility on LAFB that can be modified to meet future training requirements. Equipment requisitions have been submitted to resolve the equipment shortage problem.

6. Significant Changes. Capt Howard R. Shaffer has been replaced as Branch Chief by 1st Lt. Richard C. Taubinger.
(Vol 1, Section 10)

451 SMW (SAC) deactivation will make available two buildings (1432 & 1433) for conversion to training laboratories. Building 1432 and 1433 will be available for modification approximately FY 2/66.

Supply Procurement Training Facility – Building 1433, 38,302 sq ft.

Current long range base facility planning provides for utilization of Buildings 1432 and 1433 as a commissary and base exchange complex.

JULY - DECEMBER 1965

Department of Avionics Training

3. Operations

a. Courses newly implemented

(3) ADF32470-89 Field Intensity Meters Repair and Calibration, 16 Aug 65

(4) ADF32470-115, Dead Weight Testers Calibration and Certification, 6 Dec 65

b. Courses placed on standby status

(1) ADF32470-89, Field Intensity Meters Repair and Calibration, 16 Oct 65

(2) AZR32470-4. Advanced PME Specialist (Electronics). 7 Jul 65

c. Courses discontinued

(6) ATS32470-106, Instrumentation for Industrial Measurement and Control, 23 Jul 65

(7) ATS32470-107. Oscilloscope Theory, 31 Aug 65
(Section 10, Pages 230-231)

PME Branch (TSVP)

3. Operations:

a. Course Nrs ALH32430 and ALS32430-1. Precision Measuring Equipment specialist (35 and 19-3/7 weeks)

(1) Revisions to control documents:

(a) A rough draft of a proposed Course Chart was submitted to TSV 17 Dec 1965 with a request for the approval of TSV, TSO, TSM, and LTTC. This proposed Course Chart (44 academic weeks) includes the instruction of all new PME on order and/or in house and the other items scheduled for the upgrading of BPMELs.

(b) JTS32430/70. 29 November 1965, was approved by HQ ATC same date. This standard supersedes JTS32430/70, 17 December 1961 and all changes thereto.

(2) Improvement of Elimination and Washback Rates:

(a) Since 1.July 1965, the elimination rate has dropped from 121.3% FY65 to an average of 90.0% for FY66 to date.

(b) Since 1 July 1965, the washbacks have dropped from 131 for the same period FY65 to 141 for FY66. This is 40 fewer washbacks July through November for FY66.

b. AZR32470-1. E1ectronics Test Equipment Calibration and Repair (Tektronix-3 weeks). The Course Chart, POI, and SSQ/SWB have been revised and are being monitored by TSV to date.

c. AZR32470-2 E1ectronics Test Equipment Calibration and Repair (Hewlett-Packard-8 weeks). Attempts have been made, and will continue to be made, to discontinue this MAP course. The reasons the requests for the deletion of this course have been made are: firstly, the entry rate is erratic, unpredictable, and costly; secondly, the annual TPR is only approximately 20 personnel.

d. AZR32470-3. Electrical Standards Console (3 weeks). The Console course requires a revision, increasing the course duration from three to four weeks, per advice of NAFS, HQ ATC, LTTC, and TS to include the new equipment in house. The current shunt and phase angle standard, this new equipment, will be included in the Training Plan to be submitted to TSV FQ3/66.

e. AZR32470-4. Advanced PME Specialist (10 weeks): AZR32470-5. Advanced Electrical-Electronics Measurement (6 weeks): and AZR3247Q-6. Advanced Microwave Measurement (4 weeks). The Training Plan for these three Navy courses is, to date, being staffed at Hq ATC.

f. AZR32470-7. Physical. Optical, and Dimensional Measuring Specialist (12 weeks); A2R3247Q-8. Precision Optical and Dimensional Measuring Specialist (6 weeks): and AZR32470-9. Precision Physical Measuring Specialist (9 weeks). The Training Plan for these three Navy courses is being staffed by TSV.

g. Special Training

(1) ATS32470-2, Nuclear Radiation Measurements (48 hours); ATS32470-31 Physical Measurements (132 hours); ATS32470-36. Microwave Measurements (6 weeks): ATS32470-78. PME Specialist (Electronic Equipment - 17 weeks): ATS32470-91. Electronics Test Equipment Calibration and Repair (Hewlett-Packard – 8 weeks); ATS32470-107 Electronics Test Equipment Calibration and Repair (Tektronix - 3 weeks); ATS32470-114. PME Specialist (Electronics - 16 3/7 weeks). Special AMA Civilian personnel enter selected blocks of instruction Course Nr ALR32430, Course Nr AZR32470-1, or AZR32470-2 and are awarded the appropriate Certificate of Training.

(2) ATS32470-65. Digital Voltmeter Repair and Calibration (3 weeks). The Digital Voltmeter training, originally scheduled to phase out in July 1965, was extended to December: however, additional training slots have been requested and approved by Hq ATC extending this training to FQ4/66.

h. Traveling Team Instruction. The PME Branch have the qualified personnel and the responsibility; therefore, the following courses will be conducted when so directed by Hq ATC:

(1) ADF32470-61. Rotation Balancing Machine.

(2) ADF32470-67. Electrical Standards Console.

(3) ADF32470-71. AN.AWM-13 Test Set C & R.

(4) ADF32470-89. Field Intensity Measurement.

(5) ADF32470-115. Dead Weight Tester Calibration.

(6) ADF32470-116. Microwave Measurement.

(7) ADF32470-118. Collimation and Thermometry Calibration Techniques.

(8) ADF32470-121. Optical Measurement Instrument Maintenance and Calibration

4. Equipment. The extensive equipment survey (see paragraph 7) has been completed and all of the items, showing a shortage, have been requisitioned. When these requisitioned items are received the equipment problems listed in previous Semi Annual Historical Reports will be resolved. However a new equipment problem exists (see paragraph 5a).

5. Problem Areas. The following four distinct problem areas exist.

a. Equipment. A Equipment problem, no shortages involved, exists. This problem is new equipment in house and/or on order not included in current Course Nr ALR32430. As stated in paragraph 3(1) (b), the integration of the new PME into the training will require an increase of course duration to 44 weeks. This increase in course duration coupled with additional Special Training requirements and the six Navy courses will make the other three problems critical.

b. Facilities. The new training facility, scheduled for FY68, was designed to accommodate Course ALB32430, 35 weeks only, the three AZR32470 courses and one Special Training course for a two shift operation. The six new Navy courses were not included in the planning. In addition provisions at that time, were not made for increase of duration for Course Nr ALR32430 or additional Special Training requirements. This facility problem is presently being worked on by TSVP, TSV, TS, and LTTC.

c. Qualified Personnel. The PME Branch, to date, has a shortage of approximately ten qualified personnel. The increase in duration of Course Nr ALR32430 will increase this qualified instructor shortage to 36. The Special Training commitments could increase this shortage to 48, and the Navy training will increase it to 70. Qualified personnel are a must when additional training is scheduled.

d. Training Literature. The new training, mentioned in the problem area paragraphs above, will require technical writers to write the control documents and training literature. If an instructor shortage exists, qualified technical writers will be almost nonexistent.

6. Significant Changes. All significant changes have been mentioned in the above paragraphs.

7. Outstanding Accomplishments. The extensive equipment survey, titled PME Equipment Survey, was completed, as directed, and submitted through TSV, TS, and LTTC to Hq ATC 15 July 1965. The survey was a 38 columnar list of 222 line items listing all items of equipment, expendable and nonexpendable, required in the laboratories of Course Nrs ALR32430, ALR32430-1, AZR32470-1. AZR32470-2, AZR32470-3, and ATS32470-65. The number of each item of equipment, and hours used, required in each block of instruction of all courses was totaled and added to the number of these items required for demonstrating (in the lecture rooms), remedial training, and back-up. This total was compared to the number authorized and the number on hand and listed as over, under, or even. This PME Equipment Survey makes it possible for all personnel in the equipment requisition chain to check the validity of an equipment requisition at a single glance, and emphasized the necessity of a similar survey annually for all Branches of all Departments in TS.

8. Additional Data and/or Remarks. None.

RICHARD C. TAUBINGER, 1st Lt, USAF
Chief, PME Branch
Department of Avionics Training (Section 10, Pages 244-247)

OPERATIONS DIVISION

3. OPERATIONS:

f. PRECISION MEASURING EQUIPMENT:

A meeting was held at this Center, 3-4 May 1966 with Navy personnel, for the purpose of drawing up a support agreement for conducting AZR32470-4. -5 and -6 Advanced Electronics courses for Navy personnel. Agreement included a list of all equipment requirements to support these courses. Initial requirements will be furnished by the Navy, with the agreement that items will be replaced by Air Force furnished equipment as it becomes available. Course start date is scheduled for 7 September 1966.

v. FACILITIES:

(1) Alteration, construction, and conversion projects submitted:

(c) Item 171-61AL, FY68, Technical Training Laboratory Precision Measuring Equipment (PME). Addition and conversion to Building 1433 to provide classrooms, laboratories, and administrative support areas. Increased cost of $195,000.00 or from $568,000.00 to $763,000.00, is due to a change in scope to accommodate U S Navy PME training. (Section 10)

TRAINING PLANS BRANCH

3. Operations. The following courses were planned, developed, implemented, or reactivated during the reporting period:

Course Nr	Course Title	Status
ACC32470-100	Synchros and Resolvers	Planned
ACC32470-113	Metrology Calibration Techniques	Planned
ACC32470-117	Theodolite P/N DKM 3-PE-l	Cancelled
ACC32470-126	Frequency & time Standards Application	Active
ACC32470-127	Advanced Microwave Techniques	Planned
ACC32470-129	Power Meas. (Electronic)	Planned
ACC32470-130	Sound Level Meas.	Planned
ACC32470-134	Flow Meas.	Planned
ACC32470-135	Interferometry and Autocollimator Equipment Operation and Repair	Planned
ACC32470-136	Balances Equip Operation & Repair	Planned
ACC32470–138	LASER Application for Length Measurement	Active
ACC32470-139	Advanced Metrology Calibration Techniques	Planned
ACC32470-149	Sampling Oscilloscopes Maintenance	Active
ACC32470-150	Basic Microwave Repair & Calibration Techniques	Planned
ACC32470-151	Electronic Counter Maintenance	Planned
ACC32470-152	Spectrum Analyzer Maint. & Analysis Techniques	Planned
ACC32470-156	Model C-11D Calibrator Exciter System	Active

ACC32470-157	Theory & Application of Strain Gages	Planned
ACC32470-159	Nr 1425 Hook Gage	Active
ACC32470-162	600 Series Sig. Gen. 680 Series Sweep Osc.Maint.	Active
ACC32470-163	HP Advanced Microwave Techniques	Planned
ACC32470-169	Test Set AN/APM-123 Maint & Calibration	Active

TYPE II

ATS32470-2	Radiac Instrument Calib & Repair	Active
ATS32470-XX	Microwave Measurements	Planned
ATS32470-XX	Radiological, Radiographic Tng .	Planned
ATS32470-65	Digital Voltmeters	Active
ATS32470-92	Flow Meters Calibration & Certification	Planned
ATS32470-94	Theodolite Standards	Planned
ATS32470-97	Wave Form Measurement	Cancelled
ATS32470-99	Sound Measurement	Cancelled
ATS32470-102	Phase Measurement	Cancelled
ATS32470-103	Digital Multimeters	Active
ATS32470-119	Theodolite Calib Test Set, FSN 6675-066-7693	Planned
ATS32470-143	ROTEK 150 Calibration and Repair	Active
ATS32470-168	Test Set AN/APM-123 Maint & Calib	Planned

TYPE IV

ADF32470-95	Thermocouples Jet Cal. Analyzers	Active
ADF32470-115	Ruska Dead Weight Testers	Active
ADF32470-121	Optical Measurement Instruments	

TYPE IV

ASN32470-8	Physical & Mechanical Measurements & Dimensional & Optical Tooling Measurements	Completed
ASN32470-123	AN/PDR-43 & MA-3 Radiac Sets. Maint & Calibration	Planned
ASN32470-118	Collimation & Thermometry Calib	Completed

RESIDENT COURSES

4. The revision of course charts, plan of instruction and training materials (student study guides and workbooks) generally result from either a directive from higher headquarters (ATC), feedback from evaluations of graduate students or initiative on the part of all levels of training personnel, especially instructors, and instructor supervisors. These suggestions or directives may be forthcoming as a result of conferences involving representation from all major air commands, other services (Navy, Army and Marines) and other government agencies. Specific involvement of Type III course development and planning personnel were as follows:

a. PME (Precision Measuring Equipment) training in which the career field was restructured into basic and advanced training courses.

PRECISION MEASUREMENT EQUIPMENT BRANCH

Department of Avionics Training
3415th Technical School

1. Commander or Chief Richard C. Taubinger, 1st Lt, USAF, Chief

2. Mission. As outlined in ATC Manual 21-1.

3. Operations. Attempting to solve the many training problems created by the PMEL upgrade programs and the marked increase in precision measuring equipment, TSVP requested a USAF-Major Air Command PME Training Conference 28 Feb 1966, and the conference convened 13-15 April 1966. The majority of major air command representatives favor restructuring 324X0 career ladder to have normal 3-5-7-9 ladder progression and training designed for same. Changes to description in AFM 39-1 to reflect 3-5-7-9 career structure, general outline of 3-level (ABR) and 7-level (ABR) courses to support career structure and prerequisites for the courses (as a package), were presented to TSV, TSM, and TSOO, 0900 hours, 23 June 1966. The package will be submitted to major air commands for command headquarters staffing. All commands are expected to submit a reply to the proposals within the suspense established by Lowry Tech Tng Cen or concurrence will be assumed and the package will be submitted to USAF for final approval. Current and proposed training:

a. Courses No ALR32430 (35 weeks) and ALR32430-1 (19 weeks and 3 days), Precision Measuring Equipment Specialist.

(1) Revisions to control documents:

(a) ALR32430 and ALR32430-1 Course Chart was approved by Tech School 14 March 1966. The Course Chart was rewritten so that new equipment could be included in Blocks XII and XIII.

(b) POI ALR32430 and POI ALR32430-1, rewritten in the new format, were submitted to TSVT1 18 April 1966.

(2) Revision to Blocks XII and XIII SSG/SWB. the SSG/SWB were revised and submitted to TSVT1:

(a) Block XII - 6 May 1966.
(b) Block XIII - 6 June 1966.

b. Course No AZR32470-1, Electronic Test Equipment Calibration and Repair (Tektronix - 2 weeks). The following were rewritten and approved:

(1) Course Chart - 13 December 1965
(2) POI - 2 March 1966
(3) SSG/SWB - 30 March 1966

c. Course No AZR32470-2, Electronic Test Equipment Calibration and Repair (Hewlett-Packard - 3 weeks). The Course Chart. POI, and SSG/SWB are being rewritten and will be submitted to TSVT1 on or before 1 July 1966.

d. Course No AZR32470-3, Electrical Standards Console (3 weeks). The Training Plan, increasing the course duration from three to four weeks, was submitted to TSVT3 21 March 1966. The Training Plan has been returned to TSVP for a revision to the equipment list.

e. Courses No AZR32470-4, Advanced PME Specialist (Electronics - 10 weeks), -5, Advanced Electrical-Electronics Measurements (6 weeks), and -6, Advanced Microwave Measurement (4 weeks). The Training Plan has been approved and the target date for the initiation of the Navy training is 7 Sep 1965, however, the equipment and training materials must be received 60 days before the initial student entry. The drafts of the training materials will be submitted as follows:

(1) POI - 1 July 1966.
(2) Block I SSG/SWB - 15 July 1966.
(3) Block II SSG/SWB - 1 August 1966.
(4) Block III SSG/SWB - 15 August 1966.
(5) Block IV SSG/SWB - 1 September 1966.

f. Courses No AZR32470-7, Physical, Optical, and Dimensional Measuring Specialist (12 weeks), -8, Precision Optical and Dimensional Measuring Specialist (6 weeks), and -9, Precision Physical Measuring Specialist (9 weeks). The Training Plan for this Navy training will be submitted to Hq ATC after the training for Courses No AZR32470-4, -5, and -6 has been initiated and the necessary facilities are available.

g. Special Training:

(1) Courses No ATS32470-2, Nuclear Radiation Measurements (48 hours), and ATS32470-31, Physical Measurements (5 weeks and 4 days). Special AMA civilian personnel enter selected blocks of instruction of Course No ALR32430 and are awarded the appropriate Certificate of Training.

(2) Course No ATS32470-65, Digital Voltmeter Repair and Calibration (3 weeks). The course, presently on a standby status, will have an initial student entry 3 August 1966.

(3) Course No ATS32470-119, Theodolite Calibration Test Set (2 weeks). The tentative starting date for the course is 3 Aug 1966 if the equipment is delivered 1 July 1966. However, if it is impossible to meet this delivery date, Command Assistance will be necessary and the initial class entry will be 30 days after all items of equipment have been received.

(4) Course No ATS32470-165, Electronic Equipment PME (1 week). Special training on the Signal Generator Calibrator (VM-3) and the Multiple

Band Heterodyne Mixer Oscillator (HO-1) for two class sections, 19096 and 26096, is currently scheduled.

(5) Course No ATS/ADF32470--, AN/APM-123 Transponder Test Set, DOD-AIMS (2 weeks/4 weeks). Three PME instructors will be trained by Packard Bell, Los Angeles, California, June and July 1966 and be responsible for all of training required in the future. Special Training Requests (403's) have been received by Hq ATC (ATTES-E) from several AMA's in AFLC. Keesler TTC and Lowry TTC will also require transponder training (APM-123) for maintenance training of the F-106.

(6) Course No ADF32470-- AIR-2A. Modified Rocket System. Hill Genie, (12 hours). Two PME instructors are required to accomplish this training, tentatively scheduled for 1 Aug and 1 Sep 1966 at two AF Bases, location classified, one ZI and one OS.

4. Equipment. Of the equipment requisitions mentioned in previous Semiannual Historical Report 73 of these requisitions (213 items) are outstanding. A monthly report on the status (priority and EDD) of these requisitions are furnished TSVT3 and TSOR. TSVP requested due-out reconciliations 11 May 1966 for Accounts 762XH, 763X1, and 755XA to reinstate due-ins against valid due-outs and follow-up action on items with overdue EDD's and to establish valid due-outs. Follow-up action will be taken by TSVP on all requisitions when the EDD's become overdue.

5. Problem Areas. The following four distinct problem areas, listed in the previous semiannual Historical Report, exist:

a. Equipment. The equipment shortages (see paragraph 4) for Courses No AIR32430, ALR32430-1, AZR32470-1, and AZR32470-2 require in many cases that the students return for remedial training to complete the projects in the SWB. This could be one of the many causes of the high failure rate. The equipment problem for Course No ATS32470-119 appears in paragraph 3g(3) and for Courses No AZR32470-4, -5, and -6 in paragraph 3e. The new, additional equipment problem mentioned in the previous Semiannual Historical Report has been partially solved by including the mechanical press, load cell, proving ring, and hook gage in Course No ALR32430. If the 324X0 career ladder package (see paragraph 3) is approved by USAF and the major air commands this problem will be completely solved.

b. Facilities. The 324X0 training is located in three buildings: 375, 813, and 1433 (Theodolite - See paragraph 3g(3)). The new training facility scheduled for FY68, will not accommodate the ABR, AAR, AZR, and ATS commitments. If the career ladder package is approved the facility problem should be staffed by LTTC.

c. "Qualified" Personnel. The projected instructor personnel shortage, as of 1 Jan 67 is 18. However,' the tentative schedule for a four-shift operation Sep 1966 will increase this shortage to 51 instructor and instructor-supervisor personnel. If the Code 1 Deferment request for the 18 instructors, who will have completed their tour of duty 1 Jan 67, is not granted the shortage will increase to 69.

d. Training Literature. The ALR32430 training literature, Block III and XIII, mentioned in paragraph 3a(2), must be in-house 07076 and 20076. The new training (ABR and AAR) mentioned in paragraph 3 above, will require technical writers to write the control documents and training literature, but with a critical shortage of qualified instructors, mentioned in paragraph 5c above, it is doubtful that qualified instructors will be available.

6. Significant Changes. All significant changes have been mentioned in the paragraphs above.

7. Outstanding Accomplishments:

a. The preparation of 324X0 career ladder package for approval of USAF and major air commands to solve the following two problems:

(1) New Resources for 324X0 Students. The resources for the ALR student are almost exhausted, but for the ABR student resources are incomparable.

(2) Upgrade Equipment. The AAR course provides a means of including in the 324X0 career training all new upgrade package equipment on the Low Frequency Console, Microwave Package, on the Physical and Temperature Package, and any other new equipment in advanced techniques.

b. The cost reduction of training was accomplished and validated by:

(1) Identifying equipment overages with a savings of $15,685.00. 4/66.

(2) Changing from 30” x 40" charts to Vu-Graph transparencies saved approximately $13,000.00. 3/66.

(3) Technical advisors assisted in the script writing of Blocks V, VI, and VII ETV training films, to demonstrate the operation and calibration of various precision measuring equipment to decrease total training time.

c. Savings to Department of Defense. *"Significant savings to the Department of Defense will be realized through joint service training program being expanded at Air Training Command's Lowry AFB, Colo. Beginning in September 1966, Air Force Instructors at Lowry will teach US Navy personnel in two advanced training courses in Precision Measuring Equipment.”

*Extracted from: Weekly Report of Secretary of Defense to the President, 17 May 1966.

8. Additional Data and/or Remarks. None.

Operations Division
3415th Technical School

8. PME Pre-Entrance Examination: World-wide distribution of a revised Precision Measurement (PME) pre-entrance examination for entrance into the ALR32430, Precision. Measurement Equipment Specialist Course was affected during the month of November 1966. It is hoped that the revised test will more accurately determine the personnel qualified to enter the ALR32430 Course. The raw score cut-off remains at 90. Early returns indicate that this test may be more difficult than the one previously used for screening. (Section 10, pg 3)

PRECISION MEASURING EQUIPMENT

1. The Advanced Electronics Courses, AZR32470-4, -5, and -6, established for training Navy personnel are to be activated 4 Jan 1967.

2. All equipment requirements to support these courses initially are furnished by the Navy. Courses will be conducted in Building 905. (Section 10, pg 5)

FACILITIES

2. Item 171-61AL. FY68, Technical Training Laboratory Precision Measuring Equipment (PME). Addition and conversion to Building 1433 to provide classrooms, laboratories, and administrative support areas. Increased cost of $195,000.00 or from $568.000.00 to $763,000.00 is due to a change in scope to accommodate US Navy PME training. Approval of $765,100 has been made for this project. (Section 10, pg 8)

TYPE I COURSES

The status of the Type I Courses of the 3415th Technical School are as follows:

COURSE NUMBER	TITLE	STATUS
ACC32470-100	Synchros and Resolvers	Planned
ACC32470-113	Metrology Calib Techniques	Planned
ACC32470-126	Frequency & Time Standards Application	Active 19 Jul 65
ACC32470-127	Advanced Microwave Tech	Planned
ACC32470-129	Power Meas. (Electronic)	Planned
ACC32470-130	Sound Level Meas.	Planned
ACC32470-131	KA-20B Camera	Active
ACC32470-134	Flow Meas.	Planned
ACC32470-135	Interferometry & Autocollimation Equip Opn & Repair	Planned
ACC32470-136	Balances Equip Opns & Rep	Planned
ACC32470-138	LASER Application for Length Meas	Active

ACC32470-139	Advanced Metrology Calib Techniques	Planned
ACC32470-147	Model 175A Oscilloscope	Active
ACC32470-149	Sampling Oscilloscope Maint	Active
ACC32470-150	Basic Microwave Rep & Calib Tech	Planned
ACC32470-151	Electronic Counter Maint	Planned
ACC32470-152	Spectrum Analyzer Maint & Analysis Tech	Planned
ACC32470-156	Model C-11D Calibrator Exciter Sys	Active
ACC32470-157	Theory & Appl of Strain Gages	Active
ACC32470-159	Nr 1425 Hook Gage	Active
ACC32470-162	600 Series .Sig Gen, 680 Series Sweep Oscillator Maint	Active
ACC32470-163	HP Advanced Microwave Tech	Planned
ACC32470-169	Test Set AN/APM123 Maint & Calib	Active
ACC32470-172	560 Series Instruments	Active

TYPE II COURSES

ATS32470-2	Radiac Instru Calib & Repair	Active
ATS32470-122	Microwave Measurements	Planned
ATS3.2470	Radiological, Radiographic Tng	Planned
ATS32470-65	Digital Voltmeters	Active
ATS32470-92	Flow Meters Calib & Certification	Planned
ATS32470-94	Theodolite Standards	Planned
ATS32470-97	Wave Form Meas.	Cancelled
ATS32470-99	Sound Meas	Cancelled
ATS32470-102	Phase Meas	Cancelled
ATS32470-103	Digital Multimeters	Active
ATS32470-119	Theodolite Calibr Test Set	Planned
ATS32470-143	ROTEK-150, Calibr & Repair	Active
ATS32470-145	Mech & Dimensional Equipment Calib and Repair	Active
ATS32470-148	Temperature Meas Equip Calib & Rep	Planned
ATS32470-146	Tektronix Test Equip	
ATS32470-161	Force Calib & Repair	Planned
ATS32470-165	Electronic Equip PME	Active
ATS32470-168	Test Set AN/APM-123 Maint & Calib	Planned
ATS32470-176	Insertion Loss Meas Sys Model VM-3 and HO-1	Planned

TYPE IV COURSES

ADF32470-95	Thermocouples Jet Cal Analyzers	Active 7 Mar 66
ADF32470-115	Ruska Dual Weight Tester	Active 6 Dec 65
ADF32470-121	Optical Measurement Instruments	Active 24 Jan 66

TYPE V COURSES

ASN32470-81	Phys & Mech Meas & Dimen & Opt Tool Meas	Compl
ASN32470-123	AN/PDR-43 & MA-3 Radiac Sets, Maint & Calibration	Planned
ASX32470-118	Collimation & Thermometry Calibration	Compl

PRECISION MEASURING EQUIPMENT BRANCH
DEPARTMENT OF AVIONICS TRAINING

1. Commander or Chief. Tommy Denwell, LtCol, USAF, Chief.

2. Mission. As outlined in ATC Manual 20-1.

3. Operations. The proposal to restructure the 324X0 career ladder was submitted to all major commands as a package to include: changes to the descriptions in AFM 39-1 to reflect a 3-5-7-9 career structure, general outline of 3-level (ABR) and 7-level (AAR) courses to support the career structure, and the prerequisites for the courses. All commands submitted their replies to this proposal. The changes to the descriptions in AFM 39-1 have been submitted to and are being staffed by USAF for final approval. Upon this approval the training plans for the 3-level and 7-level courses will be prepared and submitted to Hq ATC. Current and proposed training:

a. Courses No. ALR32430 (35 weeks) and ALR32430-1 (19 weeks and 3 days). Precision Measuring Equipment Specialist.

(1) Revisions to Blocks XII and XIII SSQ/SWB.

(a) 7 August 1966 the National Calibrator (shaker table), C-11D, was included in Block XII.

(b) 28 August 1966 the Proving Rings, Load Cell Force Calibration Kit, and Calibration Press were included in Block XIII.

(2) Revision to control documents:

(a) Course Chart was submitted to HQ ATC 8 Dec 1966 for approval. The Course Chart was rewritten so that new upgrade microwave equipment could be included in Blocks IX and X.

b. Course No. AZR32470-1. Electronic Test Equipment Calibration and Repair (Tektronix-3 weeks) was discontinued 24 August 1966.

c. Course No. AZR32470-2, Electronic Test Equipment Calibration and Repair (Hewlett-Packard - 8 weeks). CTS, Course Chart, and SSG/SWB have been submitted to TSVT1. CTS submitted to Hq ATC 10 Nov 1966 for approval.

d. Course No. AZR32470-3, Electrical Standards Console (3 weeks). The training plan, increasing the course duration from three to four weeks, has been submitted to TSVT1. This increase in course duration is necessitated by the additional equipment included in the Console.

e. Course No. AZR32470-4, Advanced PME Specialist (12 weeks), -5, advanced Electrical - Electronics Measurements (6 weeks), -6, Advanced Microwave Measurements (4 weeks). The target date for the initiation of this training is 4 January 1967. The status is:

(1) Equipment on hand - 40%.

(2) Authorized instructors assigned - 66%.

(3) SSG/SWB. Block I has been delivered and Block II is in reproduction. Block III is being processed by TSVT1. Block IV awaiting processing.

(4) Other training materials on hand - 50%.

f. Courses No. AZR32470-7, Physical, Optical, Dimensional Measuring Specialist (12 weeks), -8, Precision Optical and Dimensional Measuring Specialist (6 weeks), and -9, Precision Measuring Specialist (9 weeks). The Training Plan for this Navy training is being revised and will be submitted to TSVT1 before 31 January 1967.

g. Special Training:

(1) Courses No. ATS32470-2, Nuclear Radiation Measurements (48 hours) and ATS32470-31, Physical Measurements (5 weeks and 4 days). Special AMA civilian personnel enter selected blocks of instruction of Course No. ALR32430 and are awarded the appropriate Certificate of Training.

(2) Course No. ATS32470-65, Digital Voltmeter Repair and Calibration (3 weeks) was reactivated 3 August 1966.

(3) Course No. ATS32470-119, Theodolite Calibration Test Set (2 weeks). The tentative starting date was slipped from 3 August 1966 to 8 March1967 due to the EDD of the equipment. It is possible that this new starting date cannot be met for the same reason.

(4) Other Special Training Requirements.

(a) The status of the required training on AN/APM-123 Transponder Test Set and AIR-2A Modified Rocket System has not changed since the 1 Jan – 30 Jun 1966 Semiannual Historical Report.

(b) Target date for LAFB (TSVP) training capability for the DPM-14 Test Set is 1 July 1967. AF Form 403 for DPM-14 training (2 Amn) and request for a PTT. Addendum D change (2 slots) have been submitted.

4. Problem Areas: The four distinct problem areas, listed in previous Semiannual Historical Reports, still exist:

a. Equipment. The equipment problems see (paragraph 4) for Courses AZR32470-4. -5, and -6 appear in paragraph 3e and for Course ATS32470-119 in paragraph 3g(3). In addition, the constantly recurring need for expendable items (klystrons, barretters, etc.) is not satisfied because the items are not base stocked and are ordered only when requisitioned by TSVP.

b. Facilities. The problems, listed in previous Semiannual Historical Reports, necessitating the new facility in FY68 still exist. In addition:

(1) Bldg. 905. A work order for power outlets, in the laboratories, required on or before 4 January 1967 for Courses AZR32470-4, -5, and -6 has been submitted to CE.

(2) Bldg. 1433. The airconditioning units in Rooms 1 and 2 must be repaired and restored to operational condition before 8 February 1967 or the ATS32470-119 training cannot be initiated.

c. "Qualified" Personnel. The instructor personnel currently assigned are classified as:

New instructors (qualified in one block or less)	63	40.3%
Qualified instructors	42	27.0%
Surplus instructors	51	32.7%

When the surplus instructors are lost, the results will be:

Qualified instructors	42	40%
Partially qualified instructors	63	60%

If the surplus instructors are lost before the new instructors are fully qualified, this could cause a training deficiency.

d. Training Literature. The training literature for Course AZR32470-4, 5 and 6 (see paragraph 3e) could cause a training deficiency.. The new Theodolite Calibration Test Set is a different Test Set and is made by a different manufacturer. It is possible that, due to a change in the Test Set, the SSG/SWB might have to be rewritten in January. This will negate initiating the Theodolite training, ATS 32470-119, 8 February 1967.

5. Significant Changes: All significant changes are covered in paragraphs above and below.

6. Personnel: Assigned: 1 Officer, 154 Airmen, 13 Civilians

7. Equipment: None

8. Additional Data and/or Remarks: 1st Lt Richard C. Taubinger was replaced as Branch Chief by Lt Col Tommy Benwell 8 August 1966.

9. Outstanding Accomplishments:

a. PME Tng Branch Supervision Realignment. The supervision has been changed from a vertical to a lateral system. In the vertical system the supervisor is in charge of all blocks of instruction on one shift, requiring three shift supervisors. In the lateral system the supervisor is in charge of four (or five) blocks of instruction on all three shifts by areas as follows:

Area 1	Block I	78 hours
	Block II	90 hours
	Block III	90 hours
	Block IV	60 hours

Area 2	Block V	90 hours
	Block VI	90 hours
	Block VII	60 hours
	Block VIII	90 hours
Area 3	Block IX	90 hours
	Block X	90 hours
	Block XI	48 hours
	Block XII	90 hours
	Block XIII	84 hours

This lateral system gives the area supervisor complete control of the facilities, equipment, instructor personnel, training materials, and students in his area of supervision. Under this system all facets of training are standardized.

b. Self-help Painting Program. The PME Training Branch is completely redecorating Building 375 to include painting and mounting of newly acquired porcelain enamel on steel chalkboards.

c. The PME Training Branch replaced 65 ragged-edged, sharp-cornered, old work benches with especially designed, professional-type, PME work benches.

Department of Avionics Training
3415 Technical School

3. Operations: The Department of Avionics Training was operating with the following three branches; Fighter Branch, Bomber Branch, and Precision Measurement Equipment Branch.

f. Hq USAF approved establishment of a 3/5/7/9 ladder for AFSC 324X0, Precision Measurement Equipment effective 1 Jul 67 and outlined in a change to AFM 39-1. This change necessitated a new course (ABR32430) to be-forty-six weeks in length with first class entry of 3 January 1968. The advanced course (AAR32470) is also being prepared.

4. Problem Areas.

e. The Precision Measurement Branch outline the following problem areas:

(1) Additional equipment for ABR32430 course requirements, to be implemented on 3 January 1968, has not been requisitioned along with equipment for AZR32470-7 and AZR32470-8, both scheduled for January 1968.

(2) Training facilities required for ABR32430 course has not been allocated during this reporting period.

(3) Recurring personnel shortages exist when new courses have to be written. Examples are:

	Reqr	Auth
Writers for ABR Course	8	0
Travel Team for Laser Training	2	0
	10	0

5. Significant Changes.

d. A lateral method of supervision was implemented within the ALR32430 course. This form of management (lateral) gives the Area Supervisor complete control of facilities, equipment, instructor personnel, training literature and student training. The thirty-five (35) weeks of this course is divided into two areas of supervision. Area A is ten weeks and three days of math and electronics, and six weeks of voltage, current, power, and impedance. Area B is two weeks of waveform analysis and sixteen weeks and two days of frequency, microwave, nuclear radiation, and physical measurements.

e. Courses newly implemented:

(1) ADF32470-174, AWM-13A Test Set Maintenance, 17 May 67.

(4) ATS32470-119, Theodolite Calibration Test Set. FSN 6650-66-7693, 29 Mar 67.

(5) ATS32470-176, Insertion Loss Measuring System, Model VM-3/HO-1, 11 Jan 67

(6) AZR32470-4. Advanced PME Specialist (Electronics). 4 Jan 67.

(7) AZB32470-5, Advanced Electrical-Electronic Measurements, 4 Jan 67.

(8) AZE32470-6. Advanced Microwave Measurements, 15 Feb 67
(Section 9)

Department of Avionics Training
3415th Technical School

3. Operations:

f. Hq ATC (ATTES-C) approved the Training Plan for the ABS32430 Course, October 1967. This approval supports the established 3/5/7/9 career ladder for AFSC 324X0, Precision Measuring Equipment Specialist. The Specialty Training Standards were prepared in accordance with AFR 50-34 and submitted to all AFSC 324X0 using Commands, July 1967, for review and concurrence. -The approval of the proposed STS by Hq USAF fully implements the proposed 3ABR32430 Course (Basic) training concept. The course will commence training on 3 January 1968 with an entry rate of six students every two weeks. Training material being prepared for the course is well within the proposed production schedule. Training equipment, training aids. handtools and accessories have been requisitioned and valid EDDs have been established. No problems are anticipated.

g. A two man instructor team was requested by COMUSAMACT to teach 3ALR32430 PME Course to Thailand Air Force personnel. The team departed CONUS 31 December 1967.

4. Problem Areas.

c. The Precision Measuring Branch outlines the following problem areas:

(1) Personnel: Utilization of personnel is required in unauthorized positions as shown below:

	Authorized	Required
Equipment Control	0	2
Librarian	0	1
Test Monitor	0	1

(2) Recurring temporary personnel shortages caused by:

	Authorized	Required
Writers for ABR Course	0	8
Travel Team for Laser Tng	0	2
Travel Team for directed Foreign Tng	0	2

The total requirement of 16 personnel in unauthorized positions definitely causes a permanent instructor shortage. Action has been taken, to approve manning slots for these type of unauthorized, but necessary positions.

(3) Foreign Student Entry: Specific communicative action should be taken between LTTC and Hq ATC with respect to entry of MAP students that are not properly forecasted on the flow chart. Examples:

(a) Class Nr. 671220 in the 3ALR32430 Course. Hq ATC directed entry of this MAP class after the last programmed entry, Class Nr. 671129 had been established. This action delayed the instructor training program for the 3ALR32430-1 Course class scheduling in order to prevent double class sections in-the same block of training/shift.

(b) Entering an entire class section of MAP students, Class Nr. 680228, causes a scheduling problem in accordance with ATC Reg 52-26, Tech School Supplement #1, para 3a(6)(f). It states "classes composed entirely of other than USAF students are not authorized leave breaks." This will require the Branch to accelerate this class section two weeks to a new class section. This action will result in an eighteen-man class (6 AF, 6 Navy, and 6 MAP) which the school is not programmed to handle. Request for waiver of this restriction has been submitted to ATC.

5. Significant Changes:

m. Discontinued Courses:
(2) 3AZR32470-4, Advanced PME Specialist (Electronics), effective 30 Aug 67.

6. Personnel:

b. Following key staff personnel were assigned at the end of the reporting period:

PME Branch Chief — Lt Col Tommy Benwell

8. Outstanding Accomplishments:

b. The Precision Measuring Branch effected a fifty percent reduction in the elimination rate from 12% to 6% during this reporting period. The reason for the reduction is considered to be a direct result of the outstanding method of supervision, PHALANX, employed in this organization. The PHALANX plan has increased the instructor supervisor's classroom time, which provides a closer evaluation of the instructor, instructional materials, and measurement methods of the students. Training problems are handled immediately and more effectively which results in an improved classroom operation and increases instructor effectiveness.

c. Course Control documents and course material for the 3ABR32430 PME course were developed in less than half the time normally required for a course of this length and magnitude. This type of production is a direct reflection on the ability, effectiveness, and enthusiastic attitude of the PME personnel which were assigned to this project.

d. Reference Letter, 22 Jun 67, Naval Plant Representative , Pomona to Chief of Staff, United States Air Force, MSgt Melvin A Fischer and assigned

instructor staff have done an “outstanding job” in all phases of developing and presenting the course material for the 3AZR32470-5 and 06 USN PME Courses.

9. Additional Data and/or Remarks:

c. Mr. Dave Moore replaced Mr. McKenzie as training officer and ETCM William H. Stewart replaced ETCM Leo A. Vuori as Navy Liaison Officer. (Section 9)

Department of Avionics Training
3415th Technical School

4. Problem Areas:

c. The Precision Measurement Equipment Branch outlines the following problem areas:

(1) The utilization of instructor personnel in unauthorized positions required to manage the supply function.

(2) Base PMEL's action which placed thirteen major items of equipment in NETS, Code 5 status (Reduce Shop Backlog).

5. Significant Changes.

d. Activated Courses.

(2) 3ABR32430, Precision Measuring Equipment Specialist, effective 3 January 1968.

(3) 3ABR32430-1, Precision Measuring Equipment Specialist (Electronics), effective 22 May 1968.

f. Discontinued Courses.

(6) 2ASR32470-186, Gage Block Inspection and Calibration, effective March 1968.

6. Personnel:

b. Key position for Department of Avionics Training:

Chief Department of Avionics Tng	Col C L Boyd
PME Branch Chief	Lt Col Tommy Benwell

9. Additional Data and/or Remarks:

e. Building 1433 was released to 3415th Civil Engineering Group for completion of programmed MCP.

JULY - DECEMBER 1968

Department of Avionics Training
3415th Technical School (ATC)

1. Chief: James W. Smith, Colonel, USAF

3. Operations:

h. MTT Unit is presently conducting Course No 4AST32470-4, Baird Atomic Spectrometer Maintenance training at Clark AFB PI. The team is programmed to return to Lowry AFB December 1968, if PACAF cannot release equipment for training in Korat, Thailand.

j. Courses newly activated:

(11) 2ASR32470-7 (KMQ), AN/AWM-ISA Test Set Maintenance, effective 14 August 1968.

(12) 4AST32470-4 Model A/E 35U-1, Baird Atomic Spectrometer Maintenance, effective 17 November 1968.

1. Courses discontinued:

(4) 3ALR32470, Precision Measuring Equipment Specialist, effective 21 August 1968.

(5) 3ALR32470-1, Precision Measuring Equipment Specialist (Electronics), effective 15 August 1968.

4. Problem Areas:

a. The decision by ATC to impose a standard suspense of four months for Career development Course (CDC) revisions and six months for initial CDCs created a workload requirement on the Curricula Unit which cannot be met without additional experienced CDC writers. The Unit has made every possible effort to comply with the directive by withdrawing the better resident course writing personnel from the training branches and by working extra hours and on Saturday. During this reporting period, thirteen personnel have been loaned to the Unit to supplement our writing effort. One additional technical writer was assigned and three temporary clerk-typists were acquired. However, because of the inexperience of the writers and the quantity of CDCs due, the Unit was not able to meet the established suspense dates.

Department of Avionics Training
3415th Technical School

3. Operations.

a. Courses newly activation

(5) 4AST32470-8, TTU205E Test Set Maintenance

c. Courses discontinued

(9) 2ASR32470-1. TTU-229E Maintenance, effective 30 June 1969

(10) 2ASR32470-2, Insertion Loss Measuring System VM-3/HO-1.

JULY 1969 - JUNE 1970

Department of Avionics

There are 16 active training courses and six proposed courses in the Precision Measuring Equipment Branch. This branch graduated 1091 students and eliminated 46 students from raining. (Vol 1, Pg. 60)

3415th Technical school

The Precision Measuring Equipment Branch conducted 16 active training courses on precision measuring equipment calibration and repair. At the close of this reporting period, there were 35 classes in training in Course 3ABR32430, Precision Measuring Equipment Specialist (45 weeks). Graduate evaluations indicated that the 3-level personnel were being adequately trained with the exception of the Technical Order System and in maintenance and troubleshooting techniques. Course training materials were being changed to improve instruction in these areas.

Fourteen MAP students were graduated from Course 3AZR32470-1, Electronic Test Equipment and Repair (8 weeks).

This Branch had five special type 4 training courses that were taught by deployment of travel teams. Seven travel teams were deployed in three of the five courses of training. (Vol 3. Pg 33)

3415th Civil Engineering Group

During this period new construction and acquisition are as follows:

(1) Addition and modification to Building 1433, 6800 SF, including a 200 ton Air Conditioning Unit and a Fire Detection System totaling S607.605.00.

(7) Constructed new Integrated Weapon Training Bldg 1308 with small Generator Bldg 1309 for a total of 7980 SF and $214,715.13, and new Missile Training Facility, 5267 SF and $213,240.60. (Vol 3, Pg 18)

3415th Technical School
Operations Division

3. Operations:

e. The Engine Test Stand facility, constructed adjacent to Building 1433, has been completed. Facility is used to conduct Course 2ASR32470-8, Engine Test Stand Calibration. (Vol 4, Pg 4)

Department of Avionics Training

3. <u>Operations:</u>

c. Courses discontinued

(8) 2ASR32470-7, AN/AWM-13A Test Set Maintenance, effective 26 Feb 70.

(9) 2ASR32470-65, Digital Voltmeter Repair and Calibration, effective 30 Jan 70. (Vol 4, Pg 55)

Precision Measuring Equipment Branch
Department of Avionics Training.

1. Commander or Chief: Ramon K. Broerman, Capt, USAF, Branch Chief
2. Mission: As outlined in ATCM 20-1
3. Operations:

The present operation consists of sixteen active training courses and six proposed training requirements.

Current and Proposed Training:

(1) Course Number 3ABR32430 (45 weeks) and 3ABR32430-1 (19 3/5 weeks). Precision Measuring Equipment Specialist

(a) At the present the 3ABR32430 Course has thirty-five classes in training. The programmed entry rate was 9/1 until 700204 when it changed to 6/2. The 6/2 entry rate was increased to 9/1 with class 700617 due to an increased trained personnel requirement. Graduate field evaluations indicate that the 3 level personnel are adequately trained with the exception of Technical Order Systems, maintenance and troubleshooting techniques. Course training materials are being changed to improve these areas of instruction. 3ABR32430-1 Course has no classes in training. Action has been taken to convert this training to a Type II Course in order to meet US Navy requirements on a as required basis.

(2) Course Number 3AZR32470-2, Electronic Test Equipment Calibration and Repair (8 weeks). Fourteen MAP students have been trained during this period.

(3) Course Number 3AZR32470-3, Electrical Standards Console (4 weeks). Sixty-seven students have been trained during this period. This course is being replaced with the 3AZR32470-10, Electrical Standards Console and low frequency voltage standards (6 weeks) effective 700722.

(4) Courses Number 3AZR32470-5. Advanced Electrical-Electronic Measurements (6 weeks) and 3AZR32470-6, Advanced Microwave Measurements (4 weeks). One hundred and seventy-five students have been trained in- the 3AZR32470-5 Course and one hundred and ninety students have been trained in the 3AZR32470-6 Course. Both of these courses are presently being revised based on equipment and program changes as a result of Navy field evaluations.

(5) Course Number 3AZR32470-7, Precision Physical Measurement Technician (8 weeks). Fifty students have been trained during this period.

(6) Course Number 3AZR32470-8, Precision Dimensional and Optical Measuring Technician (6 weeks). This course is scheduled for implementation January 1971.

(7) Course Number 3AZR32470-9, Digital Voltmeter Repair and Calibration (2 3/5 weeks). This course is scheduled for implementation 700930. Replaces Course 2ASR32470-65 same title.

(8) Course Number 3AZR32470-10. Electrical Standards Console and Low Frequency Voltage Standards (6 weeks). This course is scheduled for implementation 700722. Replaces Course 3AZR32470-3 Electrical Standards Console.

(9) Special Training:

(a) Course Number 2ASR32470-2, Radiac Instruments, Calibration and Repair (1 3/5 weeks). Three students have been trained during this period.

(b) Course Number 2ASR32470-7, AN/AWM-13A Test Set (3 weeks). Two students have been trained during this period. Course has been cancelled and all future training requirements will be conducted by travel team.

(c) Course Number 2ASR32470-8, Aircraft Engine Test Stand (3 weeks). Course is scheduled for implementation 700708.

(d) Course Number 2ASR32470-25, DOD AIMS Test Set Maintenance (8 weeks). Eleven students have been trained during this period. This course is scheduled to be cancelled in August 1970 and all future training requirements will be handled by travel team.

(e) Course Number 2ASR32470-119. Theodolite Calibration Test Set (2 weeks). Eleven students have been trained during this period. This course is scheduled to be cancelled in August 1970 and all future training requirements will be handled by travel team.

(f) Course Number 2ASR32470-122, Advanced Microwave Measurement (5 weeks). Twenty-eight students have been trained during this period.

(g) Course Number 2ASR32470-181, Physical Measurement (6 weeks). Three students have been trained during this period.

(h) Course Number 2ASR32470-65, Digital Voltmeter Repair and Calibration (2 3/5 weeks). Six students have been trained during this period.

(9) Travel Teams:

(a) Course Number 4AST32470-4, Model A/E 35U-1 Baird Atomic Spectrometer Maintenance (3 3/5 weeks). Four travel teams have been deployed during this period. One team to RAF Lakenheath, England, two teams to PACAF and one team to Randolph AFB, Texas.

(b) Course Number 4AST32470-5. Optical Tooling and Azimuth Transfer (120 hours). One team deployed to Alaskan Air Command during this period.

(c) Course Number 4AST32470-8, TTU-205B/E Test Set Maintenance (40 hours). Two teams deployed during this period. One team to Bergstrom, AFB and one team to Tyndall, AFB.

(d) Course Number 4AST32470-10, DOD AIMS Test Set Maintenance (80 hours). This is a new course scheduled for implementation 700708 at Edwards, AFB.

(e) Course Number 4AST32470-174, AN/AWM-13A Test Set Maintenance /108 hours). No training was conducted during this period.

4. Problem Areas: None.

5. Significant Changes: None.

6. Personnel:
As of 30 June 1970 the following list reflects the personnel assigned:

Capt	-	1	SSgt	-	80
SMSgt	-	2	Sgt	-	1
MSgt	-	19	A1C	-	1
TSgt	-	43	GS-11	-	3
			GS-9	-	9
			GS-4	-	1

7. Equipment:

The major mission equipment is listed in TA 734, Table of Allowances for Precision Measuring Equipment.

8. Outstanding Accomplishment: None.

9. Additional Data/Remarks: None.
(Vol 4, Pg 83)

JULY 1970 - JUNE 1971

3415 Technical School Department of Avionics Training

The Precision Measuring Equipment (PME) Branch conducted twelve active resident courses during this time. In addition, six travel team courses were prepared and maintained. The number of students entering training was 833 with 544 graduating in this period. (Vol II, Pg 30)

LIST OF COURSES

3ABR32430	Precision Measuring Equipment Specialist
3ABR32430-1	Precision Measuring Equipment Specialist, Electronics
3AZR32470-2	Electronic Test Equipment Calibration and Repair (MAP)
3AZR32470-3	Listed in PTT and included in 3AZR32470-10
3AZR32470-5	Advanced Electrical-Electronics Measurement (R)
3AZR32470-6	Advanced Microwave Measurements (R)
3AZR32470-7	Precision Physical Measuring Technician
3AZR32470-8	Precision Dimensional and Optical Measuring Technician (N)
3AZR32470-9	Digital Voltmeter Repair and Calibration
3AZR32470-10	Electronic Standards Console and Low Frequency Volt and Phase Standards
3AZR32470-11	Advanced Microwave Measurement and Calibration
2ASR32050	Hi-Reliability Soldering and Electronic Repair Techniques
2ASR32470-8	Aircraft Engine Test Stand Calibration
2ASR32470-25	DOD AIMS Test Set Maintenance
4AST32430-0	Precision Measuring Equipment Specialist
4AST32470-4	Training Objectives Model A/E35U-1
4AST32470-5	Optical Tooling and Theodolite Calibration
4AST32470-7	Outline of Instructional Objectives
4AST32470-8	TTU-205E Test Set Maintenance (D)
4AST32470-10	DOD Aims Test Set Maintenance (D)
4AST32470-174	Test Set Maintenance, AN/AWM-13A

(Vol II, Pg 50)

The Precision Measuring Equipment (PME) Branch is housed in building 1433. Training space used to conduct the PME courses consisted of 40 classrooms and 7 rooms for classroom support for a total of 46,758 square feet. All rooms in this complex are air conditioned. An area of approximately 8,000 to 10,000 square feet outside building 1433 is equipped to conduct aircraft engine test stand calibration training. (Vol II, Doc 28, Pg 15)

The Precision Measuring Equipment Branch conducted 11 active training courses on precision measuring equipment calibration during the period of this report. Additionally, six travel team courses were prepared and/or conducted to satisfy other Air Force or foreign agencies. During this report, period, 209 students entered Course 3ABR32430, 277 entries were made into precision measuring equipment supplemental courses, 148 students entered special training courses, and 79 students entered travel team courses. (Vol II, Doc 28, Pg 36)

Department of Avionics Training

The Precision Measuring Equipment Branch is housed in Bldg 1433. Training space used to conduct the PME courses consisted of 40 classrooms and 7 rooms for classroom support for a total of 46,758 square feet. All rooms in this complex are air conditioned. An area of approximately 8,000 to 10,000 square feet outside Bldg 1433 is equipped to conduct aircraft engine test stand calibration training. (Vol III, Doc 41)

PERSONNEL

Branch Chief, Precision Measuring Equipment Training Branch	Ramon K. Broerman, Capt, USAF
Training Officer, Precision Measuring Equipment Training Branch (Vol III, Doc 41)	David B. Moore, GS-11

OPERATIONS

At the end of this report period (31 December 1970), the following training courses were in an active status in this Department:

COURSE	TITLE
2ASR32470-8	Acft Eng Test Stand Calibration.(15 days)
2ASR32470-25	DOD AIMS Test Set Maint (8 weeks)
2ASR32470-181	Physical Measurement (5 weeks)
3ABR32430	Precision Measuring Equipment Specialist (45 weeks)
3ABR32430-1	Precision Measuring Equip Specialist (Electronics) (19 Weeks - 3 days (U.S. Navy)
3AZR32470-2	Electronic Test Equip Calbr and Repair (Hewlett-Packard) MAP (8 weeks)
3AZR32470-5	Advanced Electrical Electronics Measurement (6 weeks)
3AZR32470-6	Advance Microwave Measurements (4 weeks)
3AZR32470-7	Precision Physical Measurement Tech (8 weeks)
3AZR32470-8	Precision Dimensional and Optical Measuring Tech (6 weeks)
3AZR32470-9	Digital Voltmeter, Repair and Calibration (2 weeks - 3 days)
3AZR32470-10	Elec Stan Console and Low Freq Voltage Stan (6 weeks)
3AZR32470-11	Advanced Microwave Measurement and Calibration (5 weeks)
4AST32430-0	PME Specialist (23 weeks - 2 days)
4AST32470-4	Model A/E 35U-1, Baird Atomic Spectrometer Maintenance (3 weeks - 3 days)
4AST32470-5	CENPAC Maint/Programming (3 weeks)
4AST32470-8	TTU-205E Test Set Maintenance (5 days)
4AST32470-10	DOD AIMS Test Set Maintenance (2 weeks)
4AST32470-174 (Vol III, Doc 41)	AN/AWM-13A Test Set Maintenance (2 weeks) 41)

The Precision Measuring Equipment Branch conducted 11 active training courses on precision measuring equipment calibration during the period of this report. Additionally, six travel team courses were prepared and/or conducted to satisfy other Air Force or foreign agencies. During this report period, 209 students entered Course 3ABR32430, 227 entries were made into precision measuring equipment supplemental courses, 148 students entered special training courses, and 79 students entered travel team courses. (Vol III, Doc 41)

The precision Measuring Equipment Branch was responsible for 6 travel team courses. Activity in these courses during the period of this report was as follows:

4AST32470-4. Model A/E 35U-1 Baird Atomic Spectrometer Maintenance (3 3/5 weeks)

This course teaches the use, maintenance, repair and calibration of the Model A/E 35U-1 Spectrometer. Normal team deployment per year is two teams in CONUS, two teams to SEA. and 1 team to USAFE.

4AST32470-5. Optical Tooling (2 weeks)

This course is an advanced program in the maintenance, repair, and calibration of optical instruments. Normal team deployment is two teams per year. However, due to an increase in new calibration standards and greater workload requirements, it appears that there will be a definite increase in travel team requirements in this area.

4AST32470-8. TTU205B/E Test Set Maintenance (1 week) and 4AST32470-10. POD AIMS Test Set Maintenance (2 weeks)

These courses were established to support the BPMELs prior to the development of the 2ASR32470-25 DOD AIMS course. During the past 6 months only one team was deployed to support these areas. A request for deletion of these two travel team courses will be forwarded to Hq ATC.

4AST32470-174. AN/AWM-13A Test Set Maintenance (3 3/5 weeks)

One travel team was deployed to SEA during this reporting period.

4AST3243Q-0. Precision Measuring Equipment Specialist (22 weeks)

During the period of this report, a 5-man team was deployed to Turkey 701005 to train 20 Turkish Air Force personnel. This was a one-time requirement. (Vol III, Doc 41)

Precision Measuring Equipment Branch

Chapter 1. Mission and Resources

The mission of the Precision Measuring Equipment Branch is to train selected Air Force, U.S. Navy, and Foreign military and civilian personnel in the science of measurement and calibration. Supervises the conduct of assigned training courses in accordance with established policy and directives.

Supervises instructors and student attached for training. Coordinates with squadrons on military matters. Responsible for administrative and physical security. Plans and initiates requests for equipment, facilities, and personnel. Coordinates supply and maintenance requirements. Coordinates training matters with other branches and staff sections of the department.

Chapter II. Operations

The primary personnel responsible for the management of this branch are Capt Ramon K. Broerman, Branch Chief, Mr. David B. Moore, GS-11, Educational Training Officer and SMSgt Donald A. Anderson, Course Supervisor.

The Precision Measuring Equipment Branch is housed in Building 1433. This is a single story building of masonry construction containing 46,776 square feet of floor space.

The Branch Training Office and associated administrative, supervisory, and 34 training laboratories are located in this building. An additional training site, Engine Test Stand facility, of approximately 8,000 square feet of space is located on the east side of the building.

The overall manning required to support the organization is listed as follows:

AFSC	GRADE	AUT	ASSIGNED
3216	Maj	1	1 Capt
7524	G11	1	1
70250	G00	1	1 G04
70250	SSgt	1	1 Sgt
70250	Sgt	1	1 A1C
T32490	SMSgt	3	2
T32470	MSgt	20	15
T32470	TSgt	41	52
T32450	SSgt	102	65
T32450	Sgt	0	1
T32470	G11	2	2
T32470	G09	6	5
T32450	G09	3	2
	TOTAL 182		150

As it can be seen the organizational strength is 32 men below the authorized manning. Based on projected gains and losses this situation will continue in this manner until appropriate personnel action is taken by ATC.

The present operation consists of eleven active resident courses, one proposed resident course and six travel team courses. A brief resume of each course and it's status is reflected in the following paragraphs.

Course Number 3ABR32430 Precision Measuring Equipment Specialist training is presently 45 weeks in duration. There are 35 classes in training at the present time and the entry rate is 12/1 week. The present Course- Chart and

Plan of Instruction are in the final stages of a change with another programmed change to be implemented in April 71. This change will reduce the course length from 45 weeks to 43 weeks and result in a major savings of approximately $350,000.00. Graduate field evaluations indicate the 3 level graduates are adequately trained in all areas.

Course 3ABR32430-1, Precision Measuring Equipment Specialist (US Navy) training is 19 3/5 weeks in duration. This course is made up of selected blocks of training from the 3ABR324330 Course. At the present time there are no students in training.

Course Number 3AZR32470-2, Electronic Test Equipment Calibration and Repair (MAP) training (8 weeks). The course is presently being evaluated to determine whether this training is still required since similar training is covered in the 3ABR32430 course which these student attend prior of this course.

Courses Numbers 3AZR32470-5, Advanced Electrical-Electronic Measurements (6 weeks), 3AZR32470-6, Advanced Microwave Measurements (4 weeks). Both of these courses are specifically designed to train US Navy electronics personnel in Metrology. These courses have undergone a major revision in the past six months in training concept, equipment, and precision measurement analysis areas.

The entry rate in these courses is 10/3 weeks and they are operating on two shifts.

Course Number 3AZR32470-7. Precision Physical Measurement (6 weeks). This course trains US Navy personnel in the operation, use and calibration of Navy physical measurement standards. The entry rate is 8/4 weeks and is presently in operation on one shift. The present course chart and POI are fully adequate and no program change is scheduled in the immediate future.

Course Number 3AZR32470-8, Precision Dimensional and Optical Tooling Measuring Technician (6 weeks). This is a newly developed Navy course which is scheduled for implementation 710304. The entry rate will be 8/4 weeks and will operate on one shift for the present time.

Course Number 3AZR32470-9, Digital Voltmeter Repair and Calibration (2 3/5 weeks). This course was implemented 700930 to train selected Air Force personnel .in the latest digital, voltmeter in the inventory. The entry rate is 4/3 weeks and operates on one shift.

Course Number 3AZR32470-10, Electrical Standards Console and Low Frequency Voltage Standards (6 weeks). Revised course was implemented 700722. The course trains selected PME Technicians in the advanced optical standards measurement techniques. The entry rate is 12/6 weeks and the course is operating on three shifts.

Course Number 3AZR32470-11, Advanced Microwave Measurement (5 weeks). This course was implemented 701125. The present entry rate is 6/5 weeks and the course is operating on one shift. The course is designed to train selected Air Force personnel in advanced microwave measurement and calibration techniques.

Course Number 2ASB32470-8, Aircraft Engine Test Stand (3 weeks). Course was implemented 700708. The entry rate is 8/3 weeks and the course is operating on two shifts. This course is designed to train selected Air Force personnel in the maintenance, repair, and calibration of all aircraft engine test stands.

Course Number 2ASR32470-25, DOD AIMS Test Set Maintenance (8 weeks). Course was implemented 701021. The entry rate is 8/4 weeks and the course operates on one shift. This course is designed to train selected Air Force personnel in the operation, use, management techniques and calibration of DOD AIMS calibration standards and systems test sets.

Course Number 4AST32470-4, Model A/E 35U-1 Baird Atomic Spectrometer Maintenance (3 3/5 weeks). This course is an advanced training program on the operation, use, maintenance, repair and calibration of the Model A/E 35U-1 Spectrometer. Normal training team deployment is two teams to SEA per year, one team to USAFE per year, and two teams in the CONUS.

Course Number 4AST32470-5, Optical Tooling (2 weeks). This course is an advanced program in maintenance, repair, , and calibration of optical instruments. Normal training team deployment is two teams per year. However due to an increase in new calibration standards and greater workload requirements there will be a definite increase in travel team requirements.

Course Numbers 4AST32470-8, TTU 205B/E Test Set Maintenance (1 week) and 4AST32470-10, DOD AIMS Test Set Maintenance (2 weeks). These courses were established to support the BPMEL's prior to the development of the 2ASR32470-25 DOD AIMS Course. During the past six months only one team was deployed to support these areas. A request for deletion of the courses will be forwarded to ATC.

Course Number 4AST32470-174 AN/AWM-13A Test Set Maintenance (3 3/5 weeks). One travel team was deployed to SEA during this period.

Course Number 4AST32430-0, Precision Measuring Equipment Specialist (22 weeks). A five man team was deployed to Turkey 701005 to train 20 Turkish Air Force personnel. This is a one-time requirement.

Chapter III. Training

The following charts reflect the total numbers of student entries graduations, and eliminations/letters of attendance by course and/or areas of training:

COURSE NUMBER 3ABR32430

Entries	Graduated	Eliminations
209	183	30

The reasons for the number of eliminations during this period are numerous however, the primary causes were academic deficiency due to poor background, attitude, medical, and improper entry. During September the method of student

selection for entry into training was evaluated and found to be inadequate. Immediate corrective action was taken at this Center and at ATC to correct the deficiency and assure that only fully qualified students be put into the course.
Since November there has been a considerable improvement in the students' background qualifications and the number of washbacks and eliminations have decreased considerably.

COURSE NUMBER 3AZR32470-1

Entries	Graduations	Eliminations
2 (MAP)	2	2

Reason for these eliminations were academic deficiencies, a lack of electronics and mathematics due to background, and language problems.

SUPPLEMENTAL TRAINING COURSES

Entries	Graduations	Eliminations
227	281	5 (attendance)

The five students as indicated did not satisfactorily complete the courses and were not awarded diplomas. This action was taken due to unsatisfactory academic progress in all cases.

SPECIAL TRAINING COURSES

Entries	Graduations	Eliminations
148	149	0

TRAVEL TEAM COURSES

Entries	Graduations	Eliminations
79	59	0

Chapter IV. Maintenance and Supply

All of the equipment maintenance required to support the training courses in this organization is performed by the Base Precision Measuring Equipment Laboratory.
The major mission equipment, Precision Measuring Equipment Calibration Standards, is listed in TA734, Table of Allowances for Precision Measuring Equipment. At the present time this organization maintains eleven EAID accounts which represent a total dollar value of $1.963.374.00.

The operating budget required to provide necessary supplies, equipment, and accessories was $10,600.00 during this period.

Chapter V. Special Problems:

None.

JANUARY - JUNE 1971

PRECISION MEASURING EQUIPMENT BRANCH

Chapter 1. MISSION AND RESOURCES

Same as last report.

Chapter II. Operations

The primary personnel responsible for the management of this branch are Capt Edward J. DeVries, Branch Chief, Mr. David B. Moore, GS-ll, Educational Training Officer and SMSgt Donald A. Anderson, Course Supervisor.

The overall manning required to support the organization is listed as follows:

AFSC	GRADE	AUTH	ASSIGNED
3216	Maj	1	1 Capt.
7524	G11	1	1
70450	G00	1	1 G04
70250	SSgt	1	0
70250	Sgt	1	2 Sgt
70010	Amn	0	2
64550	Amn	0	2
T32490	SMSgt	2	3
T32470	MSgt	18	15
T32470	TSgt	36	52
T32450	SSgt	103	62
T32450	Sgt	0	1
T32470	G11	2	2
T32470	G09	6	6
T32450	G09	3	3
	TOTAL	175	153

As it can be seen the organizational strength is 22 men below the authorized manning. Bases on projected gains and losses this situation will continue in this manner until appropriate personnel action is taken by ATC.

The present operation consist of twelve active resident courses and six travel team courses. A brief resume of each course and it's status is reflected in the following paragraphs.

Course Number 3AVR32430 Precision Measuring Equipment Specialist training is presently 45 weeks in duration. There are 41 classes in training at the present time and the entry rate is 12/1 week. The present Course Chart and Plan of Instruction, implemented in April 71, reduced the course length from 45 weeks to 43 weeks. Graduate field evaluations indicate the 3 level graduates are adequately trained "in all areas.

Course 3ABR32430-1, Precision Measuring Equipment Specialist (US Navy) training is 19 3/5 weeks in duration. This course is made up of selected blocks of training from the 3ABR32430 Course. At the present time there are no students in training.

Course Number 3AZR32470-2, Electronic Test Equipment Calibration and Repair (MAP) training (8 weeks). The course is presently being evaluated to determine whether this training is still require since similar training is covered in the 3AVR32430 course which these student attend prior of this course. .

Course Number 3AZR32470-5, Advanced Electrical-Electronic Measurements (6 weeks), 3AZR32470-6, Advanced Microwave Measurements (4 weeks). Both of these courses are specifically designed to train US Navy electronics personnel in Metrology. These courses have undergone a major revision in the past six months in training concept, equipment, and precision measurement analysis areas. Revised plan of instruction was implemented 710106. The entry rate of these courses are 10/3 weeks and are operating on two shifts.

Course Number 3AZR32470-7, Precision Physical Measurement (8 weeks). This course trains US Navy personnel in the operation, use and calibration of Navy physical measurement standards. The entry rate is 8/4 weeks and is presently operated on one shift. The present course chart and POI on course is fully adequate and no program change is scheduled in the immediate future.

Course Number 3AZR32470-8, Precision Dimensional and Optical Tooling Measuring Technician (6 weeks). This is a newly developed Navy course which was implemented 710304. The entry rate is 8/4 weeks and will operate on two shifts for the present time.

Course Number 3AZR32470-9, Digital Voltmeter Repair and Calibration (2 3/5 weeks). This course trains selected Air Force personnel in the latest digital voltmeters in the inventory. The entry rate is 4/3 weeks and operates on one shift.

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Course Number 3AZR32470-10, Electrical Standards Console and Low Frequency Voltage Standards (6 weeks). The course trains selected PME technicians in the advanced electrical standards measurement techniques. The entry rate is 12/6 weeks and is operating on three shifts.

Course Number 3AZR32470-11, Advanced Microwave Measurements (5 weeks). The present entry rate is 6/5 weeks and is operating on one shift. The course is designed to train selected Air Force personnel in the advance microwave measurement and calibration techniques.

Course Number 2ASR32470-8, Aircraft Engine Test Stand (2 weeks). The entry rate is 8/3 weeks and is operating on two shifts. This course is designated to train selected Air Force personnel in the maintenance, repair, and calibration of all aircraft engine test stands.

Course Number 2ASR32470-25, DOD AIMS Test Set Maintenance (8 weeks). The entry rate is 8/4 weeks and operates on one shift. This course is designed to

train selected Air Force personnel in the operation, use, measurement techniques, and calibration of DOD AIMS calibration standards and systems test sets.

Course Number 4AST32470-4, Model A/E 35U-1 Baird Atomic Spectrometer Maintenance (3 3/5 weeks). This course is an advanced training program on the operation, use, maintenance, repair, and calibration of the Model A/E 35U-1 Spectrometer. Normal training team deployment is two teams to SEA per year, one team to USAFE per year, and two teams in the CONUS.

Course Number 4AST32470-4, Optical Tooling (2 weeks). This course is an advanced program in maintenance, repair, and calibration of optical instruments. Normal training team deployment is two times per year. However due to an increase in new calibration standards and greater workload requirements there will be a definite increase in travel team requirements.

Course Number 4AST32470-8, TTU205B/E Test Set Maintenance (1 week) and 4AST32470-10, DOD AIMS Test Set Maintenance (2 weeks). These courses were established to support the BPMELs prior to the development of the 2ASR32470-25 DOD AIMS Course. During the past six months no training teams have been deployed to support these areas. A request for deletion of the courses was forwarded to ATC. As of 710630 courses have been deleted.

Course Number 4AST32470-174, AN/AWM-13A Test Set Maintenance (3-3/5 weeks). One travel team was deployed to USAFE during this period.

Course Number 4AST32430-0, Precision Measuring Equipment Specialist (72 weeks). A travel team requirement, one man team, is programmed to support PME training for the Argentine Air Force to train twenty-five technicians. Training is presently in progress.

CHAPTER III. Training

The following charts reflect the total numbers of student entries, graduates, and eliminations/letters of attendance by course and/or area of training:

Course 3ABR32430

ENTRIES	GRADUATES	ELIMINATIONS
310	115	24

Course 3ABR32430-1

ENTRIES	GRADUATES	ELIMINATIONS
3	3	0

Supplemental Training Courses

ENTRIES	GRADUATES	ELIMINATIONS
365	297	4

Special Training Courses

ENTRIES	GRADUATES	ELIMINATIONS
155	129	1

Travel Team Courses

ENTRIES	GRADUATES	ELIMINATIONS
58	0	0

Chapter IV. Maintenance and Supply

All of the equipment maintenance required to support the training courses in this organization is performed by the Base Precision Measuring Equipment Laboratory.

The major mission equipment, Precision Measuring Equipment Calibration Standards, is listed in TA734, Table of Allowances for Precision Measuring Equipment. At the present time this organization maintains eleven EAID accounts which represent a total dollar value of $1.963.374.00.

The operating budget required to provide necessary supplies, equipment, and accessories was $10,600.00 during this period.

Chapter V. Special Problems:

None.

JULY - DECEMBER 1971

METROLOGY TRAINING DIVISION

Chapt

The mission of the Metrology Training Branch is to train selected Air Force, U.S. Navy, Foreign Military, and civilian personnel in the science of measurement and calibration. Supervises the conduct of assigned training courses in accordance with established policy and directives. Supervises instructors and student attached for training. Coordinates with squadrons on military matters. Responsible for administrative and physical "security. Plans and initiates requests for equipment, facilities, and personnel. Coordinates supply and maintenance requirements. Coordinates training matters with other branches and staff sections of the department.

The primary personnel responsible for the management of this branch are -Capt James N. Morey. Branch Chief, Mr. David B. Moore, GS-11 Educational Training Officer, and SMSgt Franklin D. Quarles, Course Supervisor.

The overall manning required to support the organization is listed as follows:

AFSC	GRADE	AUTH	ASSIGNED
4036	MAJ	1	1 Capt
7524	G11	1	1
70450	G00	1	1 G04
70250	SSgt	1	2
70250	Sgt	2	0
70230	Amn	1	2
64550	Sgt	2	2 (1 Sgt, 1 SSgt)
T32490	SMSgt	2	2
T32470	MSgt	17	28
T32470	TSgt	33	78
T32450	SSgt	95	42 (28 SSgt, 14 Sgt)
T32470	G11	2	2
T32470	G09	6	6
T32450	G09	3	3
TOTAL		167	170

Present manning reflects that the branch is over three personnel. However, CBPO has not projected any shipments at this time. The branch was informed that all shipments would be projected through September of calendar year 72.

Chapter II. Operations

The present operation consists of twelve active resident courses and four travel team courses. A brief resume of each course and it's status is reflected in the following paragraphs.

Course 3ABR32430 Precision Measuring Equipment Specialist training is presently 41 weeks in duration. There are 40 classes in training at the present time and the entry rate is twelve students every week. The present Course Chart and Plan of Instruction reflects the deletion of the mid-course leave. Graduate field evaluators indicate the 3 level graduates are adequately trained in all areas.

Based on a major increase in the Trained Personnel Requirement for FY73 the course will commence operation of 'D' shift sometime in the 3 Qtr/FY 72. It should also be noted that during the 1971 All Commands PME Conference 9-11 Nov 71, LTTC was tasked to develop a basic course to train the 3 level specialist as an Electrical/Electronic Specialist only and develop two supplemental courses, Microwave and Physical, with future planning for a 7 level course in these areas to include management. Branch personnel evaluated the program and recommended immediate action be taken to reduce the course by nine weeks, from 41 to 32. This action was approved by the Tech School Commander and forwarded to ATC (TTKA) for evaluation and approval. ATC approved the program change and re-designated the PME Specialist Course the 3ABS32430-2 Course effective with class 710721 with an implementation date of 720105.

The branch is also involved in two major projects which directly effect the PME Specialist Course. 3ABR32430 Instructional System Development project and the Advanced Instructional System project. The ISO project involves the revision of the 324X0 job description, Specialty Training Standard, and further revision of the 3ABR PME Specialist course. The AIS project involves the development of a computer-based multi-media training system. The system will incorporate the latest state-of-the-art in training technology, management techniques, and instructional media. The AIS project is being managed by the AFHRL Division assigned to LTTC.

Course 3ABR32430-1, Precision Measuring Equipment Specialist (US Navy) training will be discontinued 720819.

Course 3AZR32470-2, Electronic Test Equipment Calibration and Repair (MAP) training (8 weeks). Present programming indicates the course is still required for MAP students. Action to revise and improve the course is pending field evaluation by ATC MAP personnel and/or LTTC PME personnel.

Courses 3AZR32470-5, Advanced Electrical-Electronic Measurements (6 weeks), 3AZR32470-6 Advanced Microwave Measurements (4 weeks). Both of these courses are designed specifically to train selected US Navy and Marine Corps personnel. Due to a major change in specific items of PME, the courses will require revision and updating.

Courses 3AZR32470-7. Precision Physical Measurements (8 weeks), 3AZR32470-8 Precision Dimensional and Optical Tooling Measuring Technician (6 week). Both courses are designed to train selected US Navy personnel. No program changes are anticipated with respect to these courses.

Course 3AZR32470-9. Digital Voltmeter Repair and Calibration (2 3/5 week). This course trains selected Air Force personnel in the latest digital voltmeters in the USAF inventory. At this time there is action being taken to delete this course and phase the training into the basic course.

Course 3AZR32470-10, Electrical Standards (6 weeks). The course is presently training 7 level technicians in the advanced standards. This course is presently programmed to phase down and be incorporated in the basic course. At this time there is no firm date which can be projected for this action.

Course 3AZR32470-11, Advanced Microwave Measurement (5 weeks). The course is designed to train selected Air Force personnel in the advanced microwave measurement and calibration techniques. This course was programmed to be phased down and integrated into the basic course. However based on revised planning the course will be revised to handle 5 level personnel and future programming for part of a 7 level PME course.

Course 2ASR32470-8, Aircraft Engine Test Stand (2 3/5 weeks). This course is designed to train selected Air Force personnel in the maintenance, repair, and calibration of all engine test stands.

Course 2ASR32470-25, DOD AIMS Test Set Maintenance (8 weeks). This course is designed to train selected Air Force personnel in the operation, use, maintenance, repair and calibration of DOD AIMS Calibration standards and system test sets. Present programming reflects the need to develop two shorted courses in this area. Course charts have been forwarded to ATC (TTKA) for approval and implementation. No new assets are required in order to implement these courses.

Course 2ASR32450, Hi Reliability Soldering and Equipment Repair Techniques (3 weeks). This course is designed to train selected Air Force personnel to NASA soldering specifications.

Course 4AST32470-4, Model A/E35U-1 Baird Atomic Spectrometer Maintenance (3 3/5 weeks). This course has been revised during the reporting period. The travel team has been in PACAF since July revising the maintenance TO and conducting training at Clark AB, PI.

Course 4AST32470-5, Optical Tooling (2 weeks). Two travel teams have been deployed during the reporting period. Course is designed to train selected Air Force personnel in advanced optical instrumentation repair and calibration techniques.

Course 4AST32430-0, Precision Measuring Equipment Specialist travel team has just returned from Argentina where 25 personnel were trained. This program is designed to train personnel in PME that pertains to the needs of any foreign country PME program.

Course 4AST32470-174, AN/AWM-13A Test Set Maintenance (3 3/5 weeks). One travel team was deployed during this period.

Course 4AST32470-7, Radiac Instrument Calibration (1 week). This course has just been developed for use in the future. CONUS has been divided into four sectors and training will be conducted in each sector one time per year. This program is designed to train.5 level PME personnel in the maintenance, repair and calibration of Radiac instrumentation. Upon completion of the training the student is certified as a Radiological Industrial Monitor and can

perform the duties in a Base PMEL IAW the USAF AEC Committee and applicable regulations.

CHAPTER III. TRAINING

The following TDY trips were taken during this reporting period:

1. Two trips for five days to the 2802nd AGMC, Newark AFS, Ohio, to receive special training on the S-5002 Sampling Scope System.

2. Two trips for 13 days to Tektronix Corp, Beaverton, Oregon, to receive advanced training on the S-5002 Sampling Scope System.

3. One trip for five days to Keesler AFB, Miss. This was a staff visit to the TACAN/IFF training course in support of DOD AIMS training.

4. Two trips for five days to the 2802nd AFMC Newark AFS, Ohio to attend the All Commands PME Conference.

Other TDY trips taken were for the specific purpose of conducting Type 4 training courses as listed in Chapter II.

CHAPTER IV. MAINTENANCE AND SUPPLY

All of the equipment maintenance required to support the training courses in this organization is performed by the Base Precision Measuring Equipment Laboratory.

The branch is conjunction with Tech School and M&S Group recently established an equipment calibration section in Bldg 1433. The BPMEL assigned two 32470 technicians to perform specific calibration in-house utilizing the Transportable Field Calibration Unit assigned to this organization. The results of the program have been very effective and definitely have resulted in an economic savings.

The major equipment, Calibration Standards, is listed in TA734, Table of Allowances for Precision Measuring Equipment. At the present time this organization maintains eleven EAID accounts which represent a total dollar value of $1,963,374.00.

The operating budget required to provide necessary supplies, equipment and accessories was approximately $12,425.00 during this period. (Vol III, Doc 48, Tab 7)

In October, 1971, the department requested that the Precision Measuring Equipment (PME) Branch title be changed to the Metrology Training Branch. The request was felt to be in line with the proposed change to AFM 39-1 which was to change the title of the entire PME field to 'Metrology'. The title change was also felt to be in order because the title 'PME' connoted 'test equipment" and this was not taught in the branch. The title "Metrology", defined as 'the science of measurement including the development of measurement standards and

systems for absolute and relative measurements', more-correctly described the type of training directed by the branch. On November 22, 1971, ATC approved the name change. (Vol I, Pg. 71)

JANUARY - JUNE 1972

DEPARTMENT OF AVIONICS TRAINING
METROLOGY TRAINING BRANCH

MISSION AND RESOURCES

The mission of the Metrology Training Branch is to train selected Air Force, U.S. Navy, Foreign Military, and civilian personnel in the science of measurement and calibration. Supervises the conduct of assigned training courses in accordance with established policy and directives. Supervises instructors and students attached for training. Coordinates with squadrons on military matters. Responsible for administrative and physical security. Plans and initiates requests for equipment, facilities, and personnel. Coordinates supply and maintenance requirements. Coordinates training matters with other branches and staff sections of the department.

The primary personnel responsible for the management of this branch are Capt James N. Morey, Branch Chief and Mr. David B. Moore. GS-11 Educational Training Officer.

The overall manning required to support the organization is listed as follows:

AFSC	GRADE	AUTH	ASSIGNED
4036	Maj	1	2 (l Maj, 1 Capt) 1
7524	G11	1	1
70450	G00	1	1 G04
70250	SSgt	1	2
70250	Sgt	1	0
70230	Amn	1	2
T32490	SMSgt	2	2
T32470	MSgt	14	35
T32470	TSgt	37	74
T32450	SSgt	101	48 (34 SSgt, 12 Sgt. 2 A1C)
T32470	G11	2	2 (1 GS11, 1 GS-9)
T32470	G09	6	6
T32450	G09	2	2
TOTAL		170	177

During this six month reporting period the manning reflected that the branch was over seven personnel. However, due to projected gains and losses during the same six month period the branch was actually thirteen personnel short.

OPERATIONS

The present operation consists of twelve active resident courses and four travel team courses. A brief resume of each course and it's status is reflected in the following paragraphs.

Course 3AVH32430 Precision Measuring Equipment Specialist training is presently 41 weeks in duration. There are 2 classes in training at the present time. This course will be discontinued 720926. Graduate field evaluators indicate the 3 level graduates are adequately trained in all areas.

Based on a major increase in the Trained Personnel Requirement for FY73 and FY74 the course commenced operation of "D" shift 720105. It should also be noted that during the 1971 All Commands PME Conference, 9-11 Nov 71, LTTC was asked to develop a basic course to train the 3 level specialist as an Electrical/Electronic Specialist only and develop two supplemental courses. Microwave and Physical, with future planning for a 7 level course in these areas to include management. Branch personnel evaluated the program and recommended immediate action be taken to reduce the course by nine weeks, from 41 to 32. This action was approved by the Tech School Commander and forwarded to ATC(TTKA) for evaluation and approval. ATC approved the program change and re-designated the PME Specialist Course the 3ABR32430-2 Course effective with class 710721 with an implementation date of 720105.

The branch is also involved in two major projects which directly effect the PME Specialist Course. 3ABR32430 Instructional System Development project and the Advanced Instructional System project. The ISO project involves the revision of the 324X0 job description, Specialty Training Standard, and further revision of the 3ABR PME Specialist Course. The AIS project involves the development of a computer-based multi-media training system. The system will incorporate the latest state-of-the-art in training technology, management techniques, and instructional media. The AIS project is being managed by the AFHRL Division assigned to LTTC.

Course 3ABR32430-1, Precision Measuring Equipment Specialist (US Navy) training will be discontinued 720819.

Course 3AZR32470-2, Electronic Test Equipment Calibration and Repair (MAP) training (8 weeks). Present programming indicates the course is still required for MAP students. Action to revise and improve the course as a result of evaluation by ATC MAP personnel and for implementation in December.

Courses 3AZR32470-5, Advanced Electrical-Electronic Measurements (6 weeks), 3AZR32470-6, Advanced Microwave Measurements (4 weeks). Both of these courses are designed specifically to train selected US Navy and Marine Corps personnel. Due to a major change in specific items of PME, the courses are presently under revision and updating.

Courses 3AZR32470-7, Precision Physical Measurements (8 weeks). 3AZR32470-8 Precision Dimensional and Optical Tooling Measuring Technician (6 weeks). Both courses are designed to train selected US Navy personnel. No program changes are anticipated with respect to these courses.

Course 3AZE32470-9, Digital Voltmeter Repair and Calibration (2 3/5 weeks). This course trains selected Air Force personnel in the latest digital voltmeters in the USAF inventory. Course will be discontinued 720711.

Course 3AZR32470-10, Electrical Standards (6 weeks). The course is presently training 7 level technicians in the advanced standards. This course is presently programmed to phase down as of 721108 and be incorporated in the basic course.

Course 3AZR32470-11, Advanced Microwave Measurement (5 weeks). The course is designed to train selected Air Force personnel in the advanced microwave measurement and calibration techniques. This course was programmed to be phased down and integrated into the basic course. However, based on revised planning the course will be revised to handle 5 level personnel and future programming for part of a 7 level PME course.

Course 2ASR32470-8, Aircraft Engine Test Stand (2 3/5 weeks). This course is designed to train selected Air Force personnel in the maintenance, repair, and calibration of all engine test stands.

Course 2ASR32470-25, DOD AIMS Test Set Maintenance (8 weeks). This course is designed to train selected Air Force personnel in the operation, use, maintenance, repair and calibration of DOD AIMS Calibration Standards and system test sets.

Course 2ASR32450, Hi Reliability Soldering and Equipment Repair Techniques (3 weeks). This course is designed to train selected Air Force personnel to NASA soldering specifications.

Course 4AST32470-4, Model A/E35U-1 Baird Atomic Spectrometer Maintenance (3 3/5 weeks). This course has been revised during the reporting period. The travel team has been in PACAF conducting training at Clark AB, PI.

Course 4AST32470-5, Optical Tooling (2 weeks). Two travel teams have been deployed during the reporting period. Course is designed to train selected Air Force personnel in advanced optical instrumentation repair and calibration techniques.

Course 4AST32470-174, AN/AWM-13A Test Set Maintenance (3 3/5 weeks). One travel team was deployed during this period.

Course 4AST32470-7, Radiac Instrument Calibration (1 week). One travel team was deployed during this period.

Course 4AST32450-11, Microwave/Electrical Standards Console (11 weeks). One travel team was deployed to Argentina to conduct this course on a one time basis during this reporting period.

MAINTENANCE AND SUPPLY

The branch in conjunction with Tech School and M&S Group recently established an equipment calibration section in Bldg 1433. The BPMEL assigned two 32470 technicians to perform specific calibration in-house utilizing the

Transportable Field Calibration Unit assigned to this organization. The results of the program has been very effective and definitely has resulted in an economic savings.

At the present time this organization maintains eleven EAID accounts which represent a total dollar value of $1,963,374.00. The operating budget required to provide necessary supplies, equipment and accessories was approximately
$12,425.00 during this period. (Vol III, Doc 49)

DEVELOPMENT OF THE ADVANCED INSTRUCTIONAL SYSTEM

The training load of the Lowry School has been steadily increasing over the years. Not all of this training load can be attributed just to the number of jobs in the Air Force, but rather to the increasing complexity of the jobs. Advances in technology create new methods of accomplishing the same job, and training in job skills must be accelerated to meet the pace of technology. Luckily, advances in educational technology make it possible to keep pace with the advances in mission-oriented technology. These educational advances at Lowry take the form of something called the Advanced Instructional System, or AIS.

The Problem: Approximately 100,000 people enter the Air Force each year to replace others who are retiring and separating, and to meet increased manpower needs. People must also be retrained because of jobs made surplus or obsolete by scientific, technological, and managerial advances in their fields. This is the training load AIS must handle.

Certainly, given unlimited money and manpower, the Air Training Command could continue to produce men and women trained to meet the requirements of this expanding technology; however, with Department of Defense money becoming scarce, and the zero-draft environment complicating the training situation by including a larger percentage of lower aptitude personnel that previously encountered, the Air Force Human Resources Laboratory (AFHRL) of the Air Force Systems Command was tasked to develop more responsive and cost-effective training. They responded by proposing an integrated training system which combined the most advanced state-of-the-art in instructional and computer technology.

What AIS Is: The AIS is a five-year investigation and testing of computer-aided and managed instruction in technical training areas, which was first presented to the School staff in June.1970.

There were three basic concepts involved with what the AIS would be and do. First, it would provide self-paced and individualized instruction to the students. This recognition of differences in individual performance meant that courses would no longer have to be designed so the whole class progressed only as fast as the slowest learner. With individualized instruction, as soon as a student completes a block of course materials, he can take a test on the material. This test does not compare him with the other students, but measures his performance against a set of criterion objectives, which are precise statements of what it takes to perform the job in the field environment.

Since self-pacing means different graduation dates for each student, the second function of the AIS would be prediction of course completion dates for each student through continual updating of his progress record, providing a firm date for preparation of his assignment orders.

Finally, the computer would take over the increasingly more complex record keeping associated with a training program where each student is at a different point in training on any given day, including individual testing.

Lieutenant General Sam Maddux Jr. addressed the need for such a system in May 1970, when he was commander of ATC:

> It is apparent that real progress has been made in developing a program that addresses the requirements of our three commands. One fact does, however, stand out and that, is the void in education and training research which has developed because of the years of neglect. Unfortunately, this void is being aggravated by the austere environment facing the Air Force today. We all want the quantity and quality of research needed by education and training, but have difficulty in finding how to express our needs clearly enough to insure adequate research support.

General Maddux said he felt the AIS appeared to be the best of ail the proposed solutions to the problem.

Lowry Designated Test Site: The Lowry School of Applied Aerospace Sciences was designated a test site for AIS, and three courses were selected for conversion to AIS. They were 3ABR32430, Precision Measurement Equipment- Specialist (PME); 3ABR46230-2 Weapons Mechanic (TAC)(Wpns); and 3ABR64530-1, Inventory Management Specialist (IM).

Initial support contracts for AIS were awarded to five contractors. The system specification was to be developed by Florida State University, and Hughes Aircraft was responsible for design of the student learning environments, or carrels.

Development of instructional strategy was awarded to a different contractor for each course. McDonnell-Douglas was to handle development of the PME course, Applied Science Associates the Weapons Mechanic course, and Systems Development Corporation the Inventory Management Specialist course.

Why AIS Now? Although many civilian educational institutions were working with computer assisted instruction (CAD, and had been for several years, there were compelling reasons that forced the Air Force to forge ahead with development of the AIS without waiting for the civilian schools to lay the groundwork for them.

Most important, according to AIS project manager Joseph Y. Yasutake, was the fact that no other institution was working on putting all of the aspects of computer assisted and managed training into one package.

Some of the reasons for this lack of activity in consolidating all of the aspects of computer-assisted instruction in the civilian community included the difficulty in convincing their financial backers that the expenditure of funds would be worth it, and their tendency to try to adapt the computers they already owned for administration to training.

The military has a captive population upon which to use its training system, and a more defined end point, based as it is upon criterion objectives; i.e., to change an aircraft nose wheel, an airman will need a specific set of skills and no more. And the Air Force can procure new computer equipment to completely match the needs of the AIS.

Most of the development of AIS was based on earlier research into CAI, and specifically the PLATO project at the University of Illinois. Of specific interest in PLATO'S research was their development of a plasma display panel for presentation of graphic material. Instead of using expensive computer time to constantly restore an image to a cathode ray tube, the plasma display panel uses the initial impulse to energize a gas imbedded in the screen [A schematic diagram of a plasma panel and a technical description is contained in the book Computer-Assisted Instruction. Testing and guidance, by Wayne K. Holtzman (ed.), Harper & Row, 1970, p. 23.].

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An important consideration in the possible implementation of AIS was its cost effectiveness. Computer time was recognized as expensive, but the real costs in a training system such as this would be incurred in writing the computer programs themselves. At the end of June 1973, the cost of writing one computer instruction was estimated at $7.25.

The whole purpose in developing the AIS was to provide cost-effective training, and Mr. Yasutake felt that the system would pay for itself in two and one-half to three years.

“Estimates of the reductions in training time that could be obtained from the use of CAI ran anywhere from 15 to 45 per cent,” said Mr. Yasutake. "We took an in-between figure of 25 per cent for the system specification, to force the contractor to consider course length reduction as a goal, but at the same time not make it so high as to be impossible."

If this 25 per cent reduction in course length were realized, preliminary studies by the Human Resources Laboratory indicated that there would be a potential savings of $3,610,000 per year from the three courses alone. This figure is based on instructor salaries saved and on removing the student from a training environment where he is being paid to a productive work environment.

Evidence that such a reduction was possible came during a comparison test between a conventional presentation of a munitions lesson on aerospace ground equipment and an AIS sound-slide presentation. Conventionally, three hours were devoted to the subject; one hour of overnight homework, and two hours of classroom instruction and discussion. Normal test scores following conventional instruction were 50.5 per cent on knowledge items and 73.3 per cent successful performance on skill items. The two classes trained with the 25-minute AIS sound-slide presentation scored 79.2 per cent and 81 percent on knowledge items, and averaged 88.5 per cent successful performance on skill items.

Progress: At the end of June 1973, "We'd learned a lot, but not much was evident in the classroom, according to Mr. Yatsutake.

Two weeks of the Inventory Management course had been individualized, and approximately 60 students had been exposed to the material, with a 40 per cent reduction in training time.

Although about two weeks of materials for the Weapons Mechanic course had been completed, it had not been implemented as of the end of June. Most of the time spent during the year in this course was in studying the various techniques that could by used, to find those most effective in the unique “field” environment in which the course was conducted.

The Precision Measurement Equipment course received a slight setback when plans were formulated to upgrade many items of test equipment from vacuum tube to solid-state electronics. This negated much of the block of instruction on oscilloscope use that had already been written.

Since the overall contract to McDonnell-Douglas Corporation, for development of the AIS was not even released to them until mid-May 1973, most of the rest of the year was involved in setting up their administrative routines, and little concrete work was done on the AIS project itself.

Success or Failure? The ultimate success or failure of the AIS is impossible to predict at this time, and although "We'll have a much better idea of where we are by June 1974,” according to Mr. Yasutake, the program was to be implemented in increments, and the judgment of whether or not the system could become the wave of the future for training was still far down the road. (Vol 1, pgs. 67-75)

USAF SCHOOL OF APPLIED AEROSPACE SCIENCES (July - Dec 1972)
DEPARTMENT OF AVIONICS TRAINING

Course 3ABR32430-2 Precision Measuring Equipment Specialist Training is presently 32 weeks in duration. There are 44 class sections in training at all times on four shifts of operation. The entry rate is based on a 12-12-24 rate or an average of 18 students/week. This results in a student in training load of 528.

The branch is involved in two major projects which directly effect the PME Specialist Course. The 3ABR32430-2 Instructional System Development project will reduce the course length from 32 to 30 weeks, result in a complete upgrade of training equipment, establish a new job description and specialty training standard, and based on USAF approved Change 11 to AFM 37-1 opens the 324X0 career field to WAF personnel in January 1973. This project will be implemented 730516. The Advanced Instructional System (AIS) project; will incorporate the latest state-of-the-art in training technology, instructional management techniques, and a computer based individualized multi-media instructional system. The present programming schedule, based on contract approval, will start in January 1973 and continue through full implementation for four years.

During this period a major morale problem was resolved, with respect to the schedule for "D" Shift operation. This resulted in the elimination of the Saturday training schedule and provided the personnel with a compatible training/duty work week.

Two major inspections were conducted in this branch, ATC Standard Evaluation and the USAF IG Inspection of Precision Measurement Equipment (PME) Program Management.

During the ATC Standard Evaluation, six findings were reported. All of these were minor and had no direct effect on the overall mission of this Branch. All of these actions were corrected as of 16 October 1972 and continuous follow-up on these items and the entire operation of the Branch are inspected per the Branch Self-Inspection program.

The USAF IG Inspection that was conducted in this Branch was not a direct inspection with respect to the operation of the training program but, an evaluation of the overall PMEL program management. There were no problem areas defined. Action taken as a result of this visit resulted in establishing a valid system of communication between LTTC (TTOX), HQ ATC and SAAMA (Equipment Monagus) , with respect to TA 734 reviews and coordination action when new PME and/or replacement PME buys are scheduled. This allows the Branch to establish firm requirements and maintain a up-to-date equipment training program.

The following favorable comment was received from the Inspectors. 'A’ review of the Metrology Training School student critiques indicated no trends that could be related to the problems encountered in the field. The school's future plans and programs appeared to be well prepared, and responsive to the needs of the Air Force.

Course 3AZR32470-2. Electronic Test Equipment Calibration and Repair (MAP) Training (8 weeks). Course control documents have been completely revised and all of the instructional materials are presently under revision. An analysis of equipment employed in the course versus equipment utilized in the MAP countries will be required. Action will be taken during the 3rd Quarter FY 73.

Course 3AZR32470-5, Advanced Electrical - Electronic Measurements (6 weeks) and Course 3AZR32470-6, Advanced Microwave Measurements (4 weeks). Required revision and updating has been accomplished. However, due to additional equipment requirements and more advanced measurement technique both courses will under go a major revision during the next year. (Vol IV, Jul - Dec 1972)

USAF SCHOOL OF APPLIED AEROSPACE SCIENCES (Jan - Jun 1973)
DEPARTMENT OF AVIONICS TRAINING

Course 3ABR32430-2, Precision Measuring Equipment Specialist Training, is 30 weeks in duration. There were 44 class sections in training at all times on four shifts of operation. The entry rate was based on a 12-12-24 rate or an average of 18 students/week. This resulted in a student training load of 528. The operation of "D" Shift was reinstated 730613. At the present time, a study is being accomplished to increase class size from 12 to 14 students in order to phase out "D” shift.

The 3ABR32430-2 Instructional System Development project was implemented 730516. This project resulted in a two week reduction in course length and a major upgrade of training equipment.

The Advanced Instructional System project contract was awarded in May 1973. This project is a four year research program with an ultimate goal to fully develop and incorporate the latest state-of-the-art in training technology, instructional management techniques, and a computer based individualized multi-media instructional system.

Course 3AZB32470-2, Electronic Test Equipment Calibration and Repair (MAP) Training (8 weeks): An analysis of equipment employed in the course versus equipment utilized in the MAP countries is being accomplished.

Course 3AZR32470-5, Advanced Electrical - Electronic Measurements (6 weeks) and Course 3AZR32470-6, Advanced Microwave Measurements (4 weeks). Required revision and updating has been accomplished. However, due to additional equipment requirements and more advanced measurement technique, both courses will undergo a major revision during the next year.

Course 4AST32470-5, Optical Tooling and Theodolite Calibration (2 weeks), Course 4AST32470-7, Radiac Instrument Calibration (1 week), and Course 4AST32470-174, AN/AWM-13A Test Set Maintenance (2 3/5 weeks) have all been revised during this period. Only three travel teams were deployed to support training requirements due to a major funding problem in 3rd and 4th quarters FY 73. (Vol IV, Pages 43 & 44)

Interservice Precision Measurement Equipment Training Review:

The possibility of consolidating Army and Air Force precision measurement (PME) had been examined at least twice before, but with negative results.

Army representatives visited Lowry in 1966, and again in 1970, to examine similarities between the PME courses the Air Force taught at Lowry and Army courses taught at Aberdeen Proving Ground, Maryland. In those pre-ITRB years, similarities between the courses were not considered great enough to justify consolidation.

Although Mr. David B. Moore, a training specialist in the School's Training Plans Branch, stated that the Army's reason for rejecting consolidation in 1966 and 1970 was “Personal opposition. Let's face it; they've got a training program of their own,” Lt. Col. Mark S. Creviston Jr., Director of the Weapon Training Department at the Army Ordnance Center and School (AO&S) said that the position had since changed.

Colonel Creviston said that in the past the objection voiced had been that the training load was too big for a single installation, and that equipment and procedural differences in the two services made consolidation impossible. He added that the successful participation of the Navy in PME courses taught at Lowry since 1967 "probably influenced the reconsideration of consolidation,” but that the cost effectiveness of the proposal, combined with the Air Force's willingness to upgrade its vacuum-tube test equipment to more modern transistorized equipment (like that operated by the Army) made the consolidation feasible.

At the same time, the interservice training philosophy was changing from similarity of training to similarity of jobs at the end of training. The Executive Committee of the ITRB noted that “Each course or occupational subgroup should be looked at individually for what makes sense, not just the percentage of commonality."

The first documented discussion on the latest PME consolidation effort was between the commanding generals of TRADOC and the USAOC&S, which was tasked to study Air Force PME training.

The Army requested course documents from Lowry on 12 October 1973, in preparation for a November visit to the base. Before the Army visited Lowry, however, their project officer made some observations based on his review of the training materials. He said that 'major differences' existed in both the training levels required and the equipment used by the two services. He noted that the Army's 40-week calibration course taught to the "journeyman” level, and produced a graduate with a working knowledge of calibration, whereas the 30-week Air Force course only produced a "helper-level" graduate, who could not work unsupervised.

These and other problems were discussed at a meeting between Army and Air Force representatives at Lowry, 6 and 7 November 1973. Discussion at that

meeting showed that the first 14 weeks and the last 4 weeks of the training conducted at Lowry were compatible with Army PME training, but AO&S representatives said that the Army had an additional 580 hours in its program that the Air Force was not teaching, and that the Air Force taught 292 hours that were not needed by Army PME Specialists. Service representatives agreed, however, that this problem could by overcome by establishing special blocks of training for Army personnel, and exempting them from other blocks of instruction they would not need in the field.

Although this proposal would have created something closer to a collocation than a consolidation, there were other forces in motion that-made consolidation more feasible. The Army was restructuring its training, to produce specialists in different sub-areas of electronic equipment repair, instead of trying to produce one man knowledgeable in all areas of equipment calibration. Lowry received advance word of the impending change, and worked with the information the Army had exchanged for Air Force course information to produce a training program for the Army that would be compatible with the Air Force training program already in existence.

According to Mr. Moore, a training specialist of the School's Training Plans Branch:

> *. . . . when we vent back there is December (to the USAOC&SJ), we presented their program to them in terms of a restructuring of their MOS [military occupational specialty]. Colonel Creviston had been briefed in the meantime that this was coming about. Well, when we presented them training package that was compatible to their restructuring, that's when they gave us a tentative agreement that they would re-present their position to TRADOC. They did re-present their position, and that's when TRADOC agreed, 'alright, go on with these people.'*

Although equipment changes would still have to be made to bring Army-compatible, transistorized equipment into the courses, and there would still have to be some Army-unique training, the proposed program would bring Army and Air Force training closer to the intent of the interservice training concept. Colonel Creviston said he would deliver the Army position on the proposal as soon as the restructuring of the Army's, electronic MOS was finalized.

Lowry representatives met with Army personnel of the Army Ordinance Center and School at Aberdeen Proving Ground, Maryland, 6 through 10 May 1974. Together, they worked out the details of the consolidation, under which Army students would enter Air Force courses conducted at Lowry in January 1975.

The anticipated success of this Army/Air Force consolidation led to examination of the possibility of establishing a single interservice training program for all military electronics training.

Although the Navy had primary responsibility for the Department of Defense occupational field dealing with electronics, Lowry had been conducting PME training for the Navy for several years, and accordingly, the Navy asked Lowry to host a workshop on electronic test equipment.

During the 11 through 13 June 1974 meeting, all of the services presented their current training programs and discussed the possibility of consolidation. Although the Navy and the Aviation Marine Corps were already receiving calibration training at Lowry, the Marines were emphatic in refusing to consolidate their Ground Marine calibration training with that conducted at Lowry. They said that while the Marines emphasized field equipment and gave limited instruction on theory," the Air Force placed heavy emphasis on theory, and only trained on representative pieces of equipment that would be found in the field. They also stated that the Corps only provided maintenance and repair training, and that calibration training was not really required. Finally, they cited differences in the two-services' technical orders, publications, and maintenance procedures.

The consensus of those at the meeting was that possibilities for consolidation existed, if the Air Force made equipment changes and other course changes to recognize the unique needs of the other services. They also agreed that a working group should be established to standardize calibration training, providing a common ground from which to develop interservice training.

The preliminary report of the Electronic Test Equipment Training working group was approved by the Executive Committee of the ITRB during their 27 and 28 June 1974 meeting at Randolph AFB, Texas. This constituted final approval to consolidate the Army and Air Force basic calibration course at Lowry. At the same time, the ITRB directed the formation of a task group to investigate the calibration and maintenance training consolidation possibilities for advanced Army courses and Ground Marine courses. This group was to complete its study by 15 August 1974, and was to compile cost data by 1 September 1974 on the effect of this consolidation. (Vol 1, Pgs 78-81)

ADVANCED INSTRUCTIONAL SYSTEM

Introduction: The United States had been known for years for developing technology to solve problems; agricultural advances to increase food production in the face of rising population and decreasing space for crops, atomic energy research to meet the increasing demands for power in the face of diminishing resources, and the A-7D aircraft to meet demands for close air support during the Vietnam War.

As technology met the increasingly sophisticated demands of military weapon systems, so too the pace and complexity of the training required to operate these systems increased.

The Advanced Instructional System (AIS) was conceived as a parry to this technological thrust, based on the theory of fighting fire with fire. The system consisted of a multi-million dollar project to develop a computer-assisted and computer-managed instruction network to provide more effective and efficient training in the Air Force. The program's original charter (described fully in the last fiscal year history), called for research and development of the system by the Air Force Human Resources Laboratory (AFHRL), using three courses taught at Lowry; Inventory Management, Precision Measurement Equipment, and Weapons Mechanic (TAC) (Weapons).

Equipment: As in any computer-assisted and managed system, the first requirement was a computer. When contractor personnel from McDonnell Douglas Corporation (MDC) began arriving in July 1973, AFHRL personnel had already developed fairly concrete requirements for the system, and a CYBER 73 computer manufactured by the Control Data Corporation was quickly selected as the machine that would meet those requirements.

During the period between July and October 1973, MDC ordered more than $2 million worth of computer equipment, including the $1,661,070 CYBER 73 computer itself.

Once the computer requirements were finalized, construction began on a mechanical support building on the southeast side of the Human Resources Laboratory, Building 1470. This building was to house power supplies, air-conditioning units, and a water chiller unit used to cool the computer circuitry.

The support building contractor had to contend with the worst snowfall in 40 years during December 1973, when 30.8 inches of snow fell, and with another 8.2 inches in January. There were 13 days during the 2-month period when the maximum temperature did not rise above 32 degrees, and the average temperature in both months was below freezing.

The construction contractor countered the severe weather by installing a plastic cover during the second week of January, and running space heaters inside to raise the ambient temperature above freezing so workers could lay brick.

The computer was delivered on the morning of 21 January 1974, and it began snowing at noon. More than 4 1/2 inches of blowing snow accumulated that day, and the workers had to wait until the warmer days that occurred at the end of the month to install the air-conditioning units on the support building roof.

Meanwhile, inside the building, the installation of the computer hardware went according to plan, but operation of the system was delayed by high temperatures and high humidity. When the support building was erected at the rear of the AFHRL building, it blocked off the air vents. Although neither the air-conditioning nor chilled water supply were hooked up, the temperature had stabilized by the end of January, and all of the components except the computer mainframe and the extended core storage had been checked.

Power Interruptions: When the system was completely checked out, a potential problem arose. Interruptions to the commercial electrical power supply were causing errors in data handling. Power interruptions that would have gone unnoticed in a normal office environment had the capability to wipe out the memory banks of the central computer or erase the plasma display panel of the computer terminal used to present information to the students. Although the plasma panel could hold its image through 50 milliseconds, and the computer could operate without power for up to 500 milliseconds, longer power shut-offs would be disastrous.

The possible need foe uninterruptable power was recognized early in the planning stages, when Maj. Roger L. Grossel, the Deputy Program Manager,

suggested that a provision for adding uninterruptable power be made, and that a power monitor be installed to record power fluctuations.

The power monitor was installed in August 1973, and showed that the power interruptions did affect the equipment, according to Dr. Joseph Y. Yasutake, AIS Program Manager. Further study was require, however, to determine if the impact was great enough to require some sort of guaranteed power source to prevent training degradation. According to Dr. Yasutake:

> ... we *have not yet decided whether we will need uninterruptable power or not. There's no question that we are suffering a lot of power interruptions, but before we can justify a UPS [uninterruptable power system], we have to demonstrate that it has-an impact on something. When we get into the actual operation, and demonstrate that unless we had UPS, we would lose part of the data base and training would be affected, that's a justifiable reason for having UPS. But if we are experiencing power failures, but we don't lose any data, and it doesn't affect the activities of the students, then it probably isn't as critical.*

Although he was inclined to say that a UPS would be necessary, a final decision was not made this period, pending the outcome of the study.

Communications Network: Since the idea behind AIS was to provide computer interaction devices in the classroom, an extensive communications network was necessary to connect the student terminals to the central computer in the AFHRL facility, Building 1470. The tree courses were spread over an area which included buildings 758, 1433, 1496, 1498, and 1499. The McDonnell Douglas buildings, 492 and 493, were also included in the web.

The initial design of the communications system was done by an engineer from Griffis AFB, New York, with the actual installation to be accomplished by a team from the 1833d Electronic Installation Squadron (EIS) McClellan AFB, California.

However, when the team arrived in May, the base Civil Engineers had not completed some of the trenches that were to run from AIS buildings to the manhole covers which provided access to cable runs. Unable to begin work, the team returned to California.

The team returned to Lowry in mid-June 1974, expecting to complete the job in approximately 45 days. Incomplete preparation by the base Civil Engineers again stymied their efforts to do the job, as they found nine of the 23 cable ducts were closed by debris, and none had wires installed with which to bull the cable through. The team laid cable to and from the blocked conduit, leaving the ends to be spliced to another length of cable when the conduits were cleared.

The Civil Engineers called in the Roto-Rooter man, according to Mr. W.B. Merritt of the 1910th Communications Squadron, and gambled that none of the ducts were collapsed, but only clogged. “If one had been collapsed,” he said, “we might have accidently gotten into an adjacent tunnel and cleaned out some cable.” Only one duct was collapsed, and it was repaired without incident. The installation team, however, had not returned at the close of the period.

Student Computer Terminals: Just as in a telephone system, all of the wires had to lead from equipment to more equipment for a message to be transmitted and received. A typical 'conversation' between the computer and the student would consist of the student calling the computer, identifying himself, and asking for that day's lesson. The computer would then present information to the student, who would interact with the computer to establish that he was following the lesson.

There were two separate instruments that the student used to communicate with his electronic teacher. The first was dubbed the Type "A" terminal, and used a modification of the PLATO IV (Programmed Learning for Automated Teaching Operations -- a computer-assisted instructional system developed by Dr. Donald Bitzer of the University of Illinois.) display panel to present narrative study material. It also had a rear-projection capability, so graphic and photographic materials could be presented to the student through 35mm slide projection or 8mm single-concept motion pictures.

For student testing purposes, another device called the Type 'B' terminal. This enabled the student to take tests based on job criteria after completing a block of instruction, through the use of an optically-readable test sheet.

The AIS contractor, McDonell Douglas Corporation, received one Type 'A' terminal from Magnavox in December 1973, and four others in February 1974, primarily for development of computer software and for familiarization purposes. The first terminal was actually an unmodified PLATO IV terminal, but the others had a special keyboard designed specifically for the AIS.

A problem with the display panel of the Type 'A' terminal became evident during the first 2 months of testing. The plasma display panel of the terminal, which was used to present graphic and textual material to students, consisted of a transparent sandwich, with the space in the center filled with a pressurized neon-helium mixture. The outer panels had transparent conductors in a grid, and when a charge was applied through an X and a Y coordinate, the gas would be ionized, illuminating a point on the panel. This panel was operated by impulses from the central computer, which built textual messages and graphic displays from combinations of these points of light.

When one of the plasma display panels failed at Lowry, it was returned to the Magnovox Corporation for failure analysis. They found that the panel was flexing, and bowing out at the center, changing the spacing between the electrical conductors and the gas mixture, preventing the gas cells in the center of the panel from lighting up. This was attributed to the altitude differential between Toledo, Ohio, where the panel was manufactured by Ownes-Illinois, and Denver, where the airfield altitude was 4,800 feet higher. Ownes was changing the neon-helium mixture slightly, so the pressure could be lowered to eliminate the problem. The effect of this change on the reliability of the panel had not been determined at the end of the fiscal year, but a decision had been made to specify this modified panel on all type 'A' terminals.

Rear Projection Methods for Plasma Panel: Although the basic PLATO IV student terminal was designed to use a card-format microform known as

microfiche to project course material on the - plasma display panel from the rear, the Human Resources- Laboratory people were working on alternate projection systems. According to Dr. Yasutake:

> *. . . From the very beginning we* were *not very happy with that (microfiche) system, for a number of reasons. It requires, for example, compressed air in order to drive the microfiche. The microfiche format itself is non-standard, so we would have difficulties producing microfiche. And there are a number of other mechanistic kinds of problems that we saw with the thing.*

McDonnell Douglas sub-contracted to Martin-Marietta in Denver for the development of a filmstrip projector, but Dr. Yasutake said he was not satisfied with that approach either. He said that a possible solution was developed by AFHRL personnel:

> *Lieutenant Kirby, with Mr. Gardner, worked on a little interface board such that we could use the PLATO IV and the TUTOR (computer) language to drive a random-access S5mm projector. It's a very highly reliable system. What limitations there are on that, if any, are the limitations of a 35mm projector approach, which means you are limited' in the number of slides to a tray. There'd be a storage problem if you had a tremendous amount of images to store.*

Dr. Yasutake said that they would wait until microfilm and microfiche were developed into a usable system by someone else, because 'We don't want to get into a hardware development program. It just is not our bag.

Although Human Resources Lab personnel had predicted a Type "B" terminal would be on base by February 1974, printer selection problems delayed its arrival. According to Mr. Walker:

> *The problem was that the printer they selected the outfit that made the printer decided they didn't want to make a printer that looked like that, so they took it out of production. In fact, we just had a demonstration today of a new printer that looks even better than the one they previously selected, so it looks very promising. It's smaller, makes less noise, and with just a preliminary look at it, it looks like it will be much better, and we'd be able to have the printer right in there with the students, where before we thought we'd have to have a separate area for the Type 'B' terminal.*

Instructor Acceptance of the AIS: When an instructional system changed, the resistance of two groups had to be overcome; the students learning from the system, and the instructors whose roles were changed. Dr. Yasutake said "I'd like to say that they're (the instructors) overwhelmingly is support of the program, but the fact of the matter *is* that that's not the case."

He continued, explaining that the instructors who were directly involved in developing and executing the AIS plan did support the program, but those who were only peripherally involved were hesitant. He stated:

That's because you're changing their world, in a sense. Normally instructors are selected because they are good lecturers, it cetera. In the A1S environment, they don't do that much anymore, and don't like it. I think that perhaps once you change the role of the instructor, and you've defined it pretty well, it must be advertised to the outside world so that the guys who want to become instructors know what they're getting into. They should know that they're not going to be the podium-type instructors standing up in front of the classroom.

Throughout the history of computerization in this country, some people have looked upon it as a dehumanizing process, and Dr. Yasutake said that "we've really got a PR (public relations) kind of job to do. We've got to make sure that they (the instructors) understand that their role has not diminished, but in fact has increased, but for different reasons."

He also stressed that the instructor was going to have to maintain a broader range of knowledge about the subject being taught, since he would be dealing with individual students who would be at different points in the course, due to the self-paced nature of the instruction. The days when an instructor could 'read the next lesson and be ahead of the class' would end with the advent of the AIS.

Speaking of the changes and increased responsibilities of the instructor, Dr. Yasutake said:

He's probably going to have to be more involved, because of that person-to-person kind of contact, with the personal problems of students in a counseling kind of a mode, more than in the past. These kinds of changes can be drastic for the instructor, particularly for the guys who have been around for a while, because they're used to the other environment. It's up to us to get this message across, and at least minimize--I don't think we can ever completely overcome this kind of problem--but at least minimize some of the apprehensions that they might have.

Student Acceptance: The AIS had been tested most extensively in the Inventory Management course, with the other two courses mostly in the development stage. Most of the AISing of course material dealt primarily with self-pacing materials and finding the best media for presenting lessons, so there was little student exposure to computerization. Mr. Walker said that student acceptance of AIS materials that had been developed was good. As part of the development contract, however, Incentives were developed to give the student a greater desire to progress through the self-paced materials quickly. Mr. Walker stressed, however, that a particular incentive might not appear to be a reward to all students:

In one of the earlier tests in Inventory Management, they (the students) got to leave the base earlier, so they could go on leave, go home, or wherever they were going to, sooner. Of course, in some cases that works the other way; if they want to stick around because they've got a girlfriend or something, or they like Denver--it's not always an incentive to get to leave the base sooner.

He said that students would get through the course with or without the incentives, in his opinion, but that 'they might accelerate it a little bit.'

D. Yasutake made the point that concern for student and instructor acceptance was so great that it had taken precedence over meeting a deadline for implementation of the Type "B" terminal:

> *I wanted to make sure that we had gotten most of the glitches out of the system. . . . the worst thing that could happen would be to introduce the computer into the classroom and then have it bomb out time after time. I think that would be a very dangerous situation for us, in terms of student acceptance and instructor acceptance of the system.*

(Vol 1, Pgs 88-98)

T: mmr/LTC Creviston, Jr./4307

ATSL-TEW

SUBJECT: Review of Calibration Training

Commander
U. S. Army Training & Doctrine Command
Fort Monroe, Virginia 28651

1. Reference is made to:

a. Discussions between CG, TRADOC, and CG, USAOC&S on 30 Aug 73.

b. Unclassified message 292336Z Oct 73, ATTS-OP-S, HQ, TRADOC, subject as above.

2. During the discussions in reference la above, the Commanding General, TRADOC, expressed a desire to consolidate Army and Air Force calibration training and tasked the USAOC&S to identify methods for its accomplishment. Since the referenced discussions, an in-depth comparative study of current Air Force and Army calibration Programs of Instruction (POD was conducted. The study effort was supplemented by working level conversations among personnel of the USAOC&S, USAF School of Applied Aerospace Science, and HQ, AMC. Significant among the study findings are the following:

a. Major differences exist in both training levels required and equipment needed. For example, the 40-week Army calibration course is taught to a working knowledge level, producing a journeyman calibrator: whereas the 30-week Air Force course is taught to only the helper level.

b. In most cases, Army training is conducted on the same advanced design solid state equipment used for Army calibration in the field, while. Air Force training uses vacuum tube type equipment.

c. A lack of commonality exists in terminology and techniques.

3. Based on these findings, our interim conclusion is the present Air Force POI will not support the Army training requirements. However, from the study, we believe adjustments can be made in either Air Force or Army POI to meet the majority of current training requirements for each service. Specifically, consolidation would require:

a. The addition of 580 hours of Army subject material to the present Air Force course, through integration of material and the creation of a short Army equipment specialty block.

b. The development of common definitions, standards, equipment, and methods.

c. An increase in the specialty block length if item 3b above is not possible.

4. To further explore the feasibility of these conclusions, a working level meeting has been scheduled for the week of 5 November 1973 at the USAF School of Applied Aerospace Science. Representatives of the DOD Calibration Coordinating Group and the Army Metrology and Calibration Center will attend. We anticipate this meeting will result in the following:

a. The establishment of a joint Army-Air Force working level group for development of a detailed plan to accommodate the consolidation and effect the merger.

b. The determination of actions required by other activities in support of the consolidation effort.

5. Your headquarters will be advised of the results of our coordination with the Air Force. Currently, we envision a need for soliciting assistance from your headquarters in securing future participation of other agencies in achieving the consolidation goal.

LLOYD J. PAUL Brigadier
General, USA
Commanding

Cy Furn:
Chief, Calbr Div. WTD

(Vol III, Ex 56)

AMCQA-P

15 November 1973

MEMORANDUM THRU: CHIEF, PRODUCT OPERATIONS DIVISION

FOR: DIRECTOR OF QUALITY ASSURANCE, AMC

SUBJECT: Visit to Air Force Lowry Technical Training Center (LTTC), Lowry AFB, Colorado

1. Date of Visit: 6-7 November 1973

2. Personnel performing visit:

AMC

Mr. Jack L. Vogt, AMC HQ (AMCQA-P)
MSGT Kenneth V. Mattoon, MICOM (AMCC) (AMSMI-M)

TRADOC (Army Ordnance Center & School (AOC&S))

LTC Mark S. Creviston, Jr., Acting Dir/Weapons Tng Dept AOC&S
Mr. Zane M. Homer, Tng Spec, AOC&S

3. Purpose of visit: Initial informal joint Army and Air Force discussion regarding the feasibility and practicability of consolidating Army and Air Force calibration training at Lowry AFB, Colorado.

4. Air Force Personnel Contacted:

COL Gerald Brown, Dir/Dept of Avionics, LTTC
CAPT John Wenger, PME Tng Mgt. HQ, Air Training Command (ATC)
CAPT Gordon Luna, Chief, Metrology Tng Br, LTTC
Mr. Thomas L. Floyd, Prog Directorate, LTTC
Mr. David B. Moore, Tng Spec, LTTC
MSGT Henry F. Want, Tng Spec, LTTC
Mr. V. G. Gildea, Tng Ofcr, Metrology Tng Br, LTTC

5. Summary of significant discussion: All following discussion was informal, with no official positions taken or commitments made by either Army visitors or Air Force ATC/LTTC representatives.

a. Willingness/capability of Air Force ATC/LTTC to provide the Army with calibration training.

(1) ATC/LTTC representatives expressed a definite willingness t provide the Army with calibration training, providing the propos-consolidation can be accomplished without degradation of training now being provided Air Force and Army calibration personnel.

(2) Army annual input (100-150/year) added to the present Air Force/Navy/Marine Corps input (650/year) could be handled without facility expansion only if the LTTC is returned to a full four shift/day operation. Under the present three shift/day concept, facilities would probably have to be expanded either by movement of special advanced courses to another building or by new construction. It is important to note that the LTTC has on previous occasions successfully operated on a full four shift/day basis. Total enrollment would rise to about 800 as a result of the consolidation. The school will be able to handle 714 students on a three shift/day basis when a seventh set of equipment now on order is received. The fourth shift would increase the school's student capacity to about 950, well above the anticipated enrollment. Movement of the "Advanced Training" courses into another building would vacate 8-9 additional classrooms for use in the event a fourth shift is deemed unacceptable.

b. Correlation between Air Force LTTC and Army AOC&S curriculum.

(1) The LTTC basic 30 week course does not cover microwave or physical/dimensional measurements. Those areas and nuclear radiac measurements were dropped from the basic course when a 1969 Air Force study revealed that less than 15% of the course graduates were placed in assignments requiring the skills acquired during those phases of the course. LTTC does, however, offer "Advanced Training" in Electrical/Electronic Measurements (180 hours). Aircraft Engine Test Stand Calibration (190 hours), DOD AIMS Test Set Maintenance (240 hours), Microwave Measurements (120 or 320 hours), Physical/Dimensional Measurements (240 hours), Optical Measurements (180 hours), and Electronic Test Equipment (MAP) (240 hours). Four of these courses were established to meet Navy needs, and ATC/LTTC representatives informally indicated that other "Advanced" or "Supplemental" courses could also be established if necessary to meet Army needs.

(2) According to AOC&S/LTTC discussion, the first 14 weeks and last 4 weeks of the LTTC basic 30 week course appear to be very similar to corresponding AOC&S instruction. However, the AOC&S representatives estimated that about 580 hours of AOC&S instruction is not included in the LTTC curriculum and some 292 hours of LTTC instruction are excess to Army needs. Further discussion revealed that the OAC&S review was limited to summary type material and did not include an analysis of detailed LTTC Study Guides and Work Books. The AOC&S estimates were also based upon an AOC&S assumption that LTTC curriculum hours which do not describe operation of specific Army calibration standards are not applicable to Army needs.

(3) Two hundred and fifty-nine of the 292 LTTC hours AOC&S estimated were excess to Army needs are in Blocks VII through X (weeks 15-26) of the LTTC course. The remaining 33 hours are in Blocks I, III and XI. LTTC personnel agreed that Army personnel could skip or omit any entire Blocks of the basic 30 week course without causing any major scheduling or student load problems. Parts or portions of Blocks could not be omitted, as this would create major student load problems.

(4) It was agreed that the AOC&S would perform an in-depth review of, detailed LTTC course material, to be provided by LTTC, to make a more precise determination of LTTC course applicability to Army needs.

(5) Army students could attend some portion of the basic 30 week LTTC Course plus selected “Advanced Training” courses to satisfy Army needs, providing the sum total of the training would not exceed the length of the 40-41 week AOC&S course.

c. Compatibility between LTTC and AOC&S equipment. There is considerable difference between the equipment now used by the two schools.

(1) AOC&S uses the same calibration equipment that Army calibration specialists will use in the field, whereas LTTC uses equipment considered to be representative of equipment Air' Force calibration specialists will encounter in the field. AOC&S equipment is of very modern solid-state design, whereas most of the LTTC equipment is still of a much older vacuum tube design. However, the LTTC course does cover solid-state circuitry (Blocks IV and V).

(2) Air Force Calibration Laboratories are now being issued many more modern solid-state equipment. Air Force TFCU's (Transportable Field Calibration Units) are already equipped with modern solid-state equipment, much of which is identical or very similar to current Army calibration equipment. The exact time-frame for the update in each major parameter was not available during this visit. However, the update will certainly bring about more commonality, from both equipment and instruction standpoints, between the LTTC and AOC&S courses.

(3) The modern equipment now used by AOC&S would be available for transfer to LTTC if the recommended consolidation is implemented. This influx of modern equipment would greatly enhance and expedite the LTTC up-date efforts.

d. Cost (to Army) of Air Force Training. Probable cost to the Army was not discussed per se, but it was learned that the Navy pays the Air Force (under ISSA) about $6,000/year to operate the four "Advanced Training' courses LTTC established solely to meet Navy needs.

e. Integration of Army Instructors Into the LTTC Faculty. It was agreed that it would be mutually beneficial to both Services to integrate Army instructors into the LTTC faculty. Army instructors, however, would be used only to teach “special” or "advanced" courses required by the Army and Army peculiar parts of the basic course(s). The number of Army instructors would be limited to the number necessary to handle the Army input to the LTTC.

f. Miscellaneous.

(1) Student elimination (failure) rate at LTTC is currently 6% flashback (repeat of Blocks) rate is currently 20%.

(2) LTTC has a 4-year contract with McDonnell Douglas Co. to develop a computer assisted/managed course based on the 'self-pacing' concept which was highly advocated by Gen. Depuy (Cdr, TRADOC) in an AUSA 'Army Magazine' article (Nov 73 issue) and is a measure intended to improve training effectiveness and reduce elimination/washback rates.

(3) According to the LTTC, graduates of their 30 week basic course are granted 68 semester hours credit in the precision measurements area by Colorado State University. The basic LTTC course is fully accredited by the North Central Association for Higher Education.

(4) LTTC accepts women (WAF) in their precision measurements courses.

(5) LTTC does not allow DOD civilians to attend the basic 30 week course, as the Air Force will not hire civilian calibrators who do not already possess basic calibration skills. Civilians can attend any of the several"Advanced Training" courses. NOTE: The majority of Army's civilian calibrators also possess basic calibration skills so this would not affect Army needs. If fact, this would be an advantage of the present situation, as we now frequently experience difficulty in obtaining AOC&S approval for civilians to bypass early and middle phases of the AOC&S course.

6. Recommended Future Actions. Although no official commitments were made, Army and ATC/LTTC representatives mutually agreed that certain actions would be mutually beneficial to both Army and Air Force. Attendees mutually agreed to further discuss implementation of the actions listed below upon return to their respective Commands.

a. Temporary assignment of representative Air Force graduates (2-15) from the LTTC basic 30 week course to the Army's 95th Calibration Service Company, Redstone Arsenal, Alabama, to evaluate their capability to perform on an Army Mobile Calibration Team without extensive on-the-job training (OJT). This would provide valuable practical experience to assist in determining the applicability of the Air Force training to Army needs.

b. Rerouting of representative Army personnel, previously scheduled for attendance at AOC&S, through the LTTC 30 week course to an assignment as an Army Calibration Specialist. This, too, would assist in determining applicability of the Air Force Training.

c. Routing representative Army graduates from the AOC&S 40-41 week course through the 120 Hrs Block XI 'Test Equipment Troubleshooting, Repair and Calibration-Procedures' segment of the LTTC 30 week course.

7. Another meeting of Army (AMC/TRADOC) and Air Force (ATC/LTTC) personnel is tentatively scheduled to be held at the AOC&S Aberdeen Proving Ground. MD, in about six weeks from the date of this meeting. Discussion during the next meeting will include:

a. Results of the AOC&S review of detailed LTTC instruction material, and,

b. Implementation of recommended future actions as discussed in 6a, b and c above. Arrangements for the next meeting will be finalized by LTC Creviston, AOC&S.

JACK L. VOGT
Quality Assurance Specialist

CF:
COL Gerald Brown, USAF, LTTC
COL James J. Walsh, USA, AMCC
LTC Mark Creviston, Jr., USA, AOC&S
MAJ Warren Bailish, USA, HQ, TRADOC
CAPT John C. Wenger, USAF, HQ, ATC (Vol III, Ex 57)

TTO 17 December 1973 10-13 December 1973

TTOX Consolidation of Calibration Training USAF - US Army.

XRP TAV TAVM TTQR ATC/TTKA Further evaluate collocation and/or integration of the US Army program with the USAF program

US Army Ordnance Center and School
Aberdeen Proving Ground, Maryland

Mr. David B. Moore, Training Specialist, GS-12 TTOX

LtCol M. S. Creviston Jr., Acting Dir Weapons Tng Dept AOC&S APG, Md
Mr. J. L. Vogt, AMC Hq (AMCQA-P) Alexandria Va
Mr. Z. M. Homer, Tng Specialist (AOC&S) APG, Md
MSgt K. V. Matton, MICOM (AMCC) (AMSMI-M) Redstone Arsenal Al
Capt F. Vogel, Branch Chief (AOC&S) APG, Md
Capt J. Wenger, Training Manager, Hq ATC/TTKA Randolph AFB Tx

Summary of significant discussion: Following items discussed were informal with no official positions taken or commitments made by either Air Force ATC/LTTC or US Army representatives:

a. Feasibility of collocation: The Army proposed the relocation of their training to Lowry AFB with respect to utilizing Blocks I - VI (14 weeks) of Course 3ABR32430-2 PME Specialist, entry rate 6 students/3 weeks TPR est.102 students. Upon completion of this training the students would attend the Army calibration training 26 weeks duration. All necessary equipment, personnel, and training materials would be provided by the Army. Facilities, reproduction and other support requirements would be provided by the Air Force. This action would centrally locate all of the Metrology training at Lowry AFB and basically under the general management of the Air Force. However, the relocation of the Army program to Lowry AFB just to relocate was not considered highly economical although it was feasible. Further evaluation of this type action to fully determine the efficiency and total economic savings is required.

b. Feasibility of Single Course Training Program: This program is more in line with the concept of the Interservice Training Committee. The following action would have to be taken in order to accomplish the integration:

(1) The Air Force would have to upgrade the 3ABR32430-2 course to the total state-of-the-art measuring equipment (solid state). The present update program that TAVM is involved in. to achieve a total solid state program, with respect to Block IX; Oscilloscope; Block X, Frequency; Block VII, Digital Voltmeters along with the supporting Applied Measurement Blocks IV, V, and VI would require additional work. This would include updating meter calibration equipment, AC and DC power supplies, and selected signal generators to include the appropriate theory units of instruction. It should be noted that TAVM has been evaluating these requirements, not only with respect to the basic course,

but also to include an Advanced Electrical-Electronic course. Upon completion of this action the 3ABR32430-2 course (30 weeks) would be compatible for use by the US Army to support their transfer standards program. A three week add-on for Army students would be required to complete their training requirements.

(2) An additional Army course of eleven weeks would be required to conduct training on their Microwave, Physical and DC-L6w Frequency Reference Standards. However, based on an analysis of a proposed 35H Career Restructuring Proposal, if approved, would not require all of the students attending the 3ABR32430-2 course to attend this training since only 10-20 percent of their personnel perform this work.

(3) The Army would support the two programs, the 3ABR32430-2 three week add-on and the eleven week course, with equipment, necessary training and management personnel, and support items.

(4) This program would in effect provide the most economical and feasible action to present to the Interservice Training Committee for full analysis and determination.

c. Lt Col Creviston informed the ATC/LTTC representatives that he would notify them of the Army position as soon as the status of the 35H restructuring proposal was known.

RECOMMENDATIONS:

TAVM continue with the total solid state update to the 3ABR32430-2 course considering the additional areas and submit a complete plan to TTOX for evaluation. (Vol III, Ex 58)

US ARMY - US AIR FORCE CALIBRATION TRAINING
MEETING 6-10 MAY 1974

UNITED STATES ARMY ORDNANCE CENTER AND SCHOOL
ABERDEEN PROVING GROUND, MARYLAND

PURPOSE: To develop an implementation plan, milestones, and costing base for integration of Army and Air Force Calibration Training at Lowry Air Force Base, Colorado.

ATTENDEES:

Mr. David B. More LTC	UAAFSAAS/TTOX	926-3664
Mark S. Creviston	USAOC&S/ATSL-TEW	870-4307
Mr. Zane M. Horner	USAOC7S/ATSL-TEW-C	870-4983
CW2 Andrew C. Mitchell, Jr.	USAOC&S/ATSL-TEW-C	870-2818
Mr. V.G. Gildea	USAFSAAS/TAVM 926-4559	926-4559
CPT Howard P. Schumacher	USAOC&S/ATSL-TEW-C	870-4983
CW3 Johnny M. Ortiz Mr.	USAOC&S/ATSL-TEW-C	870-2896
Mr. Charles M. Santoni	USAOC&S/ATSL-MB	870-4908
MSG Millard H. Ulmer	USAOC&S/ATSL-TEW-C	870-4983

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PROPOSAL UNDER CONSIDERATION

This concept utilizes the Air Force 30 week PME Specialist Course with an additional four weeks of training on Army equipment, oriented primarily towards functioning at transfer level. Training will consist of transfer level requirements in the areas of DC & Low Frequency, Physical Standards, plus an introduction to Microwave. All personnel completing this course will be earmarked for assignment to mobile transfer teams only. It is envisioned that this training will be conducted in two Army Calibration Vans configured in some manner as currently found in the field.

Also, being considered in the feasibility of a Air Force/Army training split during the last four weeks of the 30 week PME course, i.e., Army Students would receive self paced training on Army equipment, applicable TAMMS manuals and procedures. This approach would, in all probability, reduce the requirement for the additional four weeks of training initially indicated. One to two weeks would be required for instruction in physical standards, and van operation. Final determination will be based on the results of a feasibility study to be jointly conducted by the Army and the Air Force.

In addition to this initial training, Advanced Specialty training will be conducted as a reenlistment option, i.e., E5 and E6 level with prior field experience at the transfer level. Training will be oriented towards the reference level laboratory specialist. Utilizing current Air Force advanced specialty courses total training time will be approximately 16 weeks, plus an OJT supplement; however, the Air Force is currently revising its advanced courses and it is envisioned that these courses could be aligned to meet Army/Air Force requirements. This would reduce the overall training time and possibly eliminate the requirement for the OJT supplement. It is emphasized that this training will be provided as a reenlistment option only, thereby constituting an annual input of 30 to 40 students.

II. MINIMUM DATA REQUIRED FROM EACH SERVICE

1. Service preparing data.

2. Location at which training is currently being conducted.

3. Proposed location of consolidated training.

4. Proposed implementation date for consolidation. 750102

5. Course number and title.

   a. 3ABR32430-2 PMS Code: PDS USAF'

   b. 3ABR32430-( ) PDS Code: USA

   Precision Measuring Equipment Specialist (Army)

6. Course length - (weeks/days) both before and after consolidation.

   a. 30 weeks 30 weeks

   b. 40 weeks 34 weeks

   * See Proposal Statement

7. Student status - indicate whether student are pipeline or TDY/PCS.

   a. Pipeline/PCS b. Pipeline/PCS

8. Student model grade - (a) for pipeline students indicate either the most probable grade (e.g. 90% El's) or the average grade; (b) for TDY students indicate the type of students (e.g. airman), and either the average grade or grade spread (e.g. E5-E8).

   a. E-4/Pipeline b. E-4/Pipeline

9. Student entries - give totals per fiscal quarter for each service participating in consolidation for: (a) the fiscal year in which training is to be phased in; and (b) the succeeding complete fiscal year (level-off).

a. AF TPR		*b.
Combined	USAF	3Qtr/75 51 est
	D/N	4Qtr/75 49 est
	ANQ	lQtr/76 25 est
	MAP	2Qtr/76 25 est
	FWWF	3Qtr/76 25 est
	Others	4Qtr/76 25 est
		*TPR is based on present AF Flow Chart, dated 2 Apr 74

Leveled Off	66/3Qtr 75	3/4Qtr FY 75 - USA
	72/4Qtr 75	Project 80
AF TPR is subject to revision		TPR 150
Fy 76 present Qtr TPX is 91		FY 76 - USA project

Headquarter Air Training Command/DCS Technical Training will be responsible for programming Army TPR. Department of the Army will provide the TPR.

10. Average student load (indicate if attrition adjusted).

a. Present 360	b. Present 132
3Qtr/75 - 250	3Qtr/75 - 51

11. Attrition rate - state current attrition rate. If estimate is used, please so indicate.

a. 12 %	b. USA will accept 12 % as standard

Elimination Rate (Attrition)

The 12% elimination rate presently assigned to the 3ABR32430-2 PME Specialist Course is based upon the academic performance of the students with respect to entry prerequisites. The Air Force entry prerequisites are based upon the minimum requirements which a student must meet in order to satisfactorily complete the training.

Students entering below the minimum entry prerequisites cannot be expected to satisfactorily complete the training program, and have historically comprised a majority of the attrition. A comparison of Army/Air Force prerequisites is attached.

I

12. Personnel requirements - (incremental or decremental as a result of consolidation). Itemize by grade, by military or civilian, and by functional area those personnel which will be added-on or given-up in the following categories:

a. Instructors and/ or supervisors.

Anticipating workloads indicate an instructor requirement of 68 personnel based on factors and computations shown at Incl 1. This represents an effective increase of eight instructors/supervisors over that required for the program without Army input. As Army student input represents 1/3 of total student load, instructor force is based on the Army/Air Force ratio of 1/3 Army, 2/3 Air Force. The following Army instructor positions are thus established.

23 Army personnel are required as follows:

3 ea GS-09 Instructor

6 ea E-7 35H40 Instructor

14 ea E-6 35H20 Instructor

Phase-in of instructor force will be accomplished as follows.

2Q - FY 75	1 GS09
	7 EM
3Q - FY 75	1 GS09
	7 EM
4Q - FY 75	1 GS09
	6 EM

Array instructors will augment Air Force resident personnel during the FY 75 phase-in period. Army personnel will replace Air-Force instructors on a 1 for 1 basis, contingent upon FY 76 and future training personnel requirements. Initial augmentation vis a vis replacement is required to provide for instructor training, Army peculiar course writing/development and necessary familiarization with Air Force equipment, procedures and techniques. To facilitate and maintain total workforce integration. Army instructors will be stabilized for a three-year period. Minor program variations (less than 30%) will be absorbed by the Air Force Cadre. Variations exceeding 30% will require revision of Army Cadre strength. The total Cadre complement will also support USAMC Civilian Training requirements.

Civilian positions requested by the Army: three (3) each QS09 Instructors will be transferred to the Air Force from the Army, and will appear on the Lowry Unit Detail Listing (UDL). FY 75 funds will be transferred with positions. Budgeting for these positions beyond FY 75 will be an Air Force responsibility; however, the positions will be annotated as being in support of Army training and will be applied against the Army Instructor Cadre.

Applicable Civil Service regulations for the above civilian positions will apply. The civilian grade structure between the Army and the Air Force differ; the Air Force grades tend to be generally lower. Civilian Instructor positions at Lowry will be graded according to Air Force criteria. Three of the present OS Army civilian instructors (GS11 position) desiring to transfer with the function to fill the GS09 positions must be given a minimum of 60 days advance notice and other appropriate/applicable civil service considerations. This action will require Lowry Air Force Base CPO action to fully support the efficient transfer of OS Army civilian personnel.

Manpower Formula: 1.2795 + G (1.8958) + 2 (.007)

AF Instructor/Supervisor Requirement 3Qtr/FY 75

30 Class Sections

ANG Class Size 7 students

Mt = 1.2795 + 30(1.8958) + 210(.007)
1.2795 + 56.8840 + 1.470
59.6335
Mt = 60 Required

AF Instructor/Supervisor Requirement 3Qtr/FY 75
USA Student Phase-In Projected 6 months
1 Qtr/FY 76 Manning Requirement

34 Class Section - a. 30 Class Section 9 students
b. 4 Class Section 4 students

Mta = 1.2795 + 30 (1.8958) + 270 (.007)
1.2795 + 56.8840 + 1.890

Mta = 4 (1.8958) + 16 (.007)

+ 7.5832 + .112

Mt = 1.2995 + 64.4772 + 2.002

M_T = 67.7567

Mt = 68

MT = increase of eight Instructor/Supervisor Positions

b. School, Department or Branch support.

(1) School - none projected

(2) Department - none projected

(3) Branch -

WO - 1 ea 2Q/FY 75

E8 - 1 ea 2Q/FY 75

G00 - 1 ea 2 Q/FY 75

Liaison Duties

To provide technical/administrative assistance to Chief, Metrology Training Branch, Department of Avionics Training in all matters of operational and academic nature concerning students attending the Precision Measuring Equipment Specialist Course. This will include duties as follows:

(a) Academic and non-academic counseling of Army students.

(b) Maintain coordination with TTOC and USAOC&S concerning matters of a doctrinal nature and requirements for revision of course content.

(c) Maintain coordination with the US Army Metrology Center, Redstone Arsenal, Alabama, to ensure training equipment is updated in accordance with field requirements and provide new equipment training (NET) for Army/Air Force instructor personnel.

(d) Maintain technical library of applicable Army publications and provide for continuous update of same, as well as ensure publications utilized by instructors and students reflect the most recent changes. Includes establishing pin-point distribution for required publications.

(e) Advises Detachment Commander on all matters concerning Army enlisted personnel to include assignments, promotions, leaves, and awards, etc.

(f) Maintains close liaison with Air Force personnel concerning submission of Army Enlisted Efficiency Reports.

(g) Establish program to provide information to Army personnel concerning calibration mission policies and standard operating procedures.

c. Base operating support and medical

See 12e - Other.

d. Detachment/Administrative

The proposed USA Detachment which will be established at Lowry Air Force Base To support the Audio-Visual Training Department of Aerospace Photography Training is acceptable to both agencies concerned.

An Army detachment will be established at Lowry Air Force Base with authorizations for military personnel appearing as a separate item in the TDA for USASESS, Fort Gordon, Georgia. The following detachment configuration was presented in minutes of Interservice Training Audio-Visual Meeting, 14 Mar 74.

Company Commander	-	CPT
XO - WAG	-	1Lt
First SGT	-	E-8
Personnel Staff NCO	-	E-7
Company Clerk	-	E-5
Clerk Typist	-	E-4
Mail Clerk	-	E-5
Supply SGT	-	E-6
Supply Clerk	-	E-4
3 NCO's (Training or Platoon NCO's)		

An advanced party for the detachment will be assigned to Lowry Air Force Base by 1 November 1974. The company commander will report to the US Army Detachment Commander (05)/Assistant Department Chief of Department of Aerospace Photography Training. The detachment commander will report to the Air Force Department Chief as well as to the Commandant, USASESS.

e. Other.

3 EM are required for maintenance (repair and calibration) of Army inventory equipment used in support of training.

(1) E7 35H40 MOS

(2) E5/6 35H20 MOS

EM are to be assigned to Base Precision Measurement Equipment Laboratory (BPMEL). These individuals will be added to augment the LTTC/LG BPMEL UDL and identified as Army Equipment Support personnel.

Note. - Maintenance personnel could also support Army Audio Visual equipment maintenance (repair and calibration).

13. Materials and Services Requirements.

a.	None	a. None
b.	Branch TAOM Present Budget (Fiscal) No additional Cash Future budget (Fiscal) is dependent upon TPR FY 76. Based on present budget will be required unless there is a major change in cost of present items.	b.
c.	Unknown	c.

14. Equipment requirements,

a. Procurement.

(1) DC and Low Frequency Area.

(a) Total line items 156 ea Cost $323,659

(b) Provided by USA

(2) Physical Standards.

(a) Total line items 54 ea Cost $53,000

(b) Provided by USA

(3) Microwave Transfer Level.

(a) Total line items 24 ea Cost

(b) Provided by USA

(4) Equipment planned and funded by AF which will be prevented by consolidation:

FSN	NOUN	QTY	TOTAL COST
6625-649-4828	HP-410C Meter	7 ea	$ 3,708
6625-115-2582	JF-540B Xfr Std	4 ea	$ 4,800
6625-239-8924YA	332B DC Std	7 ea	$28,154
6625-255-8166	HP745A AC Cal	4 ea	$18,000
	TOTAL	22 ea	$54,662

b. Maintenance.

(1) Additional equipment maintenance.

(a) AF BPMEL 234 line items

(b) USA will lose

(c)

(d)

15. USAF requirement only.

a. Modification of the present Engine Test Stand training area located East side of Bldg 1433 will require modification and support two each US Army Calibration Vans.

Van (Closed)
Length - 371 inches
Width - 98 inches
Height - 136.37 inches
Weight - 44,256 lbs

Van (Open)
Length - 449 inches
Width - 167 inches
Height - No change
Weight - No change

Pad area required/Van
Length - 44 feet
Width - 10 feet

Load Capability: 45,000 lbs

Lighting: Available - realign direction

Power Requirement:

New Van - 115 VAC, 60 cycles three phase 40 amps
One circuit/van 28 VDC and 400 cycles AC Converter self contained.

Old Van - 115 VAC, 60 cycles three phase 40 amps
circuit/van
115VAC, 400 cycles three phase 40 amps
circuit/van. 28VDC is self contained.

b. Modification to above area would require minor construction of the Calibration Van Pad areas as indicated above.

c. None.

16. USAF

a. No increase on present AF students

b. No USAF personnel PCS impact

(1) Implementation Trips

Four trips
two personnel/trip
Lowry Air Force Base, Co 80230
Destination
Two trips - Aberdeen Proving Ground, MD
One trip - HQ, ATC-ITR Meeting
One trip - Redstone Arsenal, Al
Rental car required at Aberdeen/ Redstone.

(2) Annual Surveillance trips

None - USAF

17. USAF

a. None	Army
b. None	a. None
	b. Decrease of training re-requirement for approximately 25 instructors annually.
c. None	c. None
d. None	d. None
e. None	e. None

18. USAF

a.

Army

a. None

.

b. None

c. None

d. None

19. Pertinent description or explanations.

20.

EQUIPMENTS (DELIVERY/ACCOUNTABILITY)

1. All equipments to be provided by the Army must be on-hand 60 days prior to actual classroom need date.
2. Shipping instructions should be finalized prior to actual shipment of the equipment. It is recommended that the equipment be shipped from its shipping point directly to the Metrology Training Branch, Department of Avionics Training, Bldg 1433, Lowry AFB, Colorado 80230.

3. Upon receipt of equipments, the Metrology Training Branch supply representative will inventory the equipment, validate receipt, .and submit for local Lowry AFB stock number by 601b action to establish equipment control numbers. A special Army EAIP account number will be established. This account will be managed by the branch to maintain positive control over the equipment at all times. All transactions with respect to those equipments (recoverable) will be handled in the same manner. Expendable (non-recoverable) items will be controlled by a cardex system.

Comparison of USA/DSAF Prerequisites

	USA	USAF
High School Graduate (GED)	Yes	Yes
Related Courses (physics, trig, algebra logarithms, general science)	Desirable	
*Electronic Aptitude Score	EL 110	Elec 80
Color Vision	AR 611-201	AFM 160-1
Remaining Active Duty	2 years	2 years

* USAF AQE score of 80 is equivalent to USA EL score 120. The Army will have to establish reassignment procedures to deal with students that fail the course. These procedures/actions would be managed by the Army Liaison personnel assigned to the Metrology Training Branch through the Army Detachment.

CURRICULA MATERIALS

The Army will initially provide the following 'list of text materials, technical manuals, technical bulletins, and assorted regulations/pamphlets required to provide Army students with text materials. The following list reflects the item and quantities required.

Note. - Programmed text, TM's and TB's are recoverable items for continuous use by incoming students.

SPECIAL TEXT ST 9-188-3, Calibration Equipment Physical Standards - 200

SPECIAL TEXT ST 9-188-1, DC & LOW FREQUENCY CALIBRATION EQUIPMENT - 200

SPECIAL TEXT ST 9-178, Thermometry

Programmed and Linear text required - 50/200 SPECIAL TEXT ST 9-178-2

INTRODUCTION TO FLUID PRESSURE

Programed and Linear text required - 50/200 SPECIAL TEXT ST 9-178-3

SPECIFIC GRAVITY

Programed and Linear text required - 50/200

FIELD MANUALS

FM 29-20
FM 29-27

TECHNICAL MANUALS

TM 9-1400-425-35
TM 9-2320-209-20P
TM 9-2320-209-35
TM 9-2320-209-35P
TM 9-2320-211-ESC
TM 9-4931-383-14-1
TM 9-4931-388-15
TM 9-4931-445-14-1
TM 9-6625-390-50
TM 9-6625-967-14-1
TM 9-6625-1027-50
TM 9-6625-1392-50
TM 9-6625-1860-50
TM 9-6625-2467-50
TM 11-486-10
TM 11-600-2
TM 11-6625-1614-15
TM 38-750

ARMY REGULATIONS

AS 750-25

MISCELLANEOUS

DA Pam 310-4
AMCC Pam 702-6

TECHNICAL BULLETINS

TB 9-4931-218-50
TB 9-4931-219-50
TB 9-4931-402-50
TB 9-6625-059-50
TB 9-6625-186-50
TB 9-6625-337-50
TB 9-6625-342-50
TB 9-6625-366-50
TB 9-6625-390-50
TB 9-6625-755-50
TB 9-6625-770-50
TB 9-6625-798-50
TB 9-6625-889-50
TB 0-6625-896-50
TB 9-6625-949-50
TB 9-6625-961-50
TB 9-6625-982-50
TB 9-6625-990-50
TB 9-6625-1027-50
TB 9-6625-1182-50
TB 9-6625-1860-50
TB 9-6625-1861-50
TB 385-4
TB 43-180
TB 750-25
TB 750-92-10/51
TB 750-115
TB 750-236

MILESTONE CHART

19 May 74	Air Force briefing (LTTC)
28 May 74	LTC Creviston briefs Log Center
30 May 74	Incremental/Decremental cost data to service representatives for costing
Jun 74	ITR Board (Randolph AFB, Texas)
Jul 74	Develop ISSA
1 Aug 74	Approved ISSA - Course Coordinator activated at APG
1 Oct 74	Personnel transfer (8 EM) begins, instructor training, material writing, liaison to Lowry AFB (1 WO/1 E8/E9)w
1 Nov 74	Army Detachment is formed
29 Nov 74	Last 35H20 input at APG
2 Jan 75	Army student input at LTTC
26 Mar 75	Air Force PME equipment update complete
1 Apr 75	Personnel transfer complete, equipment transfer begins 23 Apr 75 First Army trainee in Air Force, Block #7
30 Jun 75	Equipment, curriculum material transfer complete
26 Aug 75	First 35H10 graduates from LTTC
30 Sep 75	Last 35H20 graduates from APG
31 Oct 75	END

(Vol III, Ex 59)

MINUTES OF INTERSERVICE WORKING GROUP
ON
ELECTRONICS TEST EQUIPMENT TRAINING
11-13 JUNE 1974

1. Col McMasters opened the conference by welcoming conferees to Lowry and emphasizing the need for all services to work together to obtain maximum value from training resources. Maj Wenger described the conference goal to review all courses providing electronic test equipment maintenance or calibration training to determine the feasibility of further consolidation of training between services. Overviews of the individual service electronic test equipment repair and calibration training programs were presented by the appropriate service representative.

2. Navy: ETCM Stewart discussed the hierarchy of standards; fleet calibration facilities; and shore and fleet field calibration standards. Navy training consists of 46 weeks of training for Aviation Electronic Technicians (AETs) and 47 weeks of training for Surface Electronic Technicians (SETs). Following this training at either Great Lakes or Treasure Island those chosen to obtain the additional qualification of calibration specialist attend two of four courses conducted for the Navy at Lowry. These courses consist of:

Course 3AZR32470-5, Advanced Electrical Electronic Measurement, 6 weeks.

Course 3AZR32470-6, Advanced Microwave Measurement, 4 weeks.

Course 3AZR32470-7, Precision Physical Measurement, 8 weeks.

Course 3AZR32470-8, Precision Optical and Dimensional Measurement, 6 weeks.

3. Those completing the -5 and -6 courses are given Navy Enlisted Classification (NEC) Code ET 1598 if assigned as surface personnel or NEC Code 6622 if aviation personnel. Those completing the -7 and -8 courses are awarded NEC Code IM 1821.

4. Marine Corps, Ground Calibration Program: Mr. Vestal reviewed the Ground Calibration and Repair Program and discussed training given to Instrument Repair and Calibration Technicians. Following 12 weeks of basic electronic training at 29 Palms and 17 weeks of test equipment repairman training at Albany GA, Ground Marines may be assigned to the field as Electronic Test Equipment Repairmen (MOS2871); receive additional Air Force training (-5 and -6 courses) awarding MOS2872; or receive additional Air Force training (-7 and -8 courses) awarding MOS 2873. Personnel receiving both 2872 and 2873 training are awarded MOS2874.

5. The Marine 2800 series MOS is broken down as follows: 2871 – Test Equipment Repairman; 2872 - Electronic Calibration Technician; 2873 - Mechanical Calibration Technician and 2874 - Metrology Technician. Repair and Calibration Technicians work in the same laboratory. MOS2871 is basically responsible for maintenance and repair .while MOSs 2872 and 2873 are usually

senior staff NCOs and therefore normally supervisors/managers. If circumstances warrant 2871 technicians man calibrate low accuracy items following appropriate OJT.

6. Aviation Marine Corps Calibration Program: Navy controls the Marine Corps Aviation Calibration Program. Aviation Calibration Technicians now enter the Air Force PME school direct from bootcamp and receive training identical to AF 32430 personnel. The first Aviation Marines entered the 30 week Air Force PME specialist course in Jan 74. First graduates will enter the field in Sep 74.

7. Army Calibration 35H Area: Lt Col Creviston presented detailed analysis of 35H-Calibration Specialist - Career Field, followed by an analysis of Army Calibration Training and proposed consolidation with the Air Force Precision Measuring Equipment Specialist program. Comparison of instructional programs revealed significant compatibility with Field Transfer Calibration Team requirements if major training equipment modifications were effected by the Air Force. Equipment requirements involved replacing Air Force vacuum-tube type equipment with advanced design solid state equipment. Evaluation also revealed the necessity for additional Army training in Microwave and Physical Measurement Standards as well as Laboratory techniques.

8. The consolidation proposal involves Army utilization of the 30 week Air Force PME (Equipment modified) course with an Army peculiar equipment oriented 4-week add-on instructional block. This 34-week program, it is felt, will provide the Army with a calibration specialist working under experienced, more highly trained supervisors, capable of performing 80-85% of transfer team tasks. As a reenlistment option, the specialist will receive 16 weeks additional training in advanced measurement and laboratory techniques. This training can be accomplished within the framework of existing advanced level training existing at Lowry Air Force Base. Significant cost savings are possible with this proposal in terms of saved training time and deletion of unnecessary instructional spaces.

9. Army Test Equipment Maintenance and Repair 35B Area: Mr. Hattman explained that MOS 35B personnel receive 6 weeks Common Basic Electronic Training (COBET) at Ft Jackson, SC followed by 19 weeks of Electronic Instrument Maintenance Training at Ft Gordan, GA. Normally, graduates of the 19 week course (35B20) would go directly to the field and return for a 17 week 35B30 course upon reenlistment. However, due to the manning situation, most of the 35B20 graduates are sent directly to the 35B30 course resulting in a total of 42 weeks of training prior to entering the field.

10. A summary of the individual Service Training Programs is included as attachment.

11. Ground Marine Corps representatives considered consolidation with the Air Force PME course at Lowry not feasible due to the following reasons:

a. Marines require training on actual equipment used in the field and give limited theory training. The Air Force trains on items of equipment representative of many different types of equipment in the field.

b. Air Force provides insufficient practical training.

c. Ground Marine course provides only maintenance/repair training. Calibration training given in Air Force course is not desired.

d. Differences in Marine and Air Force TOs/Publications.

e. Differences in Marine and Air Force maintenance/repair procedures.

12. Ground Marine Corps representatives also considered consolidation with the Army 35B training program not feasible for the following reasons:

a. Army school too long (49 weeks).

b. Army school would not provide training on equipment used in the field by Marines.

c. Calibration training in Army course is not desired.

d. Army school provides insufficient practical training.

13. Representatives from the Army Maintenance (35BXO) school. Ft Gordon, expressed the position that further consolidation of training was not feasible until the following areas are standardized for all services:

a. Equipment

b. Training philosophies

c. Utilization of manpower

d. Entry requirements

e. Career progression

14. Navy representatives reiterated that their personnel- receive training primarily as electronic technicians and then receive secondary training as test equipment maintenance/calibration technicians. It was noted that the Navy has no career field rating specifically for calibration. Navy representatives expressed the position that they can accept any course as long as it meets the needs of the Navy and is cost effective.

15. Air Force representatives expressed the position that their 30 week basic PME specialist course (3ABR32430-2) would satisfy training needs of Army MOS35BXO and Ground Marines MOSs 2871 and 2872. It was noted that the Army prerequisite for MOS35BXO personnel would have to be increased from EL 100 to EL 120 to maintain a satisfactory elimination rate in the Air Force course. It was also noted that while the Ground Marine Training requirement could be satisfied using the normal three shift operation, total consolidation of test equipment repair and calibration training at Lowry using facilities currently available would likely require a four shift operation.

16. Radiac training was discussed as a common area of technology requiring short duration special training. At the current time, radiac training for Navy

and Marine personnel is conducted at Treasure Island and at Fort Gordon for Army personnel. Air Force currently provides Radiac training by Mobil Training Teams and is establishing a training capability at Lowry AFB. Since this is a short duration course, it is recognized that travel costs could possibly make one centrally located training site uneconomic. It was recommended that a working group be established to determine the feasibility of a common POI being developed to satisfy individual service and AEC licensing requirements. If the common POI is feasible the working group should then decide if it would be more economical for the training to be conducted at one site or if the three current training locations should be used to provide interservice training by geographical area, thereby reducing travel costs.

17. Working group would be chaired by Mr. Roy Davis, USA, Fort Gordon, GA. Also named to this group is Mr. Zane Horner, USAOC&S, Aberdeen, MD. Navy and Air Force representatives will be determined later. Point of contact for Air Force participation is Mr. V. G. (Jerry) Gildea. Navy point of contact is Lt J. G. Joel.

18. Conferees agreed that the following recommendations should be forwarded to the Interservice Training Review Panel for further consideration:

a. Recommend a DOD working group be established to resolve/define a single DOD Maint/Metcal philosophy.

b. A working group chaired by Mr. Roy Davis, Ft Gordon, GA be tasked to determine the feasibility of developing a common Plan of Instruction for Radiac training and to determine the cost effectiveness of using the individual Air Force, Army and Navy schools to provide training by geographical locations as compared to one centralized training location.

c. A working group of AF/USA/USN/USMC personnel should meet in Jan 75 to determine if Air Force supplemental courses can be tailored to satisfy the advanced training needs of the other services.

d. Recommend USMC (Air) graduates of the 3ABR32430-2 PME Specialist course be assigned (60 to 90 day TDA) to USMC Ground TIR/CAL program to evaluate their ability to perform as a 2871. A minimum of 6 graduates should be provided to USMC (Ground) to accomplish this study.

ATTENDEES

Maj John C. Wenger	ATC/TTKA	487-2662
LTC Mark S. Creviston	Dir Wpns Tng Dept USAOC&S, APG, Md	870-4307
Sy Evendorff	NAVPRO, Pomona (MEG)	714-628-5111
CW3 John M. Ortiz	Br Chief, Wpns Tng Dept USAOC&S, APG, Md	278-3833
Zane M. Horner	Supv Tng Spec, Calibr Div USAOC&S, APG, Md ATTN: ATSL-TEW-C	870-4983
G. L. Senile	CNTECHTRA (n315) NAS Memphis	966-5175
L. E. Oliver	NAVAIRSYSCOM REP PAC (Code 321A)	951-7146
V. G. Gildea LTJG	LTTC/TAVM	926-4559
Fred Joel	CNTECHTRA (N316) NAS Memphis	966-5175
Glyn Grundy	LTTC/TTOT	926-4178
ETCM W. H. Stewart	LTTC (NAVU)/TAVM	926-2203
Mr. LaVon H. Vestal	Hq USMC, Wash, DC	224-2664
Maj A. H. Dow	NAVPRO, Pomona, CA	629-5111
Mr. Roy D. Davis	35B Crs, USASESS Fort Gordon, GA	780-6539
Louis L. Hattman	35B Crs, USASESS Fort Gordon, GA	780-6539
Arnold L. Hanson	LTTC/AFHRL-TT	926-4385
MSgt Jerry C. Scott	LTTC/TAVTC	926-4270
Alvin J. Bryant	LTTC/TAVTC	926-3917
MSgt George F. Tyler	LTTC/LGMCP	926-3966
Gareth L. Beitzel, GS-11	LTTC/TSIT	926-4228
MSgt Dozier D. Bartlett	LTTC/TTQR	926-4318

Edward J. Villano	LTTC/XRP	926-3773
David B. Moore	LTTC/TTOX	926-3664
(Vol III, Ex 60)		

HISTORY OF THE DEPARTMENT OF AVIONICS TRAINING
1 JANUARY 1975 - 1 JULY 1975
METROLOGY TRAINING BRANCH

Present manning reflects that the branch is undermanned by two instructor personnel at the end of the 4th quarter of FY 75. However, based on an analysis of the first half of FY 76, the branch will be undermanned by 24 instructor personnel at the end of the first quarter and undermanned by 27 personnel at the end of the second quarter. The manning problem has been compounded by several unanticipated retirements and increased authorizations in the Supplemental and Special Training Section. A manning assistance letter is presently on file and an updated requirement for manning assistance is in the process of being submitted.

KEY PERSONNEL

Major Ronald L. Owens, Branch Chief

Mr. Venard G. Gildea, GS-11, Educational Training Specialist

PERSONNEL STRENGTH

	Officers Auth/Asgd	Enlisted Auth/Asgd	Civilians Auth/Asgd	Total Auth/Asgd
Jan-Mar	1/1	112/97	12/12	125/110
Apr-Jun	1/1	94/96	16/12	111/109

TRAINING

The present operation consists of sixteen active resident courses and three travel team courses. A listing, brief resume of each course, and its status is reflected in the following paragraphs:

course	title	duration
3ABR32430-2	Precision Measuring Equipment Specialist	30 weeks
3ABR32430-3	Precision Measuring Equipment Specialist (Army)	34 weeks
3AZR32470-2	Electronic Test Equipment Calib & Repair (MAP)	8 weeks
3A2R32470-5	Advanced Electrical-Electronic Measurements	6 weeks
3AZR32470-6	Advanced Microwave Measurements	4 weeks
3AZR32470-7	Precision Physical Measuring Technician	8 weeks
3AZR32470-8	Precision Optical and Dimensional Technician	6 weeks
3AZR32470-12	Advanced Microwave Measurement & Calibration	8 weeks
3AZR32470-13	Advanced Physical Measurement & Calibration	8 weeks
2ASR32050	Hi-Reliability Soldering & Equip Repair Tech	2 weeks
2ASR32470-6	Baird Atomic Spectrometer Model A/E 35U-3	5 weeks
2ASR32470-8	Aircraft Engine Test Stand	2-3/5 weeks
2ASR32470-11	TTU-205C/E Maintenance and Calibration	1 week

2ASH32470-25	DOD-AIMS Test Set Maintenance	8 weeks
2ASR32470-213	AN/0PM-141 Maintenance/Calibration	3-3/5 weeks
2ASR32470-214	AN/OPM-137 Maintenance/Calibration	2 weeks
4AST32470-5	Optical Tooling and Theodolite Calibration	2 weeks
4AST32470-7	Eadiac Instrument Repair and Calibration	1 week
4AST32470-174	AN/AWM-13A Test Set Maintenance	2-3/5 weeks

Course 3ABR32430-2, Precision Measuring Equipment Specialist (30 weeks). A downward revision in Air Force requirements for 324X0 personnel resulted in an apparent "overproduction" of approximately 285 3ABR32430-2 students in FY 74. To compensate for this overproduction, the student entry rate was reduced from 12 to 9 students per week as of 740508 and during the last two quarters of FY 75 a total of only 65 AF students entered the course. However, the Trained Personnel Requirements (TPR) conference held in June 1975 resulted in an upward revision of the 32430 TPR. This upward revision has resulted in a scheduled entry rate of eight AF students per week during FY 76. Updating of course content with the latest state of the art equipment is continuing and approximately eight new items (80 line items) have been incorporated into the course during this period.

Course 3ABR32430-3, Precision Measuring Equipment Specialist (Army) (34 weeks). Consolidation of Air Force/Army calibration training was approved and the first Army students entered training at Lowry AFB, 22 Jan 75. The 34-week Army course has been designated as the 3ABR32430-3 Course. The first 30 weeks is the 3ABR32430-2 Course and students in both courses are commingled and receive concurrent instruction. The additional four weeks of training is on the operation of the Army calibration van.

In November 1974 the first contingent of Army personnel assigned to Lowry AFB to support calibration training reported in to the Metrology Training Branch. The contingent consisted of two liaison and eight instructor personnel. The Army instructors graduated from the LTTC Instructor Training Course in December 1974 and was participating in normal classroom operation at years end. The second contingent of nine Army instructors arrived 15 Jan 75, graduated from Instructor Training in February, and were instructing in the classrooms by the end of March. A third group of eight Army instructors is due to arrive by 13 August. In addition, two civilian instructors being transferred to the Air Force from the Army are scheduled to report in September. This will complete the Army transfer of personnel in support of consolidated calibration training for the basic airman/soldier training course.

Course 3AZR32470-2. Electronic Test Equipment Calibration and Repair (MAP) Training (8 weeks). Lack of specific solid state equipment in the AF inventory is delaying revision of one block of instruction in this course. The revision is desirable in order to further align the course with the specific equipment presently utilized by participating MAP countries. When and if the equipment does become available a course revision will be accomplished.

Course 3AZR32470-5, Advanced Electrical-Electronic Measurements (6 weeks) and Course 3AZR32470-6, Advanced Microwave Measurements (4 weeks). Due to new/additional equipment requirements and the corresponding" measurement techniques now required for Navy personnel, both courses underwent a major revision. Implementation of the revised courses was effective 750531.

Course 3AZR32470-7, Precision Physical Measuring Technician (8 weeks). Due to extensive changes in Navy requirements in both the equipment and calibration techniques, this course was also scheduled to undergo a major revision. Course revision is being held in abeyance pending the outcome of studies to determine the feasibility of consolidating Air Force, Army, and Navy advanced physical PME courses info one common course. Preliminary approval was given in June 1975 and the final determination is scheduled to be made in September 1975.

Course 3AZR32470-8, Precision Optical and Dimensional Measuring Technician (6 weeks). No progress changes are anticipated with respect to this course.

Course 3AZR32470-12, Advanced Microwave Measurements and' Calibration (8 weeks). Course revision is being held in abeyance pending the outcome of studies to determine the feasibility of consolidating Air Force, Army, and Navy advanced microwave training into a single course. Preliminary approval of consolidation was given in June and the final determination is scheduled to be made in September 1975.

Course 3AZB32470-13, Advanced Physical Measurement and Calibration (8 weeks). Evaluation has indicated the state-of-the-art in both equipment and measurement techniques has progressed rapidly and the course was scheduled to be revised to incorporate these advancements. Course revision is being held in abeyance for the same reasons as outlined in Course 3A2H32470-7.

Course 2ASR32050, Hi-Reliability Soldering and Equipment Repair Techniques (2 weeks). Present programming reflects an increased need for this training. Widespread use of the printed circuit (PC) board, the not uncommon cost of $900 per board, and inherent logistic problems increased the requirement" for PC board repair capabilities. This course has been revised so it is now a completely self-paced course of individualized instruction.

Course 2ASR32470-6, Baird Atomic Spectrometer Model A/E35U-3 (5 weeks). Recent evaluation indicates a need for revising both course content and structure. Estimated date for implementation of revised course is the third quarter of FY 75.

Course 2ASR32470-8, Aircraft Engine Test Stand (2-3/5 weeks). Present programming indicates a continuing need for training in this area.

Course 2ASR32470-11, TTU-205C/E Maintenance and Calibration (1 week). A proposal to incorporate another model of TTU-205 plus other related equipment into the course was submitted in March 1975. Tentative approval was received from ATC/TTKA in June 1975. This proposal will add one week to the present course length.

Course 2ASR32470-25, DOD AIMS Test Set Maintenance (8 weeks). Present programming indicates a need to continue training in this area. A proposal to discontinue training on some equipment that is either obsolete, taught in another course, and/or unrelated to the actual AIMS program was submitted in March 1975. This revision will reduce course length from eight to four weeks. Tentative approval of the proposal was received from ATC/TTKA in June 1975.

Course 4AST32470-5, Optical Tooling and Theodolite Calibration. There were no travel teams deployed to support training 'requirements during this period.

Course 4AST32470-7, Radiac Instrument Calibration. No travel teams were deployed to support training requirements during this period. This course has been conducted as a resident course since 750220. No further travel team commitments are anticipated.

Course 4AST32470-174, AN/AWM-13A Test Set Maintenance. Two travel teams were deployed to support training requirements during this period.

Course 2ASE32470-213, AN/UPM-141 Test Set 'Maintenance .and Calibration (3-3/5 weeks). Course began being conducted on a normal continuing basis in 'October 1974. Evaluation indicated the course length should be increased and a recommendation to that effect was submitted in April 1975. ATC/TTKA approved the proposal and implementation of revised course is scheduled for September 1975.

Course 2ASR32470-2, Radiac Instrument Repair and Calibration (1 week). Since 1968 Radiac instruction has now been included in the basic PME 3-level course and training has been conducted by travel team. The demand for this training has new increased to the point where a resident rather than a travel team type of course is the best method of providing training. Resident radiac training was implemented 750220. The course is presently being revised and converted into a self-paced package of individualized instruction.

Course 2ASR32470-217, Photometric Instruments, Maintenance and Calibration (2 weeks). The increased use of light and intensity measuring devices in numerous AF systems has resulted in the requirement for photometric training. The training plan has been approved and the necessary equipment has been requisitioned. However, because of difficulty in obtaining equipment the target date for course implementation has been slipped to the third quarter of FY 76.

Course 2ASR32470-215, AN/ARM-135 Maintenance/Calibration (3 weeks). The ARM-135 TACAN Test Set is replacing most of the TACAN test sets now in operation in the AF. This is a complex piece of equipment utilizing the latest solid state technology. The AF need for maintenance repair and calibration capabilities has created the requirement for this course. The training plan has been approved and the majority of instructional materials developed. Because of the delay in the deployment of the test set into the AF Systems, manufacture modifications, and difficulty in obtaining necessary support equipment implementation has been slipped to the third quarter of FY 76.

Course 3AZR32470-15, Advanced Electronic Maintenance/Calibration (9 weeks). This course is designed to provide training in the latest solid state technology in logic, digital techniques, and equipment. By using the latest equipment in different areas of metrology and basing the course content on five year field need projections, it is felt this course will greatly reduce the need for many of the Type 2 Special Training Courses. The training plan was submitted in June 74 with an original target implementation date of February 1975. Difficulty in obtaining equipment and training for instructor personnel has caused a slippage in target date to the fourth quarter of FY 76.

The four-year Advanced Instructional System (AIS) contract was let to McDonnell-Douglas Corp in May 1973. The objective of the AIS program is to convert the basic 3ABR32430-2 PME Specialist Course into a computer managed, multi-media, completely self-paced, course of instruction. In October 1973, the additional seven positions were authorized at the branch in direct support of the AIS program, and as of 1 January 1975 this was increased to 12. Within the branch facility, there are now six Air Force and approximately ten contractor personnel actively engaged in developing the AIS program. Additional AF personnel will be assigned in direct support of AIS as the instructor manning situation improves. The course is being converted to the AIS concept from the last block of instruction forward. This allows for efficient management of self-paced students. Blocks XII, XI, X, and IX are now conducted under the AIS concept and the small group tryouts on Block VIII are scheduled .to commence 15 August 1975. Non-receipt of new equipment destined for Block IX has created the necessity of rewriting that material and this, in turn, has caused at least a temporary slippage in the total AIS program. Tentative plans now call for the contractor to develop material through Block VI. Blocks I through V will, in all probability, become primarily an Air Forces effort in AIS materials development.

The Interservice Working Group on Electronics Test 'Equipment Training (DOD 198 Series) was hosted by the Metrology Training Branch 6-9 May 1975. Purpose of the conference was to determine the feasibility of further consolidation of training between services. Conferees agreed that the following recommendations should be forwarded to the Interservice Training Review Panel for further consideration:

Recommendations:

a. Consolidation of Advanced Microwave training into a single course.

b. Consolidation of Physical Measurement training into a single course.

c. Development of an Advanced DCLF reference calibration course for Army personnel.

d. The three services supply instructor personnel in the same proportion as their student input.

e. Target date for implementation of consolidated courses be the third quarter FY 76.

FACILITIES

The Metrology Training Branch is housed in Buildings 1433 and 1308. Building 1433 is a single story building of masonry construction containing 46,776 square feet to floor space.

The Branch Training Office and associated administrative, supervisory, and 34 training laboratories are located in this building. An additional training site, Engine Test Stand facility, of approximately 8,000 square feet of space

is located on the east side of the building. Building 1308 is also a single story building of masonry construction and contains 6,670 square feet of floor space. The Special Training office and nine training laboratories are located in this building.

Building 1308 is a recent (June 75) addition to the facilities of the Metrology Training Branch. The necessity for additional training space has been brought about by (1) the increased requirement for "metrology" type training in all branches of the service as the state of the art advances in the various technical fields and (2) the increased responsibility for providing calibration/metrology training for both the Army and Navy under DOD 198 occupational series consolidation program. The acquisition of Building 1308 satisfies the immediate facility requirements needed to support both tri-service consolidated training and projected new equipment training programs; it also provides growth potential for future training needs.

The environmental control system in building 1433 still requires boiler replacement (scheduled for July 1975), but is now longer considered a major problem area.

EQUIPMENT

All of the equipment maintenance required to support the training courses in this organization is performed by the Base Precision Measuring Equipment Laboratory (BPMEL). Maintenance support has been very satisfactory and a definite plus factor is the minimal amount of training difficulty caused by "out of commission" equipment.

The major equipment. Calibration Standards, is listed in TA 734, Table of Allowance for Precision Measuring Equipment. Presently the branch maintains eighteen EAID accounts consisting of 3094 line items which represent a total dollar value of $2,738,679.47.

The operating budget required to provide necessary supplies, equipment, and accessories was approximately $11,023.47 for supplies and $3,207.36 for equipment during this period.

ENERGY

The energy conservation programs, e.g., minimal lighting in non-academic areas, conducted in this Branch, have had no adverse impact on training.

MISCELLANEOUS

The following listed TDY trips were taken during this reporting period:

a. 4AMF/ASF/AST32470-174 Course, MacDill AFB, FL, two men, 18 days.

b. 4AMF/ASF/AST32470-174 Course, Holloman AFB, NM, one man. 18 days.

c. Attend ITS workshop on DOD 198 occupational subgroup, Aberdeen Proving Grounds, MD. one man, five days.

d. Confer with BPMEL personnel on techniques and equipment used in training, Kirtland AFB, NM, one man, one day.

e. Attend technical data review on AN/ARM-13 TACAN Test Set, one man, ten days.

HISTORY OF THE DEPARTMENT OF AVIONICS TRAINING
1 JULY 1975 - 31 DECEMBER 1975

ROSTER OF KEY PERSONNEL

Branch Chief, Metrology Training Branch ..... Captain Ronald L. Owens

Chief, Requirements Unit (Avionics Department ..... GS-12 Keith W. Rhine

Educational Training Specialist .... GS-11 Venard G. Gildea

RESOURCES

The overall manning required to support the organization is listed as follows:

AFSC	GRADE	AUTH	ASSIGNED
4036	Maj	1	1
7524	G11	2	2
70450	G00	1	1 G04
70250	Amn	1	0
70230	Amn	1	1
T32490	SMSgt	1	1
T32470	MSft	17	18
T32470	TSgt	28	40
T32450	SSgt	59	45 (19 SSgt. 26 Sgt)
T32470	G11	1	1
T32470	G0 9	6	6
T32450	G0 9	2	2
	TOTALS	120	118

Present manning reflects that the branch is undermanned by one instructor personnel at the end of the 2nd quarter of FY 75. However, based on an analysis of the last half of FY 75, the branch will be undermanned by nine instructor personnel at the end of the third quarter and undermanned by twenty personnel at the end of the fourth quarter. The manning problem has been compounded by several unanticipated retirements and increased authorizations in the AIS and Special Training Sections. A manning assistance letter is presently on file and an updated requirement for manning assistance is in the process of being submitted.

FACILITIES

The Metrology Training Branch is housed in Building 1433. This is a single story building of masonry construction containing 46,776 square feet of floor space.

The Branch Training Office and associated administrative, supervisory, and 34 training laboratories are located in this building. An additional training

site, Engine Test Stand facility, of approximately 8000 square feet of space is located on the east side of the building.

It had been thought that the requirement to develop and support five additional PME courses in FY 75 would overtax the present space capabilities of the Metrology Training Branch and that additional facilities would have to be provided in order to implement the last of these new courses. Building 820 with approximately 10,000 square feet of floor space was provided by USAFSAAS for this purpose. However, by revising various class entry schedules, joint utilization of classrooms, relocating and combining AIS offices, and phasing the basic PME course onto a two shift (A and C) operation, sufficient training space was made available to enable building 820 to be returned to USAFSAAS for other purposes.

There is a trend toward increased requirements for "metrology" type training in all branches of the service as the state of the art advances in various technical fields. This plus the continued emphasis on consolidation of calibration and DOD 198 occupational series training all point to a projected need for additional facilities suitable for maintenance/calibration training. This need for additional facilities will probably first be felt in FY 76 as the Metrology Training Branch becomes even more responsible for meeting Army training requirements as scheduled under the recently approved consolidation of USAF/USA calibration training programs. Department of Avionics and Metrology Training Branch personnel are therefore drafting a proposal, to be submitted to DSAFSAAS in the third quarter FY 75, which outlines the anticipated future needs and recommendations on facility requirements which will allow accomplishment of the additional training obligations.

Extensive repair was accomplished on the collapsed air conditioning-heat ducting system in building 1433 during the first quarter of FY 75. While the heat plant still requires boiler replacement to be made in the fourth quarter FY 75, progress has been made and the environment control system is not the major problem it has been in the past.

EQUIPMENT

All of the equipment maintenance required to support the training courses in this organization is performed by the Base Precision Measuring Equipment Laboratory (BPMEL). Maintenance support has been very satisfactory and a definite plus factor in the minimal amount of training difficulty caused by "out of commission" equipment.

The major equipment, Calibration Standards, is listed in TA 734, Table of Allowance for Precision Measuring Equipment. Presently the branch maintains sixteen EAID accounts consisting of 3055 line items which represents a total dollar value of $2,669,062.22.

The operating budget required to provide necessary supplies, equipment and accessories was approximately $11,240.51 for supplies, and $1,028.36 for equipment, and $1,237.10 for investment items during this period.

TRAINING

The present operation consists of fifteen active resident courses and three travel team courses. A listing, brief resume of each course, and its status is reflected in the following paragraphs:

course	title	weeks duration
3ABR32430-2	Precision Measuring Equipment Specialist	30 weeks
3AZE32470-2	Electronic Test Equip Calib & Repair (MAP)	8 weeks
3AZR32470-5	Advanced Electrical 0 Electronic Measurements	6 weeks
3AZR32470-6	Advanced Microwave Measurements	4 weeks
3AZE32470-7	Precision Physical Measuring Technician	3 weeks
3AZE32470-8	Precision Optical and Dimensional Technician	6 weeks
3AZH32470-12	Advanced Microwave Measurement & Calibration	3 weeks
3AZH32470-13	Advanced Physical Measurement & Calibration	8 weeks
2ASR32050	Hi-Reliability Soldering & Equip Repair Tech	2 weeks
2ASR32470-6	Baird Atomic Spectrometer Model A/E 35U-3	5 weeks
2ASH32470-8	Aircraft Engine Test Stand	2 3/5 weeks
2ASR32470-11	TTU-205 C/E Maintenance and Calibration	1 week
2ASR32470-25	DOD AIMS Test Set Maintenance	3 weeks
2ASR32470-213	AN/UPM-141 Maintenance/Calibration	33/5 weeks
2ASR32470-214	AN/UPM-137 Maintenance/Calibration	2 weeks
4AST32470-5	Optical Tooling and Theodolite Calibration	2 weeks
4AST32470-7	Radiac Instrument Repair and Calibration	1 week
4AST32470-174	AN/AWM-13A Test Set Maintenance	2 3/5 weeks

Course 3ABR32430-2, Precision Measuring Equipment Specialist (30 Weeks). A downward revision in Air Force requirements for 324X0 personnel resulted in an apparent "overproduction" of approximately 285 3ABR32430-2 students in FY 74. To compensate for the overproduction, the student entry rate was reduced from 12 to 9 students per week as of 740508 and during the last two quarters of FY 75 a total of only 31 AF students are scheduled to enter the course. Advancements in the state-of-the-art in both equipment and metrology techniques have resulted in the requisitioning of approximately 15 items (130 line items) to update the course content. The solid state oscilloscopes and meter calibrators have been received and are being inserted in the course at this time.

Course 3AZR32470-2, Electronic Test Equipment Calibration and Repair (MAP) Training (8 weeks). Lack of specific solid state equipment in the AF inventory is delaying revision of one block of instruction in this course. The revision is desirable in order to further align the course with the specific equipment presently utilized by participating MAP countries. When and if the equipment does become available a course revision will be accomplished.

Course 3AZR32470-5, Advanced Electrical - Electronic Measurements (6 weeks) and Course 3AZR32470-6, Advanced Microwave Measurements (4 weeks). Due to new/additional equipment requirements and the corresponding measurement techniques now required for Navy personnel, both courses are undergoing a major revision. New equipment has been received from the Navy and target implementation date for the revised courses is 750403.

Course 3AZR32470-7, Precision Physical Measuring Technician (8 weeks). Due to extensive changes in Navy requirements in both the equipment and calibration technique areas, this course is also scheduled to undergo a major revision. Course revision is being held in abeyance pending the outcome of studies to determine the feasibility of consolidating Air Force, Army and Navy advanced physical PME courses into one common course. This determination is scheduled to be made in Feb 1975.

Course 3AZR32470-8, Precision Optical and Dimensional Measuring Technician (6 weeks). No progress changes are anticipated with respect to this course.

Course 3AZR32470-12. Advanced Microwave Measurement and Calibration (8 weeks). Course was implemented 730711. Course revision is being held in abeyance pending the outcome of studies to determine the feasibility of consolidating Air Force, Army and Navy advanced microwave training into a single course. Final determination is scheduled to be made in Feb 1975.

Course 3AZR32470-13, Advanced Physical Measurement and Calibration (8 weeks). This course was implemented 730903. Evaluation has indicated the state-of-the-art in both equipment and measurement techniques has progressed rapidly and the course was scheduled to be revised to incorporate these advancements. Course revision is being held in abeyance for the same reasons as outlined for course 3AZR32470-7.

Course 2ASR32050, Hi-Reliability Soldering and Equipment Repair Techniques (2 weeks). Present programming reflects an increased need for this training. Widespread use of the printed circuit (PC) board, the no uncommon cost of S900 per board, and inherent logistic problems increased the requirement for PC board repair capabilities. This course has been revised so it is now a completely self-paced course of instruction.

Course 2ASR32470-6, Baird Atomic Spectrometer Model A/E 35U-3. Course was implemented 730725. Initial evaluation does not indicate a need for any major revisions at this time. Additional Spectrometer arrived in January 1974. This has enabled the course to accommodate a larger TPR.

Course 2ASR32470-8. Aircraft Engine Test Stand (3-3/5 weeks). Present programming indicates a continuing need for training in this area. Minor changes and updating is presently under way, but no major changes are anticipated in this program.

Course 2ASR32470-11, TTU-205 C/E Maintenance and Calibration (1 week). A proposal to incorporate another model of the TTU-205 plus other related equipment into the course will be submitted in Jan 1975. This proposal will add one week to the present course length.

Course 2ASR32470-25, DOD AIMS Test Set Maintenance (8 weeks). Present programming indicates a need to continue training in this area. A proposal to discontinue training on some equipment that is either obsolete taught in another course, and/or unrelated to the actual AIMS program will be submitted in January 1975. This revision will reduce course length from eight to four weeks.

Course 4AST32470-5, Optical Tooling and Theodolite Calibration. One travel team was deployed to support training requirements during this period.

Course 4AST32470-7, Radiac Instrument Calibration. No travel teams were deployed to support training requirements during this period. This course is scheduled to be taught as a resident course commencing 750220.

Course 2ASR32470-174, AN/AWM-13A Test Set Maintenance. Two travel teams were deployed to support training requirements during this period.

Course 2ASR32470-213, AN/UPM-141 Test Set Maintenance and Calibration (3-3/5 weeks). Course began being conducted on a normal continuing basis in October 1974. Preliminary evaluation indicates the course length should be increased. Final determination will be made when sufficient classes have service tested the course as it is presently structured. Target date for this determination is February 1975.

Course 2ASR32470-2, Radiac Instrument Repair and Calibration (1 week). Since 1968 Radiac instruction has not been included in the basic PME 3-level course and training has been conducted by travel team. The demand for this training has now increased to the point where a resident rather than a travel team type of course is the best method of providing training. A training plan has been approved, radioactive sources have been received, and an AEC license has been granted. Upon implementation of this course, target is 750220, the travel team course 4AST32470-7 will be discontinued.

Course 2ASR32470-217, Photometric Instruments, Maintenance and Calibration (2 weeks). The increased use of light and intensity measuring devices in .numerous AF systems has resulted in the requirement for photometric training. The training plan has been approved and the target date for implementation is the first quarter FY 76.

Course 2ASR32470-215, AN/ARM-135 Maintenance/Calibration (3 weeks). The ARM-135 TACAN Test Set is replacing most of the TACAN test sets now in operation in the AF. This is a. complex piece of equipment utilizing the latest solid state technology. The AF need for maintenance repair and calibration capabilities has created the requirement for this course. The training plan has been approved and the majority of instructional materials developed. Because of the delay in the deployment of the test set into the AF system, manufacture modifications, and difficulty in obtaining necessary support equipment has been slipped to the fourth quarter of FY 75.

Course 3AZR32470-15, Advanced Electronic Maintenance/Calibration (9 weeks). This course is designed to provide training in the latest solid state technology in logic, digital techniques, and equipment. By using the latest equipment in different areas of metrology and basing the course content on five year field need projections, it is felt this course will greatly reduce the need for many of the Type 2 Special Training courses. The training plan was submitted in June 74 with an original target implementation date of February 1975. Difficulty in obtaining equipment and training for instructor personnel has cause a slippage in target date to the first quarter of FY 76.

The four year Advanced Instructional System (AIS) contract let McDonnell-Douglas Corp in May 1973 is progressing approximately according to contract schedule. The objective of the AIS program is to convert the basic 3ABR32430-2 PME Specialist Course into a computer managed, multi-media, completely self-paced, course of instruction. In October 1973, an additional seven positions were authorized at the branch in direct support of the AIS program, and as of 1 January 1975 this will increase to 12. There are now eight Air Force and approximately thirteen contractor personnel, within the branch facility, actively engaged in developing the AIS program. The course is being converted to the AIS concept from the last block of instruction forward. This allows for efficient management of self-paced students. The last block of instruction (Block XI) is now conducted under the AIS concept and the last of the small group tryouts on block X under the AIS concept is scheduled for 29 Jan 1975. Non receipt of new equipment destined for block IX has created the necessity of rewriting that material and this, in turn, has caused at least a temporary slippage in the total AIS program. February 1976 is still the target date for Block I implementation under the AIS concept.

In May 1974, one Metrology Branch personnel and one USAFSAAS/TTOX personnel met with Army personnel of the United States Army Ordnance Center and 'School (USAOC&S), Aberdeen Proving Ground, Maryland. Purpose of the conference, held in Aberdeen, was to arrive at a working agreement on the proposal to consolidate Army and AF Precision Measuring Equipment (PME) Training at Lowry AFB, Colorado and phase out the Army training conducted at Aberdeen Proving Ground, Maryland. The members of the group arrived at a mutually acceptable working agreement which basically would have the Army students take the present 30-week AF course with an additional add-on (max 4 weeks) for Army peculiar equipment and techniques. The Army would supply approximately 23 instructor personnel to be part of a completely integrated instructor/supervisor training staff and the first Army students would begin entering the AF PME Course in January 1975. With the May 74 Aberdeen meeting as a base both services submitted Incremental/Decremental Cost Analysis for Consolidation of Calibration Training to the Interservice Training Review (ITR).

Consolidation of Air Force/Army calibration training was approved and the first Army student is scheduled to enter training at Lowry AFB, 22 Jan 75. The 34 week Army course has been designated as the 3ABR32430-3 course.

In November 1974 the first contingent of Army personnel assigned to Lowry AFB to support calibration training reported in to the Metrology Training Branch. The contingent consisted of two liaison and eight instructor personnel. The Army instructors graduated from the LTTC Instructor Training Course in December 1974 and were participating in normal classroom operation at years end. The second contingent of ten Army instructors is due to arrive by 15 Jan 75 and the third and last group will report in April 1975.

The Interservice Working Group on Electronics Test Equipment Training (DOD 198 series) was hosted' by the US Army at Fort, Georgia, 27-29 August 1974. Purpose of the conference was to determine the feasibility of further consolidation of training between services. Conferees agreed that the following recommendations should be forwarded to the Interservice Training Review Panel for further considerations:

Recommendations:

a. Develop a common RADIAC course for all services which will be conducted at USN School at Treasure Island and the USA Signal School at Fort Gordon.

b. Task Working Group with technical representatives in advanced microwave and physical dimensional areas to meet at Lowry AFB in October 1974 to develop common courses. Joint METCAL representation is necessary at this meeting.

c. In the interim a modular course outline be developed and a cost analysis be performed to determine feasibility of this interim approach. Representatives should include USA (35H), USMC USN, and USAF personnel.

d. Further, action on or study of consolidation of training between Marine and AF or Marine and Army should be held in abeyance until graduates (Marine) from AF and Army schools can be evaluated by the Marines and the subject results forwarded to the ITR Committee.

(Reference action items a and b)

e. No further action or study of consolidation of training between AF and Army (35B) is recommended due to the disparity of programs and graduate assignment/utilization.

Action Items:

a. USMC to provide to the Task Group Chairman evaluation results of the Marine graduates from the AF and Army schools. Suspense - AF graduate June 1975, Army graduate December 1975.

On 6 Dec 74 ATC notified LTTC that the proposed consolidation of Radiac training had been disapproved by the ITR board and Lowry was to go forward in developing resident course capabilities on Radiac training.

TDY

The following listed TDY trips were taken during this reporting period:

a. Identify equipment and develop tentative shipping schedule for transfer to Lowry AFB. USAOC&S, Aberdeen Proving Grounds, Maryland. One man, two weeks.

b. 4AMF/ASF/AST32470-174 course. Bitburg AFB, Germany, two men, twelve weeks.

c. 4AMF/ASF/AST32470-5 course, Davis Monthan AFB, two men, two weeks.

d. Confer with training personnel and evaluate techniques/strategies used in AIS related courses, Keesler AFB, two men, one week.

e. Attend ITR workshop on test equipment calibration and maintenance, Fort Gordon, Georgia, three men, one week.

f. Coordinate changes to course 3AZR32470-6. with Navy personnel, MEG Pomona, Calif., one man, one week.

g. Attend type V course on Precise Time and Time Interval Measurements, Newark AFS, Ohio, two men, two weeks.

h. 4AMF/ASF/AST32470-174 course, Elmendorf AFB, AK, two men, three weeks.

i. Attend type V course on Frequency Measurement Techniques and Equipment, Palo Alto, Calif., two men, two weeks.

TECHHICAL TRAINING

RADIAC Training

An ITRB also studied the possibility of consolidating all radiation detection, indication, and computation (RADIAC) training into a single, interservice course during the year. The Board determined that a common core RADIAC program could be developed and incorporated into existing Army courses at Ft. Gordon, Georgia, and Navy courses at Treasure Island, California. A December 1974 ITR Executive Committee order halted the consolidation, however, because of project costs, and Lowry was directed to develop a resident RADIAC course for Air Force students.

Precision Measuring Equipment Training

Basic Courses: The interservice consolidation of basic precision measuring .equipment (PME) courses, under study by an ITR group since 1966, became partially successful in late FY 1974 when plans were formulated to consolidate Army and Air Force PME calibration courses. Complete interservice consolidation was blocked by the Navy and Marine Corps, which insisted that the training offered by the other services was incompatible with their requirements. The Marine Corps did agree, though, to enroll six students in Army and Air Force PME courses on a test basis. This would be followed by a field evaluation to determine the effectiveness of the joint service training in comparison with Marine Corps training.

A training consolidation study conducted by the Army had indicated a possible training problem because of the differences in Army and Air Force training philosophies: the Army training program was directed toward providing the field with journeyman- level graduates, while the Air Force trained its personnel only to the apprentice-level through technical training, followed by OJT upgrade to the journeyman level.

A cost analysis of the Army and Air Force training programs showed that the requirements of both services could be met economically through joint service courses. The students could be trained in Lowry's Precision Measuring Equipment Specialist course (3ABR32430-2), followed by a 4-week course for Army-peculiar training (3ABR32430-3).

The study also noted that the joint service consolidation would save $43,410 in training equipment costs by transferring equipment required in Air Force PME courses from the Army PME school at the Aberdeen Proving Grounds. One-time costs associated with the proposed consolidation were estimated at $23,045; combined with the savings available through equipment transfers, the consolidation would produce an immediate $20,365 savings. In addition, the consolidation would save an estimated $118,600 annually.

Lowry hosted an Air Force-Army Calibration Training Meeting 6-8 August 1974 to develop the implementation plan for the consolidation; the consolidation was approved on 13 September 1974. The Army Calibration Technician and Specialist

course (198-35H20) was discontinued at the Aberdeen Proving Grounds on 1 January 1975, and the first Army students entered training at Lowry on 22 January.

Instructor Manning: Army instructor manning to support the consolidated training program was based proportionately on the Army's student load: with a projected FY 1976 student mix of two-thirds Air Force and one-third Army, the Army was required to provide 22 of the 66 instructors/supervisors authorized for the course. A tentative phase-in plan for the Army instructor force was developed, with the Air Force instructor cadre scheduled to remain at full strength until FY 1976, when the Army/Air Force instructor ratio would be implemented. The Army instructors were scheduled to attend instructor training and assist with curriculum development and classroom instruction in the interim.

The first cadre of Army support personnel — two liaison personnel and eight instructors—arrived at Lowry in late November. The instructors graduated from Lowry's instructor training course in December, and joined their Air Force counterparts in the classroom. Another contingent of nine Army instructors arrived 15 January 1975, and were instructing PME classes by the end of March. The final cadre of instructors was scheduled to arrive in August.

Advanced PME Courses: An ITR Working Group met at Ft. Gordon, Georgia, 27-29 August 1974 to discuss the consolidation of Army, Air Force, Navy, and Marine Corps advanced PME training. The discussion highlighted the differences in equipment, measurement techniques, and documentation between the services, but noted that there was potential to develop consolidated courses. Until a common, consolidated course could be developed, the Group recommended the development of modular courses designed to teach service peculiar courses at a common location to effect savings in man-years, facilities, and equipment.

An ITRB meeting was convened at the Aberdeen Proving Grounds in late January 1975 to discuss again the consolidation of advanced PME courses. The Navy reiterated its reluctance to engage in an interservice training program, citing the difficulty in resolving conflicts in course content as the primary reason for maintaining its own training program.

At an ITH meeting held at Lowry 6-9 May 1974, the Group analyzed the advanced PME Physical and Microwave Measurement and Calibration courses. Because of increased DoD pressure to consolidate Precision Measurement Equipment Laboratories (PMELs) worldwide, the Group increased its emphasis on developing training programs which would meet the technical skills necessary to manage the interservice facilities. The Group agreed that a training program was required that provided training applicable to all PME areas — training that emphasized calibration techniques and principles and used equipment representative of all the services.

An interservice committee was established to determine the ‘best’ mix of representative equipment and to develop an interservice training program. The Group also agreed to increase interservice cooperation in procuring equipment, thereby decreasing the differences in equipment and procedures among the services.

The Group agreed to consolidate advanced Microwave and Physical Measurement courses, effective January 1976. The courses were to be conducted through the use of training modules, providing the exact amount of training required by each service—i.e., Navy students would receive 20 academic days of Microwave training, versus 30 and 32 academic days for the Army and Air Force.

Instructor Manning: Instructor resources were based on a prorated system, dependent on the number of students from each service. Initial plans provided for 11 Air Force, eight Navy and five Army instructors.

Advanced Instructional System

The Advanced Instructional System (AIS) was designed to develop more effective and efficient Air Force training programs. Through the use of computer assisted and managed training, students were provided with a personalized learning program through which they could progress at their own pace. By providing a system whereby a computer was used to instruct, test and manage the students' activities, AIS was intended to free instructors from routine clerical tasks and allow them more time to guide students who required additional help with the course material.

Computer: The core of the AIS system was the CYBER 73-14 computer, installed in January 1974. As with any system, continual updating was required to maintain compatibility between equipment and requirements. As the AIS program expanded, so did the computer's "memory" requirements. More extended core storage (ECS) equipment was installed at Lowry in January 1975, increasing the CYBER's memory from 250,000 words to 500,000 words.

Four 669-2 tape drives were installed on the CYBER in March 1975, replacing the original 659 drive system. The new drives were approximately four times faster than the original equipment, effectively reducing the computer's response times.

Computer Effectiveness: Power interruptions continued to plague the AIS program during FY 1975. Eleven power fluctuations were recorded in July 1974. each requiring a manual restart of the computer system. Power outages caused repeated water chiller system failures throughout the year. Electrical modifications were made to the system in October 1974, and additional warning sensors were added to the system to 'alert personnel of power failures. Temperature and humidity became serious problems in June 1975, threatening serious computer time losses. Additional air handling equipment was scheduled to be installed during July 1975 in an attempt to resolve the problems.

The power fluctuation problem continued throughout the year. Computer downtime was a serious problem due to the impact it had on remote terminal operations within the classrooms; the power outages created serious backlogs of student data inputs to be processed once the computer was back "on line." As noted in the last History, the installation of an uninterruptable power system (UPS) appeared to be the only solution to the problem. The UPS was expected to enhance computer reliability in addition to improving operational continuity. As noted in the following table, the problem remained unresolved, at the period's close:

AIS COMPUTES EFFECTIVENESS, FY 1975

	CYBER ONLY	TOTAL SYS*	REMARKS
Jul 74	97.5%	96.7%	11 Power Outages
Aug 74	100.0% 98.8%	98.7%	
Sep 74	92.9%	96.6%	
Oct 74		91.9%	5 Power Outages
Nov 74	98.0%	97.9%	
Dec 74	99.3%	98.4%	
Jan 75	98.9%	97.2%	
Feb 75	98.6%	97.1%	
Mar 75	97.9%	95.7%	
Apr 75 May	94.5% 98.4% **	94.1%	
75 Jun 75		95.7%	
		**	19 Hrs Computer Time Lost Due to Power Outages

* Total system included computer, water chiller, air conditioner and main power system.
** figures not available.

Communications Network: At the beginning of the fiscal year, Lowry's AIS communications network was composed of the CYBER 73-14, and interface unit, two site controllers, none "A" terminals, and three "B" terminals.

As discussed in the previous History, a number of problems had been encountered by an Air Force Electronic Installation Squadron (EIS) team from McClellan AFB, California, during its attempt to install a coaxial cable communications network in support of the AIS. As a temporary measure, in-house telephone lines were used to connect the classroom terminals with the computer. The coaxial cable network was finally installed in August 1974. The telephone network was left intact, however, to provide a redundant communications link to the classrooms.

Eighteen additional "A" terminals were received during the fiscal year. The new panels had been modified to correct the flexing and bowing problems caused by the altitude differential between the manufacturing site and Lowry, and a number of evaluations were in progress during the year to determine if the modifications had been successful.

One 'B" terminal was integrated into classroom instruction in the Inventory Management/Materiel Facilities (IM/MF) courses in January 1975, and a 3-month critical design review (CDR) was completed in April. The terminal, consisting of an OMR 6500 optical mark reader, a Data Interface 240 printer, and a PDP 11/05 controller, had been used 2 hours daily to grade student module tests. The other "B" (management) terminals had been used for course development by McDonnell-Douglas and the Human Resource's Lab, operating on a three-shift basis to support courseware development and student data processing requirements. The 3-month evaluation concluded that the terminals were operating effectively.

Computer Assisted/Managed Instructional Language: Computer Assisted Managed Instructional Language (CAMIL) was a system whereby course writers were

able to program course changes directly into the CYBER, using a simplified computer language. A CAMIL compiler, developed by the Softech Company and the McDonnell-Douglas Corporation (MDC), recognized the CAMIL programs, but was not able to interpret the instructions. A CAMIL interpreter was developed by McDonnell-Douglas to work in association with the compiler, converting the basic CAMIL into instructions easily interpreted by the CYBER, which in turn executed the CAMIL program. The CAMIL system was linked to the classrooms via a time-shared operating system (TSOS) link to the "A" terminals. This allowed course changes to be immediately' implemented in the classrooms.

The first CAMIL program was successfully compiled, loaded into the ECS, interpreted, and executed on 6 March 1975. This marked the first time that the entire CAMIL system—compiler, interpreter, file manager, terminals, and foreground monitor—had worked as an integrated system.

McDonnell-Douglas began conducting classes on the use of CAMIL for its personnel and those of the Human Resources Lab in April 1975. A number of problems had surfaced during the development of the CAMIL software; consequently, MDC devoted the main thrust of its education program to the resolution of the problems.

USAFSAAS Support of AIS: Although the Human Resources Laboratory had the primary responsibility for developing the AIS program, the School provided technical experts to assist in course development and hardware fabrication. The support provided by the School during FY 1975 is summarized in the following table:

USAFSAAS SUPPORT OF AIS, FY 1975

	PERSONNEL	MANHOURS		PERSONNEL	MANHOURS
Jul 74	45	3,473	Jan 75	47	3,065
Aug 74	44	2,922	Feb 75	53	3,881
Sep 74	44	3,077	Mar 75	62	4,162
Oct 74	45	3,235	Apr 75	60	4,163
Nov 74	45	2,899	May 75	58	4,380
Dec 74	46	1,308	Jun 75	60	3,294

TOTAL MANHOURS: 39,859

One of the more significant examples of the School's support during the fiscal year was the development and fabrication of 260 individual student carrels by the Training Services Division. The local fabrication effort saved an estimated $64,000 over the cost of procuring like equipment from commercial sources.

Courseware Development: Eventually, the School was destined to assume the responsibilities for the development of AIS media subsystems. With this in mind, the School requested the establishment of a test period during which it could test its capability to develop the courseware, and a two-phase program was initiated in January 1975 to evaluate the School's support capabilities.

The first phase began on 1 March. During this phase, the School was responsible for revising contractor-produced materials during periodic updates. The test was successfully completed at the end of May, and the second phase, during which the School would assume total responsibility for the development of the mediated portions of electronics instruction within the Precision Measurement Equipment (PME) and Weapons Mechanic (WM) courses, was scheduled to begin in early FY 1976.

The results of the Phase II evaluation would determine if the School would be ready to assume responsibility for the development of all AIS media subsystem on 1 January 1976, as the current schedule called for. If the School successfully supported the program during the Phase II evaluation, it would assume total responsibility for the production of AIS courseware in June 1976, marking the first transfer of a major AIS subsystem to an ATC organization.

Problems:

Instructor Shortages: Instructor shortages during the fiscal year created difficulties in maintaining an adequate number of classroom instructors. This in turn affected the amount of support that the School was able to provide the AIS program.

The instructor shortages most seriously affected AIS support within the Department of Avionics Training, where AIS support manning fell to 50 percent of its authorized level, "seriously impacting the PME AIS schedule. A reduction in the Air Force student input to PME courses in November 1974 had been expected to 'relieve the present . . . instructor shortage," by allowing instructors to be reassigned to AIS support positions, but the situation remained "critical" for the remainder of the year.

Instructor Training: Instructor training was a continuing problem associated with AIS throughout the year. Proper instructor training was considered vital to the program's success because the training directly affected the instructor's attitude toward AIS, and, subsequently, the attitude of the students toward the program. Instructor training had been conducted through an OJT program, but instructor shortages had severely restricted the amount of time that instructors were available for training.

To rectify the problem, the Lowry HRL assigned one specialist to the AIS training program to develop and implement a systematic certification program.

Under the new certification program, an instructor training program was developed, scheduled to be implemented in July 1975. Instructor training materials were received from the Army and Navy in June, and were being integrated with Air Force instructional materials to develop the instructor training program at the year's end.

AIS Course Development:

Precision Measuring Equipment: As noted earlier, instructor shortages had significantly reduced the amount of support the School was able to devote to AIS development. This was particularly true in the Department of Avionics Training, where instructor shortages seriously hindered the AIS implementation

schedule during the year. Department AIS support manning during the year was only 50 percent of that authorized. Because of the urgent requirement to validate AIS projects during the research and development stages. McDonnell-Douglas formulated plans in September 1974 to hire qualified former servicemen as temporary instructors until the manning situation stabilized at Lowry. A sudden drop in the Air Force TPH in November, however, alleviated the instructor shortages to some degree, and the temporary hire program was not implemented.

Changes in the course content also delayed the development of AIS in PME courses. A transition to solid state equipment in lieu of vacuum tube equipment had increased the course length by 40 hours in Block XI and 75 hours in Block VI, due, primarily, to different hands-on performance requirements. The number of performance checks were increased significantly: There had been 11 performance checks in Block X previously; 35 performance checks were required with the solid state equipment.

The shift in equipment had caused a shift in course development from vacuum tube theory to solid state and logic theory, requiring a revision of the basic instruction blocks already developed under AIS. Manning shortages complicated this revision. Although Blocks IX, X, XI and XII had been converted to AIS before the end of the year, the new materials had been implemented in the classroom on a test basis only. The tests showed that significant savings in training time were possible using the AIS materials: 570 students using AIS materials in Blocks X-XII had saved 18,965 training hours during the test period.

The tests also showed that foreign students saved the least amount of time--3 percent in Block X-- but instructors reported that they felt that the foreign student 'learning achievement is greater" than that of USAF students using AIS course materials.

DOD SUBGROUP 198

CONSOLIDATION OF
ADVANCED PME
TRAINING WORKSHOP

6-9 MAY 1975

LOWRY AFB, CO

ATTENDEES:

Mark S. Creviston, Jr. Lt Col
USA/USAOC&A, Dip, Wpn Tng Dept

Robert E. Russin, Maj, USAF
ATC/TTKA

G. O. Mallette, Capt, USMC
MCLONAVPRO-USMC
Representative

SY Evendorff
Naval Plant Rep Office
Pamona/MEC

Howard L. Quisenberry
CNTECHTRA/Code 311

George Greenup
AGMC/Dir of Metrology

MSgt Kenneth V. Mattoon
US Army Metrology Calibration Center

1. AUTHOBITY: The conference was convened in response to ATC/TTKA message 2219202 Apr 75. The conference was held in Building 1433, Metrology Training Branch, Lowry AFB, CO. Personnel attending "-the conference are identified in Attachment 1.

2. LOWRY WELCOME: Colonel Billy C. McMaster, USAFSAAS, Lowry Operations Officer, opened the conference with a welcome address. Colonel McMaster stated that he fully understood the importance of the DOD Consolidation of the PMEL Training Programs, not only with respect to the past accomplishments in the basic course, but in the development of the advanced programs at hand. He stressed the importance of working together as an interservice training group to develop viable advanced PME training programs which will keep pace with the training requirements for future consolidated PMEL facilities world-wide. He closed his remarks by again welcoming the conferees by personally extending this welcome from General C. C. Pattillo, Center Commander, Colonel Caudry, USAFSAAS School Commander, and himself.

3. OPENING REMARKS AND CONFERENCE OBJECTIVES: Major Russin, ATC/TTKA, Conference Chairman, reviewed the conference agenda with regard to analyzing advanced PME Physical and Microwave Measurement and Calibration courses to determine the feasibility of consolidation for USA, USN, USMC and USAF. Major Russin stated that cost analysis data based upon consolidation efforts, training concepts, and the development of implementation plans for these courses were expected outcomes of this meeting. The conference agenda (see Attachment 2) was agreed upon.

4. PHILOSOPHY OF AIR FORCE PME TRAINING: Mr. Greenup gave a presentation on the Air Force metrology program. He then emphasized that the PMEL training course graduates should be competent technicians that are able to process a wide variety of precision measurement equipment. Training should be provided that is not specific equipment oriented. General overall training on calibration methods and techniques that can be applied to all PME is required. Increased emphasis is being placed on consolidation of PMEL facilities world-wide, and training programs must be developed to meet the technical skills required to man these facilities.

5. Service representatives discussed methods to be used for updating/changing consolidated courses. Emphasis on calibration techniques and principles using representative field equipment was mutually agreed upon. Procedures for updating consolidated courses were drafted and are included as Attachment 3. Basically, a committee composed of service representatives (at Lowry AFB) will, on a recurring basis, consider changes proposed by any service. This committee will recommend the "best" representative equipment to be used in satisfying the training requirement.

6. Differences in equipment and procedures throughout the services create problems in consolidated training. It was mutually agreed that more interservice coordination of procurement action on test equipment is required. Equipment buy programs were discussed resulting in agreement that procurement information sharing by AGMC, AMC, and USN will be effected to minimize training difficulties.

7. Splinter groups were established to work out course content, length, and duration requirements. Service representatives agreed to the courses as contained in Attachments 4, 5 and 6.

8. Preliminary cost estimates indicate:

- One time implementation cost $107.5

- Annual recurring savings 91.3

Consolidated Advanced Microwave and Physical Measurement course instructor requirements are contained in Attachment 7. Navy instructor personnel for the consolidation will be programmed for First Quarter, FY77.

9. Service representatives recommend consolidation of Advanced Microwave and Physical Measurement courses. A DCLF reference calibration course will be developed for Army personnel. Target date for implementation of these courses is January 1976.

10. Tentative milestones for implementation of Advanced Course consolidation is contained in Attachment 8.

ACTION ITEMS:

1. Navy will provide to ATC/TTKA/ACMF by 1 June 1975. Incremental/Decremental Cost Data for consolidated Microwave and Advanced Physical Measurement training.
ACTION: CNTECHTRA/CODE 311

2. AF will program students for consolidation training.
ACTION: ATC/TTKA

3. AGMC will provide on a recurring basis to USAFSAAS/TTOR/TAVM, information on systems/standards proposed or procured for USAF PMELs.
ACTION: AGMC

4. USAF, USA and USN representatives will meet at Lowry AFB NLT 1 June 1975 for the purpose of developing detailed plans of instruction and associated support material required for Advanced Microwave and Physical Measurements Calibration course.
ACTION: ALL
(EX 64)

AIR FORCE HUMAN RESOURCES LABORATORY
TECHNICAL TRAINING DIVISION
LOWRY AIR FORCE BASE COLORADO

AIS MONTHLY ACTIVITY REPORT FOR PERIOD ENDING 31 JUL 74

C. DESIGN and INTEGRATION

1. Instructional Design

c. Precision- Measuring Equipment (PME)

Tryouts for PME-AIS started in July 74. The soldering materials have been trained on 30 students with a 25% average time reduction and 100% criterion achievement. The first trial of troubleshooting materials is in progress. A 25% time reduction is anticipated. There were several problems encountered. There were shortages of both instructor personnel and equipment.

The troubleshooting tryout was delayed a week because of instructor shortages and adequate time for instructor training was not available.

There are shortages of soldering hand tools and operating electronic equipment. Additional hand tools will be procured and some equipment has been borrowed from McDonnell resources. The equipment difficulties will require further analysis to determine an appropriate course of action. The tryout students have demonstrated some deficiencies in minor practical skills that had previously been assumed at later stages of the course. More students must be evaluated to determine if this is typical or a case of a single class.

When the instructor and equipment shortages are solved, increased time savings with full criterion attainment should be achieved.

d. Media

Small group trials in PME incorporates MDC-produced picture texts, printed texts and Super 8mm single concept films. The films were produced for AF under a previous pre-AIS contract (LOGOS) using an A. B. Dick projection system. This system is being replaced because of maintainability problems. The Kodak Supermatic-60 projector was purchased by ATC as a school resource replacement for the A. B. Dick system. By removing the existing films from the Dick cartridges and placing them into Kodak cartridges, MDC was able to continue usage of a highly effective courseware package. Selection of the described media and courseware makes for an optimal and cost effective learning combination within the AIS. (EX 130)

AIR FORCE HUMAN RESOURCES LABORATORY

TECHNICAL TRAINING DIVISION

LOWRY AIB FOBCE BASE COLORADO

AIS MONTHLY ACTIVITY REPORT FOR PERIOD ENDING 31 AUG 74

A. SIGNIFICANT EVENTS

4. A serious manning problem has developed in the Precision Measuring Equipment (PME) course. The instructor manning is 10% below the current authorization. It was expected that these deficiencies would be corrected by September 1974; however, known losses currently exceed projected gains. This problem if not resolved could have a very serious impact on the implementation schedule for the PME course as well as the overall AIS schedule.

C. DESIGN and INTEGRATION

1. Instructional Design

c. Precision Measuring Equipment (PME)

PME Instructor Manpower

(1) As previously reported the manning for both PME instructors and PME, AIS/ATC personnel has been deficient. Instructor strength is 10% below authorization and AIS manning is 50% below authorization. It was expected that these deficiencies would be corrected by September 74, but current known, losses exceed projected gains.

(2) In early August we were informed by the contractor that instructor support for the program was and would be less than required. This was because of an actual shortage of people. We recommended that the contractor document this in a memo. The contractor's memo and the PME Implementation Plan also indicated that the AIS requirement for instructors would exceed the current authorizations. Current authorizations are 61 instructors and the contractor's estimate is that 83 are required.

(3) An initial meeting was held 22 August 74 with school, contractor, and AFHRL personnel to discuss the personnel situation. It was concluded that the current shortages did interfere with the development and tryout of the learning materials and with student progress during the tryouts. It was agreed that an increase in both manning and personnel was required because of the AIS function. .These increases are required because of the R&D nature of the project and in part because validating new systems requires added personnel because of the validation requirement. It was also agreed that if the instructor personnel situation is not improved, significant differences from the PME Implementation Plan will result. Delays in improving the situation will result in modifying the currently planned development cycle.

(4) The manning/personnel situation will be examined and the kinds of personnel required will be evaluated. We will also explore any avenue that

would promise reduction in the personnel requirement. Because, however, of the delays involved in obtaining personnel, it would seem impossible to implement the initial PME Implementation Plan.

(5) The initial tryout of the Block XI materials has been completed. All (15) students successfully completed the materials with a 20% mean time savings. These time savings were reduced by shortages of instructor personnel, equipment and facilities.

e. Media

Introduction of the MDC "picture books" (a lesson comprised of individual 3x5 color photographs with appropriate print accompaniment) in the PME course small group trials has been highly successful.

AIR FORCE HUMAN RESOURCES LABORATORY
TECHNICAL TRAINING DIVISION
LOWRY AIR FORCE BASE COLORADO

AIS MONTHLY ACTIVITY REPORT FOR PERIOD ENDING 30 SEP 74

A. SIGNIFICANT EVENTS

4. Instructor shortages in the Precision Measuring Equipment course have continued to be a problem. Several meetings with Lowry Technical training personnel have resulted in the school requesting five additional manpower authorizations to support the AIS.

C. DESIGN and INTEGRATION

1. Instructional Design

a. Instructional Strategies Subsystem

(3) Precision Measuring Equipment (PME)

The instructor shortages in PME continue to be a problem. The school has requested five additional manpower authorizations to support the AIS. McDonnell Douglas is also considering hiring some qualified former service personnel on a temporary basis to help alleviate the problem.

Tryouts in Block XI are continuing. A second group of fourteen students is presently going through Block XI.

b. Media Subsystem

Implementation of the AIS in PME, Block X, Soldering, has created a resources availability problem in that non-AIS students must use the same room and equipment items. Accordingly, PME supervisors recommended that the non-AIS portion of the course be individualized to accommodate the non-AIS students. This will allow both AIS and non-AIS students to-proceed through the required instruction utilizing the same equipment at the same time. PME course personnel filed a work order with the Training Services Division (ATC) to create a special series of illustrated texts as the prime instructional delivery item. These texts are fashioned after the MDC-developed illustrated texts and will deal with a more advanced subject area. This activity also provides an opportunity to test Air Training Command's ability to generate an AIS-related courseware requirement. Such interaction is desirable in that the successful transition of media requirements depends on ATC's ability to establish an AIS capability as early as possible.

AIR FORCE HUMAN RESOURCES LABORATORY
TECHNICAL TRAINING DIVISION
LOWRY AIR FORCE BASE COLORADO

AIS MONTHLY ACTIVITY REPORT FOR PERIOD ENDING 31 OCT 74

A. SIGNIFICANT EVENTS

3. The Air Force Trained Personnel Requirement (TPR) for the Precision Measuring Equipment (PME) Course has been reduced to zero for approximately 9 months; however, student input from the other services will continue. The TPR for FY 77 will be 450 with 220 from the other services. It has been decided to continue course material development rather than re-direct the effort to another course.

C. DESIGN and INTEGRATION

1. Instructional Design

b. Precision Measuring Equipment (PME)

(1) The Air Force Trained Personnel Requirements (TPR) have suddenly been reduced. This will cause the Air Force flow in 3ABR32430, Precision Measurement Equipment Specialist, to go to zero for approximately none months. As a result of this information, a meeting was held between AFHRL/TT, the Tech School Commander, and representatives of the Avionics Department. It was determined that even without Air Force students, there would be a continuing flow of Marine and Army students (at least 6 per week) and that Air Force students would re-enter the course at a later date. Future flows for FY77 and 78 are up to 600-700 students, including Air Force, Army, Marines and Military Assistance Pact. It was pointed out that part of the reasoning for selecting Lowry as the DOD location for PME training was that the AIS would develop the basic PME course. The reduced student flow will alleviate the current instructor shortage and should provide additional instructor assistance for material development. It was decided that no change to the AIS development would be made because of this reduced TPR.

(2) The AIS development of the PME course includes electronic principles materials. An attempt will be made to interface with the ATC standardized basic electronic course in the development of AIS materials so that there will be as much common usage of materials as possible.

(3) The preliminary design review (PDR) for the Precision Measuring Equipment Course implementation plan was successfully completed 15 October 1974.

AIR FORCE HUMAN RESOURCES LABORATORY
TECHNICAL TRAINING DIVISION
LOWRY AIR FORCE BASE COLORADO

AIS MONTHLY ACTIVITY REPORT FOR PERIOD ENDING 30 NOV 74

C. DESIGN and INTEGRATION

1. Instructional Design

b. Precision Measuring Equipment (PME)

(1) Seven each of six different items of new PME electronics test equipment were due 10 Nov 74. This equipment was required because of ATC course changes from vacuum tubes to solid state. Five of the six items were not delivered, and the earliest due date is now Sep 75.

(2) Block IX tryouts will be delayed from Jan 75 to March 75 because of the delay in equipment delivery, since materials must be revised to use the old equipment.

(3) Block X tryouts were started 20 Nov 74 and appear to be satisfactory. Twenty-seven students completed Block XI in November resulting in a cumulative savings of 698 student manhours.

AIR FORCE HUMAN RESOURCES LABORATORY
TECHNICAL TRAINING DIVISION
LOWRY AIR FORCE BASE COLORADO

AIS MONTHLY ACTIVITY REPORT FOR PERIOD ENDING 31 DEC 74

A. SIGNIFICANT EVENTS

6. The first small group tryout of Precision Measurement Equipment (PME) Block X materials has been completed. Twelve trainees participated. The mean end-of-block test score was 85, and the mean time to block completion was 62 hours, 50 minutes. This represents a mean time savings per trainee of 31%.

C. DESIGN and INTEGRATION

1. Instructional Design

b. Precision Measuring Equipment (PME)

Tryouts of Block X material have been satisfactory. The first class of 14 students saved 30.6% of the 90 hour block time. The range in savings was 3% to 45.2%. The three percent student was a foreign student. It should be noted that the foreign students are slower than USAF students. Instructor opinion reported about foreign students is that under individual pacing the foreign student learning achievement is greater. The second tryout group of six students had two students finish before the Christmas break with time savings of 50% and 53%.

AIR FORCE HUMAN RESOURCES LABORATORY
TECHNICAL TRAINING DIVISION
LOWRY AIR FORCE BASE COLORADO

AIS MONTHLY ACTIVITY REPORT FOR PERIOD ENDING 31 JAN 75

C. DESIGN and INTEGRATION

1. Instructional Design

c. Precision Measuring Equipment (PME)

Block X small group tryouts were completed in January 1975. The conventional training time was 90 hours, the AIS time 61 hours. Conventional mean written test score was 88%, the AIS score 85. These tests are not identical due to changes in course content. Conventional students were performance tested in pairs 11 times, AIS students individually 35 times. Performance testing occurred during the block, written testing at the end of the block.

Block XI revisions have been completed and revised materials have been installed. Block X revisions (based on small group tryouts) are 90% complete. The first two Army students entered the course in January 1975, making it a tri-service course.

AIR FORCE HUMAN RESOURCES LABORATORY
TECHNICAL TRAINING
DIVISION LOWRY AIR FORCE
BASE COLORADO

AIS MONTHLY ACTIVITY REPORT FOR PERIOD ENDING 28 FEB 75

A. SIGNIFICANT EVENTS

2. The first large group tryout of Precision Measuring Equipment (PME) Block X materials has been completed. The average end of block test score was 83%, and the average time to block completion was 61 hours and 12 minutes. This represents an average time savings per trainee of 32%.

3. To date 354 students in PME have used the self-paced AIS materials for a total time saving of 4532 manhours.

B. DESIGN and INTEGRATION

1. Instructional Design

c. Precision Measuring Equipment (PME)

The PME Course is still experiencing instructor shortages, and at this time does not have their instructor authorizations filled. The MED-4 team has recently completed a manpower evaluation survey, and, if approved, the number of instructor authorizations will be increased. As a temporary measure, the possibility of utilizing instructor aides is being investigated.

The decision to use the DIGIAC logic trainer in PME was recently made in coordination with course personnel and MDC. One trainer will be purchased through the contract so that the materials can be developed. The remaining trainers will be procured through ATC channels. Course personnel are also investigating present equipment used in the course and what exists in the PMEL laboratories. They are also looking at future procurements by the Air Materiel Area (Kelly AFB). The extent of the impact of new equipment buys on the MDC contract has not been determined at the present time.

The transition to solid state equipment in PME has required additional instructional materials to be added in Blocks VI and XI. The estimates are that approximately 40 hours have been added to Block XI and 75 hours to Block VI. Documentation procedures to track additional instructional materials have been implemented.

The number of performance checks in PME has increased as a result of the AIS implementation. For example, in Block X the number of performance checks under conventional instruction was 11. The number under AIS has increased to 35. These increases are desirable and were directed by course personnel.

AIR FORCE HUMAN RESOURCES LABORATORY
TECHNICAL TRAINING DIVISION
LOWRY AIR FORCE BASE COLORADO

AIS MONTHLY ACTIVITY REPORT FOR PERIOD ENDING 31 MAR 75

B. DESIGN and INTEGRATION

1. Instructional Design

c. Precision Measuring Equipment (PME)

The following time saving data is reported effective 24 Mar 75:

	Students	Conventional Time Hours	Average AIS Time Hours	Cumulative Hours Saved
Block XII	246	30	24	1476
Block XI	173	120	70	8650
Block X	45	90	63	1215
				11341

The transition to solid state equipment in the PME course will result in a revised course that will differ significantly from the previous course. The majority of hands-on performance will be on different and updated equipment. There will be a major shift from the vacuum tube theory to solid state and logic theory. In many ways the courses will not be comparable. This change is having two kinds of impact on course development. For new items it does not provide normal classroom experience on which to base the individualized learning materials. And in some instances it results in revision of already prepared materials because of midcourse changes in the procurement cycle by the AMA. These changes are required because of the technology change in test equipment and its impact on the calibration program.

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AIR FORCE HUMAN RESOURCES LABORATORY
TECHNICAL TRAINING DIVISION
LOWRY AIR FORCE BASE COLORADO

AIS MONTHLY ACTIVITY REPORT FOR PERIOD ENDING 30 APR 75

C. DESIGN and INTEGRATION

4. Precision Measuring Equipment (PME)

a. The cumulative manhour savings in PME as of April 1975 are as follows:

Block	# Students	Hrs/wk Saved	POI Hours	Hours Saved
XII	196	5.9	30	1156
XI	196	12.6	120	9878
X	16	9.0	90	432
				11466

b. There have been 196 students graduated who completed Blocks XI and XII, 16 of whom completed Block X.

c. Instructor manning in the PME basic course was reduced by 22 slots on the latest UDL. This was because of decreased student flows as documented. Since then (May 75) the student flow has been restored and the decrease in manning authorization should be restored. A Management Engineering Detachment evaluation of the course recommending increased manning has been informally approved by Hq ATC but there are no personnel funds to implement it.

d. The status of the "currency" of the test equipment in the PME course has been questioned and correspondence requesting an AF evaluation has been submitted to ATC by the school. There have been many instances of equipment changes to date and more are expected. It appears that the equipment changes will result in learning material changes beyond the 40% level included in the specification.

AIR FORCE HUMAN RESOURCES LABORATORY
TECHNICAL TRAINING DIVISION
LOWRY AIR FORCE BASE COLORADO

AIS MONTHLY ACTIVITY REPORT FOR PERIOD ENDING 31 MAY 75

B. DESIGN and INTEGRATION

4. Precision Measuring Equipment (PME)

a. The cumulative time savings in manhours for PME graduates are as follows:

Block	# Students	Hrs/wk Saved	Week/Block	Hours Saved
XII	229	5.9	1	1282
XI	229	12.6	4	11541
X	49	9.0	3	1323
			Total	14147

b. The instructor manpower situation in the basic PME Course is a problem. The instructor UDL for the basic course was reduced to 32 instructors because of the then reduced student flow per flow charts. There are about 40 instructors available for instructor and supervisor duty. A week after the reduction in manning, the student flow was increased and as yet the manning has not been upped. This means that no gains in personnel will occur until such UDL action is completed. It is expected that the combined AF-Army strength will go to 73 instructors. The MED-4 detachment at Lowry evaluated the requirement for individually-paced instruction and fixed the requirement at 91 instructors for the basic course. ATC Headquarters has not rejected this, but because of manpower shortages in the basic PME course are hampering AIS material review, AIS instructor training and may reduce the level of technical support needed by the contractor.

c. Block IX small group tryouts were started in May. Of the seven students, five passed with block test 'scores of 80, 89, 95, 96, and 100. The times ranged from 60-71 hours for a 78-hour block. The first attempt non-completions had test scores of 56 and 53. An analysis of test scores (including a second tryout. group) and other data will be accomplished to determine what should be done about altering materials or procedures.

AIR FORCE HUMAN RESOURCES LABORATORY
TECHNICAL TRAINING DIVISION
LOWRY AIR FORCE BASE COLORADO

AIS MONTHLY ACTIVITY REPORT FOR PERIOD ENDING 30 JUNE 75

C. DESIGN and INTEGRATION

5. Precision Measuring Equipment (PME)

A series of meetings were held within the Technical School on the status of insufficient manpower" authorizations in the Metrology Training Branch. These meetings culminated in a TWX being sent to Hq ATC/TTK outlining the general impact of insufficient manpower authorizations. The impact is the inability to conduct several advanced courses and to handle the full TPR for the basic course. Branch personnel also indicate that AIS has not been a significant contributing factor to this situation and in fact the situation would be worse if there were not individualized materials.

The cumulative man hours saved in PME to date are:

Block	Conventional Length	AIS Length	Hours Saved	Number of Students	Cumulative Hours Saved
XII	30	24.1	5.9	250	1,475
XI	120	69.6	50.4	250	12,600
X	90	63.0	27.0	70	1,890
				Total	15,965

Delivery of new items of test equipment for use in updating the PME course continues to be a problem. One item of equipment is a problem in upcoming Block VIII tryouts. A model 801A Generator Detector is currently in short supply and is not under procurement by the AF depot. The item is available from US Army resources and will be obtained. There is a possibility of late delivery.

The Block IX materials were initiated 5 May. The tryout data has not been summarized, but it appears that mean block time will be 75 hours and the mean block test score will be 83 percent. This is a new block using new equipment and cannot be compared directly with the conventional Block IX. The new block is solid state hardware and the fundamentals in previous blocks are less than adequate in this area. It is expected that more complete solid state fundamentals will reduce the mean Block IX length.

Recent reviews of the progress in course material development indicate that the entire course cannot be completed under the McDonnell Douglas contract. This situation has been documented in previous activity reports and is due to the following:

(a) Substantial changes in the .PME course content. These have been necessary due to changes in technology in the PME field.

(b) The number of man hours required to produce materials has exceeded the original estimate (over 100 per hour vs 60 bid).

(c) Instructor shortages "in PME have affected the manning of the A1S positions and have complicated the implementation of AIS modules.

(d) New materials have been developed to support the new solid state equipment.

Analysis of Blocks I-VII is being conducted to determine which ones should be developed. The main points of the analysis involve stability of the material and the availability of existing material that can be used as is or would require minor revisions. The decision as to which .blocks will be developed will be made in July. (EX 130)

AIR FORCE HUMAN RESOURCES LABORATORY
TECHNICAL TRAINING DIVISION
LOWRY AIR FORCE BASE COLORADO

AIS MONTHLY ACTIVITY REPORT FOR PERIOD ENDING 31 JUL 75

C. DESIGN and INTEGRATION

4. Precision Measuring Equipment (PME)

The cumulative manhour savings for PME are:

Block # Students POI Hours % Reduction Manhours Saved

Block	# Students	POI Hours	% Reduction	Manhours Saved
XII	270	30	20	1593
XI	270	120	42	13608
X	90	90	30	2320
			TOTAL	17631

The type B management terminal has been installed in the PME course and is going through a shakedown on A shift.

Additional instructor authorizations will appear on the UDL effective FY 2/76 (1 Oct 76). Major Owens, Branch Chief, estimates January 76 as the earliest "get well' date for instructor manning.

The twelve Digiac Logic Trainers required in support of PME training will be procured as soon as 3080 funds are made available. Release of these funds is expected in August.

AIR FORCE HUMAN RESOURCES LABORATORY
TECHNICAL TRAINING DIVISION
LOWRY AIR FORCE BASE COLORADO

AIS MONTHLY ACTIVITY REPORT FOR PERIOD ENDING 31 AUG 75

B. DESIGN and INTEGRATION

1. Instructional Design

e. Precision Measuring Equipment (PME)

The cumulative manhour savings for PME are:

Block	# Students	POI Hours	% Reduction	Manhours Saved
XII	293	30	20	1729
XI	293	120	42	14767
X	113	90	30	3051
				19547

AFHRL/TT personnel interviewed fifteen PME students regarding their attitudes toward the AIS. Fourteen of the students indicated a preference for individualized instruction over conventional instruction. The attributes of individualized instruction that they liked best were individual pacing and individual (rather than paired) performance on training equipment. Negative aspects mentioned were errors in the learning materials, availability of instructor for assistance and not being allowed to take materials out of the classroom for home study. Based on these comments, the contractor, ATC, and AFHRL/TT personnel are reviewing the instructional materials again to determine where errors may exist and to make the necessary corrections. The availability of instructors for individual assistance is directly attributable to instructor shortages. This situation will improve as additional instructors are assigned. McDonnell Douglas is solving the homework problem by reproducing more copies of the instructional materials.

AIR FORCE HUMAN RESOURCES LABORATORY
TECHNICAL TRAINING DIVISION
LOWRY AIR FORCE BASE COLORADO

AIS MONTHLY ACTIVITY REPORT FOR PERIOD ENDING 30 SEP 75

B. DESIGN and INTEGRATION

1. Instructional Design

d. Precision Measuring Equipment (PME)

(1) Block IX is still undergoing large group tryouts and Block VIII material is undergoing small group tryouts. Time savings for Block IX are running at approximately 30%. The computation of time savings is complicated by the new solid state devices being introduced and the students need additional solid state theory which would normally be added to the lower blocks (I-VI).

(2) A recent survey of student attitudes shows a significant increase seems to be due to (a) increased experience on the part of the instructors in managing the AIS, (b) more positive attitudes on the part of the instructors. The monthly instructor "rap" sessions have helped a great deal in soliciting the instructors' opinions and answering any questions they have about AIS.

(3) the cumulative time savings for PME in' FY 75 were 15,965 manhours for a cost avoidance of $161K.

METROLOGY TRAINING: The Precision Measuring Equipment Specialist Course, 3ABR32430-2, worked against a deficit existing in 324XX manning. Beginning in January 1976, student entries into the course were maximized on three shifts of operation. The entry rate of 14 students per week could not make up the deficit and at the same time satisfy projected field replacement needs, and as a result, the entries were maximized on four shifts, starting in September. Even at that rate, it was estimated that it would require approximately two years to make up the deficit in the career field.

Course 3AZR32470-2, Electronic Test Equipment Calibration and Repair (Military Assistance Program--MAP) Training, incurred delays in a revision of a block of instruction in the course. Lack of some of the specific solid state equipment in the AF inventory appeared to be responsible. The revision was desirable in order to further align the course with the equipment utilized by participating MAP countries. Although the equipment had not become available by the end of the year, the branch indicated that when it arrived, the course revision would be accomplished.

A DoD consolidated course, 3AZR32470-18/21/22, Microwave Measurement and Calibration, was designed to train USAF, USA, USN, and USMC civilian and military personnel. Implemented 13 January 1976, the course completed its service test phase in July 1976. The USAF-peculiar portion of the course ran six weeks and two days, the USA portion was six weeks, and the Navy segment only four weeks.

Another DoD consolidated course the 3AZR32470-19/23/24, Physical Measurement and Calibration, also trained the same four services. The course was implemented 21 January 1976 and completed the service test phase in July. This replaced courses 3AZR32470-7 (Navy), 3AZR32470-13 (USAF)," conducted at Lowry, and the Army's 34H30 Course previously conducted at Aberdeen Proving Ground, Maryland.

A four year AIS contract was let to McAir in 1973, the objective of which was to convert the basic 3ABR32430-2 Precision Measuring Equipment (PME) Specialist Course into a computer managed, multi-media, completely self-paced course of instruction. In October 1973, an additional seven manning positions were authorized at the branch in direct support of the AIS program, and as of 1 January 1975, this was increased to 12. The manning situation as of 31 December 1976 was seven Air Force and 10 civilian personnel; however, additional AF personnel were planned in direct support of the program as the manning situation improved. The course was being converted completely to AIS concept to allow for most efficient management of self-paced students. Target date for AIS material development was set for April 1977. (pgs 37-38)

HISTORY OF THE 3450TH TECHNICAL TRAINING GROUP
(FORMERLY- THE DEPARTMENT OF AVIONICS TRAINING)
METROLOGY TRAINING BRANCH
1 JANUARY 1976 - 30 JUNE 1976

PERSONNEL

The manning reflects that the branch is overmanned by four instructor personnel. This figure has been challenged and an instructor manning survey accomplished by MED-4 has been forwarded to ATC with a request for increased instructor authorizations. Based on an analysis of FY 7T and the first quarter of FY 77, the branch will be undermanned by 24 instructor personnel at the end of 7T and undermanned by 35 instructor personnel at the end of the first quarter of 77. The manning problem has been compounded by several unanticipated retirements, loss of two civilian instructor positions by reduction-in-force, and an across-the-board increase in Trained Personnel Requirements (TPR) by all branches (Army, Navy, and Air Force) of service. Manning assistance has been requested and Hq ATC has initiated personnel actions in an attempt to mitigate the situation.

In addition to the assigned Air Force personnel there are two Navy Liaisons (E8 and E6), two Army Liaisons (CWO-2 and E9), and 26 Army instructor personnel working in this training branch.

KEY PERSONNEL

Major Ronald L. Owens, Branch Chief (assigned 15 July 1974)

Mr. Venard G. Gildea, GS-11, Educational Training Specialist (assigned 15 October 1973)

PERSONNEL STRENGTH

	Officers Auth/Asgd	Enlisted Auth/Asgd	Civilians Auth/Asgd	Total Auth/Asgd
Jan-Mar	1/1	133/141	16/14	150/156
Apr-Jun	1/1	134/140	14/14	149/155

There are presently 12 personnel in training (OJT) for skill upgrading. There are four personnel eligible for upgrading and 12 have been upgraded since 1 Jan 76.

The present operation consists of twenty active resident courses and two travel team courses. A listing, brief resume of each course, and its status is reflected in the following paragraphs:

Course	Title	Duration Weeks
3ABH32430-2	Precision Measuring Equipment Specialist	30
3ABR32430-3	Precision Measuring Equipment Specialist (Army)	34
3AZR32470-2	Electronic Test Equipment Calib & Repair (MAP)	8
3AZR32470-5	Advanced Electrical-Electronic Measurements	6
3AZR32470-8	Precision Optical and Dimensional Tech	6
3AZR32470-18/ 21/22	Microwave Measurement	6-2/5
3AZR32470-19/ 23/24	Physical Measurement	6
2ASR32050	Hi-Reliability Soldering & Equipment Repair	2
2ASR32470-2	Radiac Instrument Repair and Calibration	1-2/5
2ASR32470-6	Baird Atomic Spectrometer Model A/E35U-3	5
2ASR32470-8	Aircraft Engine Test Stand	2-3/5
2ASR32470-9	Precision Optical Measuring Technician	3
2ASR32470-12	DOD AIMS Altitude/Reporting Instr Maint/Cal	2
2ASR32470-13	DOD AIMS Ident Test Set Maint & Calib	4-2/5
2ASR32470-33	Operation/Calibration Analysis (AN/ARM-135)	2
2ASR32470-213	AN/UPM-141 Maintenance/Calibration	3-3/5
4AST32470-5	Optical Tooling and Theodolite Calibration	2
4AST32470-174	AN/AWM-13A Test Set Maintenance	2-3/5

Course 3ABR32430-2, Precision Measuring Equipment Specialist (30 weeks). Since January 1976 student entries have been maximized on three shifts of operation. This entry rate (14 per week) cannot make up the present deficit in 324XX manning and also satisfy projected field replacement needs. Therefore, the course" is tentatively scheduled to operate on a four shift basis commencing 760913 and continue in this mode for approximately two and one-half years.

Course 3ABR32430-3, Precision Measuring Equipment Specialist (Army) (34 weeks). The first 30 weeks are the same as the 3ABR32.430-2 Course and the students in both courses are commingled and receive concurrent instruction. The additional four weeks of training are on the operation of the Army calibration van.

Course 3AZR32470-2, Electronic Test Equipment Calibration and Repair (MAP) Training (8 weeks). Lack of specific solid state equipment in the AF inventory is delaying revision of one block of instruction in this course. The revision is desirable in order to further align the course with the specific equipment presently utilized by participating MAP countries. When the equipment becomes available a course revision will be accomplished

Course 3AZR32470-5, Advanced Electrical-Electronic Measurements (6 weeks), changes in the Navy inventory necessitated a major revision of this course. Target date for implementation of revised course is November 1976.

Course 3AZR32470-6, Advanced Microwave Measurements (4 weeks). This course has been consolidated into a common Air Force, Army and Navy advanced microwave course effective 760113. The last class entered 751205 and graduated 760112.

Course 3AZB32470-8, Precision Optical and Dimensional Measuring Technician (6 weeks). No program changes are anticipated with respect to this course.

Course 3AZR32470-18/21/22, Microwave Measurement and Calibration (6 weeks, 2 days USAF -18; 6 weeks USA -21; 4 weeks USN -22). DOD consolidated course designed to train USAF, USA, USN, and USMC civilian and military personnel. Course was implemented 760113 and is presently ending the service test phase. This replaces Courses 3AZR32470-6 and 3AZR32470-12 conducted at Lowry AFB, CO, and USA 35H30 Course conducted at Aberdeen Proving Ground, MD>

Course 3AZR32470-19/23/24, Physical Measurement and Calibration (6 weeks USAF -19; 4 weeks USA -23; 5 weeks USN -24). DOD consolidated .course designed to train USAF, USA, USN, and USMC military and civilian personnel: Course was implemented 76-121 and is presently ending the service test phase. This replaces Courses 3AZR32470-7 (Navy) and 3AZR32470-13 (USAF) " previously conducted at Lowry AFB, CO, and USA 35H30 Course conducted at Aberdeen Proving Ground, MD.

Course 4AST32470-5, Optical Tooling and Theodolite Calibration. One travel team was deployed to support training requirements during this period.
Course 4AST32470-174, AN/AWM-13A Test Set Maintenance. Two travel teams were deployed to support training requirements during this period.

Course 2ASR32050, Hi-Reliability Soldering and Equipment Repair Technician (2 weeks). Present programming reflects an increased need for this training. Widespread use of the printed circuit (pc) board, the not uncommon cost of $900 per board, and inherent logistic problems increased the requirements for PC board repair capabilities. No program changes are anticipated for this course.

Course 2ASR32470-2, Radiac Instrument Repair and Calibration (1-4/5 weeks). This course has been revised and converted to a self-paced package of individualized instruction.

Course 2ASR32470-6, Baird Atomic Spectrometer Model A/E35U-3 (5 weeks). Present programming indicates an increased need for training in this area.

Course 2ASR32470-8, Aircraft Engine Test Stand (2-3/5 weeks). Present programming indicates a continuing need for training in this area.

Course 2ASR32470-9, Precision Optical Measuring Technician (3-3/5 weeks). No program changes are anticipated in this course.

Course 2ASR32470-12, DOD AIMS Altitude/Reporting Instr Maint/Cal (2 weeks). No program changes are anticipated in the near future.
"

Course 2ASR32470-13, DOD AIMS Ident Test Set Maint and Cal (4-2/5 weeks). No program changes are anticipated in the near future.

Course 2ASR32470-213, AN/UPM-141 Test Set Maintenance and Calibration (3-3/5 weeks). A major revision to the course which included adding three days to the length was implemented in January 1976.

Course 2ASR32470-215, AN/ARM-135 Maintenanoe/Calibration (3 weeks). The ARM-135 TACAN Test Set is replacing most of the TACAN test sets now in operation in the AF. This is a complex piece of equipment utilizing the latest solid state technology. The AF need for maintenance, repair, and calibration capabilities has created the requirement for this course. The training plan has been approved and some instructional materials developed. Because of the delay in the deployment of the test set into the AF systems, manufacture modifications, and difficulty in obtaining necessary support equipment implementation of this course has been slipped indefinitely.

Course 2ASR32470-33, Operation/Calibration Analysis AN/ARM-135 TACAN Test Set (2 weeks). Interim course in support of ARM-135 TACAN being offered as a stop-gap solution for field training needs. Will be replaced by Course 2ASR32470-215 when equipment and calibration problems are resolved. Course was implemented 760621.

Course 2ASR32470-217, Photometric Instruments, Maintenance and Calibration (2 weeks). The increased use of light and intensity measuring devices in numerous AF systems has resulted in the requirement for photometric training. The training plan has been approved and the necessary equipment has been requisitioned. However, because of difficulty in obtaining equipment the target date for course implementation has been slipped indefinitely.

The four-year Advanced Instructional System (AIS) contract was let to McDonnell-Douglas Corp in May 1973. The objective of the AIS program is to convert the basic 3ABR32430-2 PME Specialist Course into a computer managed, multi-media, completely self-paced course of instruction. In October 1973, the additional seven positions were authorized at the branch in direct support of the AIS program, and as of 1 January 1975 this was increased to 12. Within the branch facility, there are now seven Air Force and approximately 10 contractor personnel actively engaged in developing the AIS program. Additional AF personnel will be assigned in direct support of AIS as the instructor manning situation improves. The course is being converted to the AIS concept from the last block of instruction forward. This allows for efficient management of self-paced students. Blocks XII, XI, X, IX, VIII, and VII are now conducted under the AIS concept. Blocks I through VI have become primarily an Air Force/Army effort in AIS material development. Target date for their completion is April 1977.

FACILITIES

The Metrology Training Branch is housed in Building 1433 and Building 1308. Building 1433 is a single story building of masonry construction containing 46,776 square feet of floor space.

The Branch Training Office and associated administrative, supervisory, and 34 training laboratories are located in this building. An additional training site Engine Test Stand Facility, of approximately 8,000 square feet of space is located on the east side of the building. Building 1308 is also a single story building of masonry construction and contains 6,670 square feet of floor space. The Special Training office and none training laboratories are located in this building

The metrology training program has continued to grow and now all the laboratory space available in Buildings 1433 and 1308 is being used for existing programs. The expected/projected increase in training requirements will require additional facilities. Interim planning is to explore the feasibility of joint utilization of Building 905 by both Metrology and Systems Training Branches. Long term planning is to build onto present facilities (Bldg 1433).

EQUIPMENT

All of the equipment maintenance required to support the training course in this organization is performed by the Base Precision Measuring Equipment Laboratory (BPMEL). Maintenance support has been very satisfactory and a definite plus factor in the minimal amount of training difficulty caused by "out of commission" equipment.

The major equipment, Calibration Standards, is listed in TA 734. Table of Allowance for Precision Measuring Equipment. Presently the branch maintains nineteen EAID accounts consisting of 2691 line items which represent a total dollar value of $4,301,061.99.

The operating budget required to provide necessary supplies, equipment, and accessories was approximately $15,290.71 for supplies and $11,457.21 for equipment during this period.

ENERGY

The energy conservation programs, e.g., minimal lighting in non-academic areas, conducted in this Branch, have had no adverse impact on training.

MISCELLANEOUS

The following TDY trips were taken in support of the training program during this reporting period:

a. Attend critical design review of Microwave Transmission Line Test Set, Clearwater, FL, one man, four days.

b. Visit AGMC for review of training requirements in the metrology program, Newark AFS, OH, one man, four days.

c. Conduct Course 4AST32470-174 AN/AWM-13A Test Set Maintenance, Seymour-Johnson AFB, NC, two men, 38 days.

d. Conduct Course 4AST32470-5 Optical Tooling and Theodolite Calibration, Ellsworth AFB, SD, two men, 43 days.

e. Conduct Course 4AST32470-174 AN/AWM-13A Test Set Maintenance. Tinker AFB, OK, one man, 18 days.

f. Visit DOD 198 Subgroup Interservice -Metrology Representatives, Metrology Engineering Center, Pomona, CA, two men, four days.

g. Attend Precise Time and Frequency Console Training, Newark AFS, OH, two men, none days.

h. Attend critical design review of ARM-135A TACAN Test Set, Syosset, NY, one man, five days.

HISTORY OF THE 3450TH TECHNICAL TRAINING GROUP
METROLOGY TRAINING BRANCH
1 JULY 1976 - 31 DECEMBER 1976

PERSONNEL

Present manning reflects that the branch is overmanned by one instructor. An instructor manning survey accomplished by MED-4 and forwarded to ATC with a request for increased instructor authorizations has resulted in a projected increase of approximately 20 instructors to meet our present and future needs. HQ ATC has initiated personnel actions in an attempt to mitigate the problem of time lag between obtaining authorizations and actually having instructors available in the classroom.

In addition to the assigned Air Force personnel there are two Navy Liaisons (E9 and E6) , two Army Liaisons (CSO-2 and E9), 26 Army instructors, and five Navy instructor personnel working in this training branch.

KEY PERSONNEL

Major Ronald L. Owens, Branch Chief (assigned 15 July 1974)

Mr. Venard G. Gildea, GS-11, Educational Training Specialist (assigned 15 October 1973)

PERSONNEL STRENGTH

	Officers	Enlisted	Civilians	Total
	Auth/Asgd	Auth/Asgd	Auth/Asgd	Auth/Asgd
Jul-Sep	1/1	131/143	14/13	146/157
Oct-Dec	1/1	144/145	14/14	159/160

There are presently 23 personnel in training (OJT) for skill upgrading. There are zero personnel eligible for upgrading and 12 have been upgraded since 1 Jul 76.

TRAINING

The present operation consists of twenty-two active resident courses and two travel team courses. A listing, brief resume of each course, and its status is reflected in the following paragraphs:

Weeks course	title	duration
3ABR32430-2	Precision Measuring Equipment Specialist	30 weeks
3ABR32430-3	Precision Measuring Equipment Specialist (Army)	34 weeks
3AZR32470-2	Electronic Test Equipment Calib & Repair (MAP)	8 weeks
3AZR32470-5	Advanced Electrical-Electronic Measurements	6 weeks

3AZR32470-8	Precision Optical and Dimensional Tech	6 weeks
3AZR32470-18/ 21/22	Microwave Measurement	6 weeks
3AZR32470-19/ 23/24	Physical Measurement	6 weeks
3AZR32470-020	Precise Time and Frequency Calibration Sys	2 weeks
2ASR32050	Hi-Reliability Soldering & Equip Repair Tech	2 weeks
2ASR32470-2	Radiac Instrument Repair and Calibration	1-2/5 weeks
2ASR32470-6	Baird Atomic Spectrometer Model A/E35U-3	5 weeks
2ASR32470-8	Aircraft Engine Test Stand	2-3/5 weeks.
2ASR32470-9	Precision Optical Measuring Technician	3 weeks
2ASR32470-12	DOD AIMS "Altitude/Reporting Instr Maint/Cal	2 weeks
2ASR32470-13	DOD AIMS Ident Test Set Maint & Calib	4-2/5 weeks
2ASR32470-032	Oxygen Equipment Cleaning and Calib	1 week
2ASR32470-33	Operation/Calibration Analysis (AN/ARM-135)	2 weeks
2ASR32470-213	AN/UPM-141 Maintenance/Calibration	3-3/5 weeks
4AST32470-5	Optical Tooling and Theodolite Calib	2 weeks
4AST32470-174	AN/AWM-13A Test Set Maintenance	2-3/5 weeks

Course 3ABR32430-2, Precision-Measuring Equipment Specialist (30 weeks). Since September 1976 student entries have been maximized on four shifts of operation. This entry rate will require approximately two years to make up the present deficit in 324XX manning and satisfy projected field replacement needs.

Course 3ABR32430-3, Precision Measuring Equipment Specialist (Army) (34 weeks). The first 30 weeks is the same as the 3ABR32430-2 Course and the students in both courses are commingled and receive concurrent instruction. The additional four weeks of training, is on the operation of the Army calibration van.

Course 3A2R32470-2, Electronic Test Equipment Calibration and Repair (MAP) Training (8 weeks). Lack of specific solid state equipment in the AF inventory is delaying revision of one block of instruction in this course. The revision is desirable in order to further align the course with the specific equipment presently utilized by participating MAP countries. When the equipment becomes available a course revision will be accomplished.

Course 3AZR32470-5, Advanced Electrical-Electronic Measurements (6 weeks). Changes in the Navy inventory necessitated a major revision of this course which was completed November 1976.

Course 3AZR32470-8, Precision Optical and Dimensional Measuring Technician (6 weeks). No program changes are anticipated with respect to this course.

Course 3AZR32470-18/21/22, Microwave Measurement and Calibration (6 weeks, 2 days USAF -18; 6 weeks USA -21; 4 weeks USN -22). DOD consolidated course designed to train USAF, USA, USN, and USMC civilian and military personnel. The service test phase was completed July 1976.

Course 3AZR32470-19/23/24, Physical. Measurement and Calibration (6 weeks USAF -19; 4 weeks USA -23; 5 weeks USN -24). DOD consolidated course designed to train USAF, USA, USN, and USMC personnel (military and civilian). Course was implemented 760121. The service test phase was completed July 1976.

Course 3AZE32470-20, Precise Time and Frequency Calibration System (2 weeks). This course includes theory, operation, and use techniques of time transfer, maintenance, and calibration of precise time and frequency measuring systems. Although primarily intended for 324X0 personnel, peculiar requirements within 304X4 and 328XOA fields indicate they will also attend.

Course 4AST32470-5, Optical Tooling and Theodolite Calibration. Two travel teams were deployed to support .training requirements during this period.

Course 4AST32470-174, AN/AWM-13A Test Set Maintenance. One travel team was deployed to support training requirements during this period.

Course 2ASR32050, Hi-Reliability Soldering and Equipment Repair Technician (2 weeks). Present programming reflects an increased need for this training. Widespread use of the printed circuit (PC) board, the not uncommon cost of $900 per board, and inherent logistic problems increased the requirements for PC board repair capabilities. No program changes are anticipated for this course.

Course 2ASR32470-2, Badiac Instrument Repair and Calibration (1-4/5 weeks). This course has been revised and converted to a self-paced package of individualized instruction.

Course 2ASR32470-6, Baird Atomic Spectrometer Model A/E35U-3 (5 weeks). Present programming indicates an increased need for training in this area.

Course 2ASR32470-8, Aircraft Engine Test Stand (2-3/5 weeks). Present programming indicates a continued need for training in this area.

Course 2ASR32470-9, Precision Optical Measuring Technician (3-3/5 weeks). No program changes are anticipated in this course.

Course 2ASR32470-12, DOD AIMS Altitude/Reporting Instr Maint/Cal (2 weeks). No program changes are anticipated in the near future.

Course 2ASR32470-13, DOD AIMS Ident Test Set Maint and Cal (4-2/5 weeks). No program changes are anticipated in the near future.

Course 2ASR32470-32, Oxygen Equipment Cleaning and Calibration (1 week), course was designed to train selected Navy and other military and civilian personnel on the knowledge and skills required to clean, inspect, calibrate, and package oxygen systems components. It was implemented 761005.

Course 2ASR32470-33, Operation/Calibration Analysis AN/ARM-135 TACAN Test Set (2 weeks). Interim course in support of ARM-135 TACAN being offered as a stop-gap solution for field training needs. Will be replaced by course 2ASR32470-215 when equipment and calibration problems are resolved.

Course 2ASR32470-213, AN/UPM-141 Test Set Maintenance and Calibration (3-3/5 weeks). No program changes are anticipated in the foreseeable future.

Course 2ASR32470-215, AN/ARM-135 Maintenance/Calibration (3 weeks). The ARM-135 TACAN Test Set is replacing most of the TACAN test sets now in

operation in the AF. This is a complex piece of equipment utilizing the latest solid state technology. The AF need for maintenance, repair, and calibration capabilities has created the requirement for this course. The training plan has been approved and some instructional materials developed. Because of the delay in the deployment of the test set into the AF systems, manufacture modifications, and difficulty in obtaining necessary support equipment implementation of this course has been slipped indefinitely.

Course 2ASR32470-217, Photometric Instruments, Maintenance and Calibration (2 weeks). The increased use of light and intensity measuring devices in numerous AF systems has resulted in the requirement for photometric training. The training plan has been approved and the necessary equipment has been requisitioned. However, because of difficulty in obtaining equipment the target date for course implementation has been slipped indefinitely.

The four-year Advanced Instructional System (AIS) contract was let to McDonnell-Douglas Corp in May 1973. A recent Contract Change proposal has extended the life of the contract to extend through October 1977. The objective of the AIS program is to convert the basic 3ABR32430-2 PME Specialist Course into a computer managed, multi-media, completely self-paced course of instruction. In October 1973, the additional seven positions were authorized at the branch in direct support of the AIS program, and as of 1 January 1975 this was increased to 12. Within the branch facility, there are now seven Air Force and approximately 10 contractor personnel actively engaged in developing the AIS program. Additional AF personnel will be assigned in direct support of AIS as the instructor manning situation improves. The course is being converted to the AIS concept from the last block of instruction forward. This allows for efficient management of self-paced students. Blocks XII, XI, X, IX, VIII, and VII are now conducted under the AIS concept. Blocks I through VI have become primarily an Air Force/Army effort in AIS material development.

FACILITIES

The Metrology Training Branch is housed in Building 1433 and Building 1308. Building 1433 is a single story building of masonry construction containing 46,776 square feet of floor space.

The Branch Training Office and associated administrative, supervisory, and 34 training laboratories are located in this building. An additional training site, Engine Test Stand Facility, of approximately 8,000 square feet of space is located on the east side of the building. Building 1308 is also a single story building of masonry construction and contains 6,670 square feet of floor space. The Special Training Office and nine training laboratories are located in this building.

The metrology training program has continued to grow and now all the laboratory space available in Buildings 1433 and 1308 is being used for existing programs. The expected/projected increase in training requirements will require additional facilities. Interim planning is to explore the feasibility of joint utilization of Building 905 by both Metrology and Systems Training Branches. Long term planning is to build onto present facilities (bldg 1433).

EQUIPMENT

All of the equipment maintenance required to support the training courses in this organization is performed by the Base Precision Measuring Equipment Laboratory (BPMEL). Maintenance support has been very satisfactory and a definite plus factor in the minimal amount of Draining difficulty caused by "out of commission" equipment.

The major equipment. Calibration Standards, is listed in TA 734, Table of Allowance for Precision Measuring Equipment. Presently the branch maintains EAID accounts consisting of 4,873 line items which represent a total dollar value of $6,413,864.00.

The operating budget required to provide necessary supplies, equipment, and accessories was approximately $17,433.71 for supplies and $225,333.11 for equipment during this period.

ENERGY

The energy conservation programs, e.g., minimal lighting in non-academic areas, conducted in this Branch, have had no adverse impact on training.

MISCELLANEOUS

The following TDY trips were taken in support of the training program during this reporting period:

a. Attend Course 1ASC32470-025 LTD-Q Switched Laser System Techniques, Orlando, FL, one man, fourteen days.

b. Visit AGMC for review of training requirements in the metrology program, Newark AFS, OH, One man, four days.

c. Conduct Course 4AST32470-5 Optical Tooling and Theodolite Calibration Set, Plattsburgh AFB, NY, two men, 29 days.

d. Conduct Course 4AST32470-5 Optical Tooling and Theodolite Calibration, Beale AFB, CA, one man, 14 days.

e. Conduct Course 4AST32470-174 AN/AWM-13A Test Set Maintenance, Kaufbeuren, Germany, two men, 33 days.

f. Attend DOD 198 Subgroup Interservice Metrology meeting, Aberdeen Proving Grounds, MD, one man, four days.

g. Attend Course 1ASC32470-118 HP Spectrum Analyzer Maintenance and Calibration, Santa Rosa, CA, two men, five days.

h. Attend first article acceptance of ARM-135A TACAN Test Set, Syosset, NY, one man, 12 days.

i. Conduct Course 4AST32470-000 Phase Angle Measurements and Calibration, Rio de Janeiro, Brazil, one man, 21 days.

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HISTORY OF LOWRY TECHNICAL TRAINING CENTER
1 JANUARY - 31 DECEMBER 1977

Technical Training
Advanced Instructional System

The major research project at Lowry for the past four and a half years has been the development of the Advanced Instructional System (A1S) which was conceived as a computer-based multi-media, individualized instructional system. This impressive project, under contract with McDonnell Douglas Corporation, involved the self-pacing of four of Lowry's most active courses: Inventory Management Specialist, Weapons Mechanic, Precision Measuring Equipment Specialist, and Materiel Facilities Specialist.

In May 1973, the Air Force awarded a $9.9 million, four year contract to the McDonnell Douglas Astronautics Company to develop and implement AIS. The three basic concepts of AIS included individualized, self-paced instruction; efficient use of resources and computer support.

The AIS project is a development program monitored by the Air Force Systems Command's Human Resources Laboratory (HRL) at Lowry AFB. A project that the HRL staff sponsored starting in 1969, when they started with an advanced development plan. The HRL carried the AIS idea forward through their own efforts in educational research, and by initiating other Air Force sponsored research to investigate specific areas which would culminate in AIS.

Three basic concepts surrounded AIS application. First, instruction was tailored to individual need and was self-paced. Utilizing a variety of instructional materials, the student saw pictures of each step in a procedure while he listened to descriptions of the steps. He also accomplished "hands-on" performance tasks with the student actually doing the job. Also included in the first concept was counseling by the instructors, programmed texts, simulators and computer terminals along with other training materials and devices.

The second basic concept of AIS was the effective utilization of resources. Of primary importance in a training system are the individualized (the first basic concept of AIS), the second basic concept (effective utilization of resources) became of utmost importance.

Under the self-pace system, each student was free to complete the course at his own speed. Utilizing analysis data gathered on each student concerning individual aptitudes, interests and background, the computer program developed a prediction of graduation. As the student completed a phase of the course, he was tested on that block and his completed test fed into the computer. The computer scored the test and upon satisfactory completion the student went on to the next block of instruction. If the student had trouble with the material, the computer was called upon to help the instructor analyze the problem and determine the type of remedial training required.

Early in 1977, in an effort to cut cost, General Pringle started an examination of the AIS. In a letter to ATC headquarters he pointed out that

any course length reductions associated with Lowry were not attributable to utilization of the AIS computer. General Pringle was of the opinion that computer managed instruction/computer assisted instruction was still in the research and development phase. Of deepest concern to General Pringle was the cost element. As he stated in his letter of 8 March 1977, to ATC headquarters, "I must ask myself if computer support is worth this expenditure or would it be more economically feasible to continue in a self-paced training mode without computer assistance or involvement of any type."

ATC's response confirmed that General Pringle's concerns were warranted. The vice Commander at ATC headquarters agreed that AIS had not proven that computer training saved training time and costs. General Pringle was instructed to assume additional responsibilities for all courses on development and maintenance effective 1 October 1977. He was also instructed to negotiate an agreement with HRL that would provide support for the continuation of required research.

General Pringle then established a management and control group with representatives from the Tech School, HRL, and each AIS configured training course. The group monitored responsibilities, implemented research findings and insured prompt resolution of problems.

When the "Integrated System Test" of AIS was completed in September, General Pringle concluded that AIS was not a cost effective training system. He attributed the training time savings to "self-pacing" of the courses and not to computer involvement. It was General Pringle's conclusion that, "due to the apparent limited pay-off of the computer involvement, we cannot recommend this aspect of AIS become a part of the operational environment."

During 1977, as indicated, cost effectiveness of AIS was a primary concern. At the same time, HRL was keeping track of their accomplishments under AIS. HRL pointed out that of significance in 1977, was the full implementation of self-pacing in the Weapons Mechanics Course. With the completion of this action, the entire course was placed under AIS computer management.

Also, during this period, the utilization of self-pacing in the Precision Measurement Equipment (PME) Electronics Fundamentals Course took place. The PME course development team accomplished all the necessary actions to make the first six blocks of their course self-paced. These blocks of instruction involve the electronics fundamentals portion of the course.

The Integrated System Test (IST) for the AIS was initiated and completed during 1977. The IST attempted to provide quantitative answers to the training time reductions attributable to the Computer Managed Instruction (CMI) functions associated with AIS. The IST also attempted to evaluate the reliability of the AIS/CMI functions and support systems (media, computer hardware, computer software). Results of the test indicated to HRL that CMI functions resulted in substantial time savings and that the reliability of the CMI functions and support systems was more than adequate.

During the IST, AIS introduced a unique feature to the CMI system: the Student Progress Management System. This system provided AIS with the capability to predict and assign individual block and course completion time

targets based on performance, aptitude, and abilities. It also provided feedback to both instructors and students on the targeted times on a daily basis.

The Instructor Training Division of HRL produced and validated instructional modules specifically designed for the non-traditional instructor. Portions of these modules were used to prepare CMI instructors in many of the CMI functions of their respective AIS courses. Although these instructional modules were developed- they were not implemented.

During 1977, many of the functions of everyday AIS operations were transitioned to ATC personnel. These functions included maintenance of AIS course data bases, maintenance of media equipment, course development responsibilities etc. The AIS contractor (McDonnell Douglas Astronautics Company-East) trained many ATC personnel in the maintenance of the AIS data base. Included in this group were members of ATC's Data Base Management Team who were given the responsibility to maintain all data bases for the AIS courses.

There were two basic objectives covered in the original AIS contract: (1) to develop a multi-media, computer based system for the administration and management of individual technical training on a large scale and (2) to utilize AIS as a test bed to evaluate the cost effectiveness of varied instructional innovations. On 31 December 1977, the contract phase of the AIS came to an end. It marked an end to the over four and one half years of the development of the prototype AIS by the Air Force Human Resources Laboratory (AFHEL/TT), Air Training Command, and the McDonnell Douglas Corporation. (Narrative, 9-12}

HISTORY OF THE 3450TH TECHNICAL TRAINING GROUP
METROLOGY TRAINING BRANCH
1 JULY 1977 - 31 DECEMBER 1977

PERSONNEL

Personnel Resources

Present manning reflects that the branch is overmanned by three instructor personnel. Projected instructor requirements reflect need for eight additional instructors.

OJT

The number of personnel in OJT at the end of this period was 38. Ten were eligible for upgrade and ten were upgraded.

PERSONNEL STRENGTH

	Officers Auth/Asgd	Enlisted Auth/Asgd	Civilians Auth/Asgd	Total Auth/Asgd
Jul-Sep	1/1	156/154	14/14	171/169
Oct-Dec	1/1	156/160	14/13	171/174

In addition to the assigned Air Force personnel there are four Army Warrant Officers, 24 Army enlisted personnel, two Marine Corps enlisted personnel, and 11 Navy enlisted personnel working in the training branch.

TRAINING

The present operation consists of twenty-one active resident courses and two travel team courses. A listing, brief resume of each course, and its status is reflected in the following paragraphs.

course	title	weeks duration
G3AAR32090	Avionics Systems Superintendent	7 weeks
G3ABR32430-002	Precision Measuring Equipment Specialist	30 weeks
G3ABR32430-003	Precision Measuring Equipment Specialist (Army 35H20)	34 weeks
G3AZR32470-005	Advanced Electrical-Electronic Measurements	6 weeks
G3AZR32470-008	Precision Dimensional Optical and Measuring Technician	6 weeks
G3AZR32470-017	DCLF Reference Measurement and Calibration (USA MOS 35H30)	6 weeks
G3AZR32470-018/021/022	Microwave Measurement and Calibration	6/6/4 weeks
G3AZR32470-019/023/024	Physical Measurement and Calibration	6/4/5 weeks
G3AZR32470-020	Precise Time and Frequency Calibration System	2 weeks

G2ASR32050	Hi-Reliability Soldering & Electronic Repair Techniques	2 weeks
G2ASR32470-002	Radiac Instrument Repair and Calibration	1-4/5 weeks
G2ASR32470-006	A/E35U-3 Spectrometer Maintenance Calibration	5 weeks
G2ASR32470-008	Aircraft Engine Test Stand Calibration	2-3/5 weeks
G2ASR32470-009	Precision Optical Measuring Technician	3 weeks
G2ASR32470-012	DOD AIMS Altitude/Reporting Instruments Maintenance/Calibration	2 weeks
G2ASR32470-013	DOD AIMS Identification Test Set Maintenance/ Calibration	4-2/5 weeks
G2ASR32470-032	Oxygen Equipment Cleaning and Calibration	1week
G2ASR32470-213	AN/UPM-141 Maintenance/Calibration	4-1/5 weeks
G4AST32470-005	Optical Tooling and Theodolite Calibration	2 weeks
G4AST32470-174	AN/AWM-13A Test Set Maintenance	2-3/5 week

Course G3AAR32090, Avionics Systems Superintendent. This is an advanced course designed to train senior NCOs as Avionics Systems Superintendents. Ho program changes are anticipated in this course.

Course G3ABR32430-002, Precision Measuring Equipment Specialist. This is a basic course designed to train personnel as specialists to analyze and isolate malfunctions, repair, and calibrate precision electrical-electronic measuring equipment. The Advanced instructional System (AIS) contract with McDonnell-Douglas Corp., terminated 31 December 1977. Blocks VII through XII are self-paced computer managed type of instruction. Blocks I through VI are still in the development stage with a proposed implementation during CY 78.

Course G3ABR32430-003, Precision Measuring Equipment Specialist (Army MOS 35H20). The first 30 weeks of the course are the same as the G3ABR32430-002 course and the students in both courses are commingled and receive concurrent instruction. The additional four weeks of training is on the operation of the Army calibration mobile van.

Course G3A2R32470-005, Advanced Electrical-Electronic Measurements. This is an advanced course designed to train Marine Corps and Navy personnel operation, application, and calibration of precision electrical-electronic equipment. No program changes are anticipated for this course.

Course G3AZR32470-008, Precision Dimensional and Optical Measuring Technician. This is an advanced course designed to train Marine Corps and Navy personnel operation, application, and calibration of dimensional and optical equipment. No program changes are anticipated for this course.

Course G3AZR32470-017, DCLF Reference Measurement and Calibration (USA MOS 35H30). This is an advanced course designed to train Army personnel principles of metrology, measurement methods, and calibration and repair of standards. No program changes are anticipated for this course.

Course G3AZR32470-018/021/022, Microwave Measurement and Calibration (018, USAF, 6 weeks; 021 USA, 6 weeks; 022 USN, 4 weeks). This is a DOD consolidated course designed to train DOD personnel operation, application, and calibration of microwave equipment. No program changes are anticipated for this course.

Course G3AZR32470-019/023/024, Physical Measurement and Calibration (019 USAF, 6 weeks; 023, USA, 4 weeks; 024, USN, 5 weeks). This is a DOD consolidated course designed to train DOD personnel operation, application, and calibration of physical/dimensional equipment. No program changes are anticipated for this course.

Course G2ASR32050, Hi-Reliability Soldering and Electronic Repair Techniques. This is an advanced course designed to train personnel soldering and printed circuit board maintenance techniques. No program changes are anticipated for this course.

Course G2ASR32470-002, Radiac Instrument Repair and Calibration. This is an advanced course designed to train personnel repair, calibration, and certification of radiation monitoring equipment. Training provided meets requirements for industrial radiological monitors and qualifies student to hold USAF individual user's permit for radioactive isotopes used as calibration source. Planning is underway to include additional equipment and source (Army and to change course to a type III supplemental course.

Course G2ASR32470-006, A/E35U-3 Spectrometer Maintenance Calibration. This is an advanced course designed to train personnel operation and troubleshooting of a fluid analysis spectrometer. No program changes are anticipated for this course.

Course G2ASR32470-008, Aircraft Engine Test Stand Calibration. This is an advanced course designed to train personnel operation, application, and calibration of aircraft engine test stands. Planning is underway to delete the turboprop test stand from the course.

Course G2ASR32470-012, DOD AIMS Altitude/Reporting Instruments Maintenance/Calibration. This is an advanced course designed to train personnel troubleshooting, repair, and calibration of temperature-pressure and altitude reporting test sets. No program changes are anticipated for this course.

Course G2ASR32470-013, DOD AIMS Identification Test Set Maintenance/Calibration. This is an advanced course designed to train personnel troubleshooting, repair, and calibration of IFF test sets. No program changes are anticipated for this course.

Course G2ASR32470-032, Oxygen Equipment Cleaning and Calibration. This is an advanced course designed to train Navy personnel oxygen cleaning, inspection, and calibration systems. Planning is under way to increase depth of training to meet critical Navy requirements with an increase of course length of three days (new course length - eight days). Additional training includes cleaning and calibration of flow meters, calibration of manifold gage system and clean room procedures.

Course G2ASR32470-213, ANUPM141 Maintenance/Calibration. This is an advanced course designed to train personnel operation, circuit analysis, troubleshooting, and calibration of the AN/UPM141 Radar Test Set. No program changes are anticipated for this course.

Course G3AST32470-005, Optical Tooling and Theodolite Calibration. This is a travel team course designed to train personnel optical principles and theodolite calibration. No program changes are anticipated for this course.

Course G4AST32470-174, AN/AWM-13A Test Set Maintenance. This is a travel team course designed to train personnel circuit analysis, troubleshooting, and calibration of the AN/AWM-13A Test Set. No program changes are anticipated for this course.

Two additional course to be implemented in CY 78 are as follows:

Course G2ASR32470-215, AN/ARM-135O Maintenance and Calibration (3 3/5 weeks). This is an advanced course designed to train personnel operation, circuit analysis, troubleshooting, and calibration of the AN/ARM-135O TACAN Test Set.

Course G3AZB32470-015, Advanced Electronic Maintenance/Calibration. This is an advanced course designed to train personnel digital techniques, solid state logic analysis and micro-electronic troubleshooting techniques.

FACILITIES

The Metrology Training Branch is housed in Buildings 905, 1308, and 1433. Buildings 1308 and 1433 provide an adequate environment to accomplish the assigned mission. Building 905 does not meet environmental standards (temperature-humidity) conducive to satisfy assigned mission.

ENERGY

The energy conservation programs, e.g., minimal lighting in non-academic areas, conducted in this branch, have had no adverse impact on training.

MISCELLANEOUS

The following TDY trips were taken in support of the training program during this reporting period:

a. Attend PME Training Conference, one man, five days, AFMC/MLTS, Newark AFS, OH

b. Conduct Course 4AST32470-174, AN/AWM-13 Test Set, one man, 19 days, Seymour Johnson AFB, NC.

c. Review training films, one man, one day, Fort Carson, CO.

d. Attend OCONUS Calibration Conference, one man, five days, Redstone Arsenal, Huntsville, AL.

e. Attend contractor new equipment course, one man, five days, Redstone Arsenal, Huntsville, AL.

METROLOGY TRAINING BRANCH
MISSION, COMMAND, AND ORGANIZATION

Organizational Changes

The Avionics Systems Superintendent Course, 3AAR32090, was transferred to this branch from Standardized Electronics Branch in April 1977. The reason for the move was due to facility requirements. No problems were encountered. The course is conducted in Building 1433.

PERSONNEL

Present manning reflects that the branch is overmanned by one instructor personnel. Manning assistance has been received from Hq ATC and personnel actions have been completed to increase the Trained Personnel Requirements by all branches (Army, Navy, and Air Force.) The Manning problem previously reported has been corrected.

In addition to the assigned Air Force personnel there are two Navy Liaisons (E9 and E6), two Army Liaisons (CWO-2 and E9), 26 Army and nine Navy instructor personnel working in the training branch.

KEY PERSONNEL

Major Ronald L. Owens, Branch Chief (assigned 15 July 1974)

Mr. Michael J. Regan, GS-11, Educational Training Specialist (assigned 1February 1977)

PERSONNEL STRENGTH

	Officers Auth/Asgd	Enlisted Auth/Asgd	Civilians Auth/Asgd	Total Auth/Asgd
Jan -Mar	1/1	156/148	14/14	171/163
Apr-Jun	1/1	161/162	14/14	176/177

TRAINING

The present operation consists of twenty active resident courses and three travel team courses. A listing, brief resume of each course, and its status is reflected in the following paragraphs:

COURSE	TITLE DURATION	WEEKS
3AAR32090-000	Avionics System Superintendent	7 Weeks
3ABR32430-2	Precision Measuring Equipment Specialist	30 Weeks
3ABR32430-3	Precision Measuring Equipment Specialist (Army)	34 Weeks
3A2R32470-2	Electronic Test Equipment Calib & Repair (MAP)	8 Weeks
3AZR32470-5	Advanced Electrical-Electronic Measurements	6 Weeks

3AZR32470-8	Precision Optical and Dimensional Tech.	6 Weeks
3AZR32470-18/ 21/22	Microwave Measurement	6-2/5 Weeks
3AZR32470-19/ 23/24	Physical Measurement	6 Weeks
2ASR32050	Hi-Reliability Soldering & Equip Repair	2 Weeks
2ASR32470-2	Technician	1-2/5 Weeks
2ASR32470-6	Radiac Instrument Repair and Calibration	5 Weeks
2ASR32470-8	Baird Atomic Spectrometer Model A/E35U-3	2-3/5 Weeks
2ASR32470-9	Aircraft Engine Test Stand	3 Weeks
2ASR32470-12	Precision Optical Measuring Technician	2 Weeks
2ASR32470-13	DOD AIMS Altitude/Reporting Instr Maint/Cal	4-2/5 Weeks
2ASR32470-32	DOD AIMS Ident Test Set Maint & Calib	1 Week
2ASR32470-33	Oxygen Cleaning	2 Weeks
2ASR32470-213	Operation/Calibration Analysis (AN/ARM-135)	3-3/5 Weeks
3AST32470-5	AN/UPM-141 Maintenance/Calibration	2 Weeks
4AST32470-174	Optical Tooling and Theodolite Calibration AN/AWM-13A Test Set Maintenance .	2-3/5 Weeks

Course 3ABR32090-000, Avionics Systems Superintendent (7 weeks). This is an advance course designed to train senior JJCOs as Avionic Systems Superintendents. No problems have been encountered with the transfer into Metrology Training Branch. This course has completed a major revision and is in the tryout phase.

Course 3ABR32430-2, Precision Measuring Equipment Specialist (30 Weeks). During this reporting period student entries have been maximized on a four shift basis at a class size of (14). Plans are underway to increase equipment needs to meet a class size of (22) in order to return to a three shift operation.

Course 3ABR32430-3, Precision Measuring Equipment Specialist (Army) (34 Weeks). The first 30 weeks is the same as the 3ABR32430-2 Course and the students in both courses are commingled and receive concurrent instruction. The additional four weeks of training is on the operation of the Army calibration van.

Course 3AZR32470-2, Electronic Test Equipment Calibration and Repair (MAP) Training (8 Weeks). Request has been submitted to update or cancel this course due to latest state-of-the-art changes which are not included in this course.

Course 3AZR32470-5, Advanced Electrical-Electronic Measurements (6 Weeks). Major revisions with in this course have been completed during this reporting period.

Course 3AZR32470-18/21/22, Microwave Measurement and Calibration (6 Weeks, 2 days USAF-18; 6 Weeks USA-21; 4 Weeks USN-22). DOD consolidated course designed to train USAF, USA, USN, and USMC civilian and military personnel. No program changes are anticipated with respect to this course.

Course 3AZR32470-19/23/24, Physical Measurement .and Calibration (6 Weeks USAF-19; 4 Weeks USA-23; 5 Weeks USN-24). DOD consolidated course designed to

train USAF, USA, USN and USMC military and civilian personnel. New equipment will be added in mid 78 to maintain currency with field requirements.

Course 4AST32470-5, Optical Tooling and Theodolite Calibration two travel teams were deployed to support training requirements during this period.

Course 4AST32470-174, AN/AWM-13A Test Set Maintenance. One travel team was deployed to support training requirements during this period.

Course 4AST32470-32, Oxygen Cleaning (1 Week). Navy course designed to provide training for selected Navy personnel to perform as calibration technicians for inspection, cleaning and calibration techniques for inspection, cleaning and calibration of oxygen gas system pressure instruments plans are under development to increase course length to (8 days).

Course 2ASR32050, Hi Reliability Soldering and Equipment Eepair Technician (2 Weeks). No program changes are anticipated in this course.

Course 2ASR32470-2, Radiac Instrument Repair and Calibration (1-4/5 Weeks). Major revision to the course is being programmed to include new Army Equipment.

Course 2ASR32470-6, Baird Atomic Spectrometer Model A/E35U-3 (5 Weeks). No program changes are anticipated in this course.

Course 2ASR32470-8, Aircraft Engine Test Stand (2-3/5 Weeks). No program changes are anticipated in this course.

Course 2ASR32470-9, Precision Optical Measuring Technician (3-3/5 Weeks). No program changes are anticipated in the course.

Course 2ASR32470-12, DOD AIMS Altitude/Reporting Instr Maint/Cal (2 Weeks). No program changes are anticipated in the near future.

Course 2ASR32470-13, DOD AIMS Ident Test Set Maint and Cal (4-2/5 Weeks). No program changes are anticipated in the near future.

Course 2ASR32470-213, AN/UPM-141 Test Set Maintenance and Calibration (3-3/5 Week's).- No program changes are anticipated in the near future.

Course 2ASR32470-215, AN/ARM-135 and AN/ARM-135A. Plans are to have this course functional in early 1978 for the AN/AWM-135. As equipment is received for the AN/ARM-135A revision to the course will be made to include both test sets.

Course 2ASR32470-33, Operation/Calibration Analysis AN/ARM-135 TACAN Test Set (2 Weeks). The student input has been stopped to personnel to develop the 2ASR32470-215 Course.

Course 2ASR32470-217, Photometric Instruments, Maintenance and Calibration (2 Weeks). No program changes are anticipated in the near future.

The four-year Advanced Instructional System (AIS) contract was let to McDonnell-Douglas Corp in May 1973. This contract will come to a close the end

of September 1977. Blocks VII thru XII for the basic Course 3ABR32430-2/3 are under self-pace computer managed type of instruction. Plans are programmed to incorporate Blocks IV, V and VI in September. Blocks 1, II and III are programmed to be incorporated during December 1977.

FACILITIES

The Metrology Training Branch is housed in Buildings 1433, 1308, and 905. This is a change from previous report with the addition of Building 905 to the facilities of the Branch.

Building 905 is co-utilized with Systems Training Branch. Building 905 is a two story building of wood construction and provides 10 classrooms, 1 office, 1 storage, 1 library, and 2 remedial training rooms.

EQUIPMENT

All of the equipment maintenance required support the training courses in this organization is performed by the Base Precision Measurement Equipment Laboratory (BPMEL).

The major equipment, Calibration Standards, is listed in TA 734 Table of Allowance for Precision Measuring Equipment.

The operating budget required to provide necessary supplies, equipment, and accessories was approximately $13,557.33 for supplies and S15.397.94 for equipment during this period.

MISCELLANEOUS

The following TDY trips were taken in support of the training program during this reporting period:

a. Attend verification/demonstration Phase II of AN/AEM-135A TACAN Test Set. One man, 12 days, Syoset, NY, PRD Electronics,

b. Attend Major Command GAP and NDI conference, one man, 5 days. Kelly AFB, TX.

c. Conduct Course 4AST32470-005, Optical Tooling and Theodolite Calibration, one man, fourteen days, Dover AFB, DE.

d. Conduct Course 4AST32470-174, AN/AWM-13 Test Set, Nellis AFB, NV, two men 18 days.

e. Attend special training course at Brunson Instrument Company, one man, 12 days, Kansas City, MO.

f. Conduct Course 4AST32470-005, Optical Tooling and Theodolite Calibration, two men, 26 days, Myrtle Beach AFB, SC and Edwards AFB, CA.

During the period of 21-24 June 1977, the 3450th TCHTG/Metrology Training Branch hosted the DOD Sub Group 198 Working Group Conference. Minutes of the working group are:

1. Col McPherson, Commander, 3450 TCHTG, Lowry AFB, welcomed the working group on behalf of the Commander. He offered the assistance of his staff to the visitors during the duration of their stay.

2. Major Russin presented the agenda which would serve as milestones for the group meeting. He opened discussion of training with a review of radiological equipment training (RADIAC). A discussion of this subject indicated several problem areas required resolution in order to accommodate Army/AF consolidated training. General agreement was reached that a standard operating procedure (SOP) was required to preclude difficulties and adhere to safety requirements.

3. Two Radiological Protection Officers (RPOs) are required to be available at Lowry prior to receipt of Army AN/UDM-2 equipment. One Army instructor is currently designated as RPO and one AF instructor will be trained and certified to fulfill the requirement. The consolidated RADIAC Instrument Repair and Calibration course can be-implemented 120 days after receipt of Army equipment and technical data. A dummy AN/UDM-2 will be provided to Lowry for instructor training.

4. Mr. Regan presented the status of current consolidated and collocated training programs conducted at the Metrology Training Branch.

a. Vigorous discussion of the Microwave Measurement and Calibration Course G3AZR32470-018/-021/-022 was pursued. A major problem identified as a result of the discussion was that students of the services are having difficulty in completing this training due to a lack of math and/or state-of-the-art background. A proposal to increase course length was not endorsed by the Group. However, members agreed that a pretest and pre-entrance training package to be administered in the field should resolve the problems cited.

b. The Physical Measurement and Calibration Course G3AZR32470-019/-023/-024 was accomplished training needs of all participating services. New equipment will be added in mid 78 to maintain currency with field requirements. Navy FY 78 TPR was revised to 32 military and 42
civilians.

c. Oxygen Equipment Cleaning and Calibration Course G2ASR32470-032, Navy TPR was revised to 20 civilians and 20 military for FY 78. Navy indicated increased training was required for their personnel in this area. Course length will be increased from 40 to 64 hours to meet critical Navy depth of training. Navy will provide instructor personnel to support this course. Navy will include military instructor in POM 80. MEG Pomona will attempt to provide a temporary civilian until that time.

d. Course G3AZR32470-008, Navy TPR was revised to 32 military and 30 civilians. No changes in curriculum required.

e. Course 63AZR32470-017 is stable and no near or mid term changes are required at this time. An Army representative indicated USA secondary transfer sets are being replaced in the field. This replacement will be accomplished by

modifying/updating the present equipment. Changes required in the course will be provided by the Army upon equipment procurement decision.

6. Mr. Horner stated the transfer of the calibration combat development and training mission from the USA Ordnance and Chemical Center and School (USAOCCS) to the USA Missile and Munition Center and School (USAMMCS) is effective 1 October 1977. The USAMMCS at Redstone Arsenal AL will be assigned the responsibility for calibration combat developments, calibration doctrine, resident calibration training currently consisting of MOS 252A and MOS 35H, and nonresident calibration training development and monitorship.

7. A presentation on the Air Force Metrology Program was given by Mr. G. Greenup. A short discussion on PMEL support for F-15 then ensued. The AGMC program for new standards and equipment was presented. It was recommended that more coordination between the services should take place concerning new equipment requirements. The impact on total training requirements due to PMEL consolidation should be furnished ATC as soon as possible. During the presentation on the Precise Time and Frequency Measurement Console, the Navy representative indicated Navy may have a future training requirement in the AF course.

8. The representatives were briefed on the USAF Academic Instructor Course (AIC) conducted at Maxwell AFB AL. They felt the program would definitely enhance the professionalism of the interservice staff. However, TDY funds are not available for FY 77--action must be taken to provide FY 78 funds in order to pay for instructor travel and per diem. A package covering course content and lesson objectives will be forwarded to representatives for their review and funding approval.

9. Manpower and Personnel Requirements.
10.

a. Mr Groff, CNTT, and Mr Olson, Det 4, presented the new ITR manpower formula analysis to the group. An in-depth discussion of the manpower/personnel requirements in conjunction with the ITRO method of determining these requirements ensued. The following items were identified as a result of this discussion:

(1) Course revision invalidated present manpower justification data.

2) Present scheduling requirement must be revised in order to accommodate the ITRO method.

3) Group size data—maximum vs normal-- and indirect instructor/supervisory times were not clearly identified. These items require greater definition prior to acceptance of the ITRO method.

Upon resolution of the above items, revised manpower and personnel statement will be developed and forwarded to the representatives for review and approval.

b. The 3400 TCHTW representative and the USA representative stated the ITRO method of computing manpower requirements did not adequately satisfy course manpower requirements. Reasons cited included continuous course changes as required by USA, USN, and USAF, equipment and personnel safety and lack of

supervisory support time. Recommend that until the ITRO method is fully evaluated for these course, the host service manpower methods be continued.

c. The Air Force will determine instructor requirements and forward them to CNTECHTRA by 31 Aug 77 with supporting documentation for Electrical and Dimensional/Optical Courses, G3AZR32470-005/008. CNTECHTRA will include these requirements in POM 80 submission. The Air Force will provide instructor support for these courses until Navy instructors are realized from the POM 80. ITRO procedures will be used.

d. USMC instructor positions are required in support of the G3ABR32430-002/003 courses. It is estimated that seven personnel are required. A formal request for these manpower and personnel requirements will be forwarded to the USMC representation for staffing and acceptance of these requirements.

HISTORY OF LOWRY TECHNICAL TRAINING CENTER
LOWRY AIR FORCE BASE, COLORADO
1 JANUARY - 31 DECEMBER 1978

TECHNICAL TRAINING

The Eight Hour Training Day

One of the most significant developments affecting the LTTC training program, and indeed the whole base, was the implementation of the eight-hour training day. During the final quarter of CY 1978, the eight-hour training day was fully in operation with the exception of 21 courses which were requesting waivers or courses which would not have students in training until subsequent months. With one exception, the courses requesting waivers in order to remain on a 6 + 2 program had a low training personnel requirement (TPR, had equipment problems which frequently necessitated multiple shifts, and were associated with our most sophisticated training on the Defense Support Program, Special Instruments, and Precision Measuring Equipment areas. The one course exception was the Disaster Preparedness Indoctrination for Senior Staff Officer.

The six-hour academic day had been the primary training schedule since World War II. It was originally adopted for administrative convenience and allowed the conducting of four training sessions per day in the same facility. With meals and remediation outside of the six-hour academic period, administration of volume student flow was relatively simple. The training day under the six-hour scheme required the daily assignment of home study. In 1973, a program of Complementary Technical Training (CTT) was incorporated into technical training. In effect, this combination provided an eight-hour day of training and permitted use of the classroom for four sections a day if required. That program was referred to as the 6+2 schedule and was generally preferred to the straight eight-hours per day academic schedule.

Implementation

Maj Gen Evan W. Rosencrans, ATC Vice Commander, headed the command effort directed at implementing the eight-hour classroom day. Following the initiatives taken in 1976 and 1977 to reduce the cost of training, the eight-hour classroom day concept seemed an even greater effort. General Rosencrans set 1 September 1978 as the deadline for all courses to be operating under the new concept. The new training day was to include related training but did not include a mandatory meal break of one hour.

To implement the eight-hour training day it was necessary for HQ ATC to provide guidance to all the centers. It was established that the eight-hour training day could be implemented in any course without a change in the programmed entry schedules. However, the revised graduation dates (courses were for the most part shorter in length) resulting from increasing the hours utilized in the training day would have to be entered into the computer following the procedures already in effect. The data required to effect a

change included the new course length in academic days, implementation date, minimum entry interval in academic days, maximum number of groups in training, and the number of groups per shift.

To lessen the impact of personnel processing requirements on the students involved in the eight-hour training day, the personnel division took several actions to streamline processing. Clerks formerly employed solely in out-processing actions were merged with other clerks responsible for completing reassignment functions. That action added another processing team and provided a more equitable balance in the number of school courses that each team was responsible for. With the new alignment, each team was held responsible for all aspects of the reassignment process.

Prior to the onset of the eight-hour training day it was the policy to have each student attend a pre-departure assignment briefing after the student was enrolled in his training course. That requirement disrupted his training schedule and was not compatible with the eight-hour day. The new plan allowed the pre-departure briefing to be presented immediately following the in-processing. In the majority of cases, the Personnel Division was able to provide students with their new assignment at the time of the briefing. If the assignment was not on file in the Personnel Data System, every attempt was made to secure one from the Air Force Military Personnel Center (AFMPC) within two weeks.

Civilian Students

The issue of assigning homework to civilian students surfaced as a problem. Since scheduled classroom training of eight-hours per day was an effort to reduce costs and improve efficiency of training operations any programs that would increase costs was suspect. The eight-hour day did not generate outside study assignments. Those classes that had outside assignments were required to force civilians to work beyond an eight-hour day. The problem had existed before the eight-hour day was introduced but with the introduction of the eight-hour day it was accentuated. General Roberts was quick to react to the rumblings and stated:

The issue of assigning homework (study and preparation) to civilian students after an eight-hour classroom session without payment of overtime has been raised. There is no additional liability incurred for either pay or compensatory time for civilian employees assigned to such training. The Federal Training Act prohibits the payment of overtime, holiday, or night differential pay for training extending beyond normal duty hours. This statute has been supported in numerous Comptroller General (CG) decisions. Premium pay must be paid only to employees falling within certain narrowly defined categories as set forth in the Basic Federal Personnel Manual, Chapter 410, Subchapter 6.

As General Roberts further clarified the ATC position:

Homework assigned to civilian employees in conjunction with an eight-hour training day is exempt from the requirement of any pay or compensatory time, since further training would also be exempt. Since there is no clear distinction made between training versus study or preparation either in the

current regulatory guidance or CG decisions. civilian students will be encouraged to accomplish any necessary assignments (including any special individual assistance) in order that they may stay abreast of their contemporaries and meet all course requirements. Civilian students are expected to devote the time and energy necessary to maintain the same course standards as military students.

Advanced Instructional System

Background

The Advanced Instructional System (AIS) project started in May 1973 as a contractual effort as a result of an ATC research requirement. McDonnell-Douglas was appointed the contractor and the Air Force Human Resources Laboratory (AFHRL) became the contract manager with Lowry being selected as the site for carrying out the project. "The purpose of the project was two-fold; to demonstrate the feasibility of the use of a computer to manage a large scale, individually-paced instructional program across a selected number of courses, and to provide a vehicle which could be used in further development of the potential of computers in training and to investigate other research issues." Air Force Systems Command (AFSC), in an attempt to project toward future requirements, procured a much larger computer than was actually needed. AFSC envisioned a continuing need to own the computer and the related equipment for future research purposes.

The courses selected for computer management were ones that represented a cross section of Air Force Technical Training and had been brought about through formal instructional system development (ISD). The specific courses selected were:

(1) The Inventory Management and Materiel Facilities Courses which are short courses representing high student flow, with comparatively low technical content.

(2) The Weapons Mechanic Course, representing a high student flow, greater technical content and also team work features.

(3) The Precision Measurement Equipment Course, a comparatively long course with a low student flow and high technical content.

McDonnell-Douglas, the contractor for AIS, was awarded a $9.9 million contract in May 1973. The $2 million Control Data Corporation CYBER 70 computer arrived in January 1974. ATC was to assume responsibility for the AIS in 1977. The cost to AFSC by that time was approaching $13 million and ATC was taking a second look at the practicality of the system.

When General Hoover assumed command on 25 April 1978, he was tasked by General Roberts to take an unbiased look at AIS. As a result, he talked to numerous individuals about AIS, and asked what they thought. General Hoover also talked to an individual at the RAND corporation in an attempt to get as many outside views as possible. In addition General Hoover asked for and received an executive course on AIS to give him "a more in-depth feeling about the capabilities and potential of AIS."

The goal of AIS was to reduce training time by 25 percent without increasing the elimination rate or decreasing the quality of instruction. Although reduced training time was an objective of AIS, the amount of material the student was expected to learn was not reduced. The system did not reduce course length, but hopefully, would move students through more quickly.

During the duration of the test project that started in 1973, the technical school at Lowry pledged certain support. This support included providing a total of 38 instructors, programmers, and operators; constructing 1190 student learning carrels; assisting in the preparation of instructional materials, and assisting in the preparation of instructional materials, and development of an instructor training course that emphasized self-paced., AIS type instruction. Unfortunately, one of the failures was the development of- the instructor training aspect.

The bulk of AIS support was provided by McDonnell-Douglas Astronautics Company {MDAC) under the terms of Contract F-33615-78-C-000. "Maintenance of AIS Equipment and Software." Under the terms of that contract. MDAC was required to provide: hardware and software maintenance, logistics support of spares and consumables, data aids as required, and the resolution of any design deficiencies or changes. Also, they provided operations support that included routine daily computer and classroom assistance and advise.

It was the role of AFHRL to monitor MDAC performance in support of AIS, in accordance with the maintenance contract. AFHRL was also charged with the responsibility, as the contract monitoring agency, for initiating any changes to the contract through the contracting officer. AFHRL also provided technical consultation on any problems encountered involving hardware or software. These were problems other than routine hardware and software problems, which were referred to MDAC personnel directly. ATC responsibilities involved maintenance for the ATC data in the system and notifying AFHRL of any operational problems. Since MDAC is responsible for total system integrity, it was necessary that they be made aware of any changes in system data. Minor daily operational problems that involved the hardware or software were directed by ATC to the responsible MDAC personnel, who in turn keep AFHRL informed of the system status. If problems did arise that involved hardware or software and were not resolved by MDAC, or which were not within the scope of "the maintenance contract they were directed to AFHRL for resolution.

In January 1978, General Roberts concluded that the prototype AIS had "demonstrated a reduction in training time as well as a capability for serving as an R&D test bed." The General expressed some disappointment, however, when he said, "The review also made evident that AFHRL did not complete all research objectives, leaving a number of questions unanswered, the most significant of which involve the computer's role in reducing training time and the most cost-effective hardware confirmation to support training in the AIS mode." Since the cost-effectiveness of the computer in support of training had not yet been established. General Roberts did not feel the program should be funded by ATC. It was the General's opinion that AFSC should continue to fund the program while ATC provided support of students, manpower, and facilities. As he stated to General Lew Allen, Jr., Commander, AFSC, "We will rely on R&D funds during FY 78 and FY 79 for continuing AIS computer Support until operational decisions are reached and can be implemented.

New Service Test

As directed by General Roberts, an AIS planning group meeting was held on 17-18 January 1978 at Randolph AFB. A cost-analysis plan was created at this meeting and was' distributed in March 1978. Because of the unanswered questions and the hazy area of cost-effectiveness, it was time to make a definitive evaluation of AIS. Five years of experience had been accumulated and there was still uncertainty requarding the benefits of computer assisted instruction. As a result of the uncertainty surrounding the AIS project, ATC directed that a service test be accomplished. The time frames established were 15 February to 15 June 1978. The evaluation concerned a cost comparison of Computer Managed Instruction (CMI) supported by the R&D computer, and the manual self-paced (MSP) instructional techniques. The purpose of the evaluation was to determine, the still unanswered questions, "the computer's contribution to cost effectiveness of AIS," and "the contribution of the computer to training.' The four original training courses being managed under AIS were selected for the test and the main source of the required data was the student record of training (ATC Form 156).

The Computer Managed Instruction (CMI) Working Group" was established soon after the center was tasked with monitoring the evaluation of the CMI/MSP test. The working group was not intended in any way to interrupt the operation of the courses under evaluation. It was to serve as a means of coordinating problems and changes designed to improve the system as a whole. As the CMI system progressed, ATC and AFHRL personnel, as they became more knowledgeable, were tasked to exploit the capability of the CMI system.

The Plans Division of the Deputy Commander for Training directed the efforts of the Service Test. Lt Col Jack S. Ballard, Chief, Plans and Requirements Division, Deputy Commander for Training, served as chairman of the Computer Managed Instruction (CMI) Working Group which was established soon after LTTC was tasked with monitoring the evaluation of the CMI/MSP test. The working group was not intended in any way to interrupt the operation of the courses under evaluation. It was to serve as a means of coordinating problems and changes designed to improve the systems as a whole. As the CMI system progressed, ATC and AFHSL personnel, as they became more knowledgeable, were tasked to exploit the capability of the CMI system. As chairman, Colonel Ballard was also required to serve as arbitrator for the service test. Perhaps the most trying part of the service test was the hammering out of the ground rules to govern the test. That phase, was difficult, controversial, and extremely important. Many meetings were held and the whole method of evaluation and data gathering were determined at that time.

Whether or not CMI would be operationally employed was based on its ability to produce quality graduates at the same or lower overall cost than a manual self-paced system. The questions that needed answering through the test were the following:

(a) What is the impact of the computer on the management of self-paced instruction?

(1) Is there a difference in manpower requirements (numbers as well as grade level requirements) between CMI and manually self-paced (MSP) instruction?

(2) What are the differences in student times to completion between CMI and MSP modes?

(b) (Should CMI prove to be more cost effective than MSP instruction) What should the operational version of the system consist of and what are the capital investment costs?

(1) Computer required and costs.

(2) Peripheral equipment and costs.

(3) Software development and maintenance course costs.

(4) Courseware development and maintenance costs.

(5) Operational costs to include maintenance and supplies.

(c) What further research is required in Computer-Managed Instruction, Computer-Assisted Instruction, and support of other ATC training research requirements in all areas in which the AIS research capabilities can be used?

The working group painstakingly gathered the data on the cost of training. It was necessary to identify the required data such as manpower, operational support, supplies, and student time savings involved in each of the CMI and MSP modes. That data was collected by the Plans Division and provided to the ATC comptroller for cost analysis and comparison. .That data was to be included in the final results presented to the ATC commander.

The "Cost Analysis Annex to the Service Test Plan" expanded the areas to be addressed to include:

- one time facility construction and/or modification cost,
- one time special training equipment and media purchase.
- one time computer and related equipment purchase and installation.
- expected technological lives of special training/media equipment and computers.
- the build-up manpower commitment for course development.

One concern during the test was the quality of instruction. The presumption was that there would be no difference in the quality of instruction in the two modes since the same training materials were used in bo.th. Likewise, it was presumed that the quality of instruction during the test would not be significantly different from instruction before the comparative evaluation. These were important ground rules.

A particularly difficult measurement in the comparative service test was the question of graduate quality. In order -to evaluate that concern adequately, the Field Evaluation Questionnaire was used. Selected graduates and their supervisors from the courses involved were contacted and asked to respond to questionnaires on the training received. The objective of that exercise .was to determine the task requirements of the various job that Lowry graduates were being assigned and to determine if the training given was adequate to meet job requirements. The survey was conducted on graduates that had been in the field for about four months. The survey included equal numbers of CMI and MSP graduates. The responses received indicated minimal differences in the adequacy of training:

One problem encountered during the comparison study was the significant differences in the time students were taking to complete Block 14 in the weapons course. Students on the CMI shift were requiring an average of 10.4 hours while the students in the MSP group were averaging 3.4 hours. This difference posed a dilemma since there was only one lesson in the block and virtually no computer management. Investigation revealed that the performance nature of the block allowed the instructor to determine when the student had completed the block satisfactorily. Evidently the CMI instructors had established stringent requirements for graduation while the MSP shift was reaching the lower criteria in about four hours. The 156s maintained on each student verified that students on the CMI shift were taking much longer than the MSP students.

When the CMI/MSP service test agreement was formulated, concern was expressed about possible advantages of one shift over another. During the test, A-shift was used for ail CMI courses and B-shift for thr.ee of the MSP courses. The data obtained from AFHRL showed that students under CMI completed courses faster on 3-shift. When the alternatives to the arrangement being followed were examined, e.g., changing students from one shift to another, they were found to be more disruptive and had the potential of being more damaging to the service test results than staying with the shift arrangement that was in effect. The shift arrangement that was in effect was one of the ground rules that had been established.

Data was collected on graduates for the period 1 January through 15 April 1978, pertaining to time in the course and average course score. An analysis of 40 A-shift students and 40 B-shift students showed that the A-shift students averaged 8056 hours with an average score of 87.8; the B-shift students averaged 909 hours with an average score of 85.8. In checking the results on 56 C-shift students, the average time in course came to 839 hours with an average score of 85.2. That data indicated that differences existed between shifts. The major variance between A and B shifts could not be attributed to computer support since both shifts had the same level of support through 14 February. A possible cause for the shift difference was the generally higher reading scores, and this effect was reversed in Block VI, a performance-oriented block on automatic guns. Since AFHRL expresses reluctance to comment on the shift difference, it was not recommended that a correlation factor for shift assignment be included in the data collected for the service test. Data did not really support that assignment of shifts made any significant difference.

When professional analysis of the shift differentials was performed, it was noted that B-shift times were shorter in all blocks in the Weapons Mechanic Course with the exception of the last block. It was also noted that the B-shift students had generally higher reading scores. Other data collected from 1 January to 15 April 1978 in the PME course indicated that B-shift students took longer in the course that A-shift students, a reversal of the finding in the weapons course. In the IM course there were no reliable shift differences. The IM course had shown a significant shift differential during the previous year, which had disappeared. Since a shift differential was not proven, it was not considered as a corrective factor in the final analysis of the data.

Another problem of the service test involved the ground rules that were established at the beginning of the test. While test configuration and data collection began on 15 February 1978, complete implementation of all criteria did not occur until 12 April 1978. Because of the delayed implementation of the service test procedures, and reduced student flow, the student data collection from participating courses was extended from 15 June to 15 July 1978.

Preliminary Analysis

A preliminary analysis of the test data indicated that the quality of the students, when using their Air Force Qualifying Test (AFQT) scores as a basis, were evenly balanced between CMI and MSP shifts. Also, course block and final scores were nearly the same for both CMI and MSP in each course. There was more remedial assistance on the CMI mode by a small margin. The elimination rate was roughly the same for both modes. The Weapons Mechanic course took approximately five days longer to complete the CMI mode; student time in ail other courses was about the same for both modes. The student time on base was about the same in all courses except Weapons Mechanics which was about five days longer in the CMI mode. Based on the preliminary analysis, as reported on 10 August 1978, the computer did not produce a savings in student time in training. One positive aspect was the accelerated production of graduates, compared to pre-test data, indicating possible improved efficiency. There was some lingering controversy concerning certain aspects of the test. For example, there was the feeling in some quarters that the good students and good instructors were placed on the MSP shift. However, the test data indicated that there was an even balance.

AIS Conclusions

General Roberts was briefed on the results of the service test on 29 September 1978. The cost analysis of the service test data showed CMI to be cost-effective only in the Inventory Management course. In addition, there was no experience with CMI under the new channelized munitions training to being in 1979. After hearing the results General Roberts approved continuation of CMI indefinitely in the Inventory Management course and called for a new evaluation of CMI performance in channelized training. This new evaluation, focusing primarily on manpower requirements, was to be completed by summer 1979. It was also determined that the Materiel Facilities and Precision Measuring Equipment

courses were to be handled by manual management since they were not proven cost effective under CMI. As summarized by Brig Gen Everett L. True, Deputy Chief of Staff for Plans at HQ ATC:

... we know that the CMI system as currently configured is not one that would buy for Command-wide application. If it is cost-effective in a given application, however, (such as Inventory Management, or possibly channelized munitions), we see no reason to 'unplug it--it does provide a research tool that we do not wish to abandon. In fact, if the computer is cost-effective in these application, ATC ought to pay part of the cost. In those areas where the computer is not cost-effective, however, we do not feel ATC should have to pay any of the computer's costs.

Hq ATC was willing to continue the use of the computer in the Materiel Facilities or Precision Measuring Equipment courses provided AFHRL would absorb all computer costs. As General True concluded, 'specifically be next July we think we can outline the specifications for a low-cost CMI system, defining for the Commander what it is that we want, what it will do for us. and how much it will cost.'

General Hoover saw the service test as inconclusive, "both statistically and, for lack of a better word, structurally." The statistical differences concerning course length, grades and attrition were not significant. The issue of cost effectiveness hinges on the swing of a very few "spongy" numbers—as was demonstrated upon the input of corrected data a few days subsequent to my receiving the briefing. The corrected data swung the service test conclusion from favorable to CMI to unfavorable. 'Commenting further, General Hoover said:

The service test data and my analysis indicate there would be additional costs to the Air Force and ATC if the CMI were to become operational and any possible savings from the system as yet unclear. For these reasons I cannot recommend CMI go operational in the near future.

As for the future potential of computer managed instruction. General Hoover felt that, "We--Lowry and ATC--should take what we have learned and clearly establish, from a training standpoint, the kind of CMI we would like operationally." The General saw the CMI version of AIS as "essentially a scheduling and feedback tool—which only justifies itself if there is a resulting reduction in training cost." General Hoover did not think that AIS had been designed "on the basis of how it should be structured to minimize cost." As he expressed to General Roberts:

Maybe we should approach the problem from the basis of how the computer can be used as a tool to optimize the use of our training resources with reduction of cost as a fundamental objective. We must identify--on the front end--how we will measure cost effectiveness.

General Hoover wanted CMI, as it was configured, to be continued during FY 79, but with funding provided by AFHRL. This would have allowed time to "regroup, rethink the concept, establish the players and the roles, and develop an operational acceptance plan." General Hoover was concerned with the cost effectiveness of the computer. He cited the $700,000 it was necessary for

AFHEL to spend.in FY 79 to maintain- the computer facility that supported the R&D and operational CMI system. Instructor training was computed at another $60,000. The most nebulous area was in the course length reductions. As General Hoover pointed out in 'regard to the briefing he had received:

The...briefing given at Lowry indicated a $9 million annual savings attributable as AIS because of course length reductions in the AIS courses since 1972. Attributing savings of this magnitude to AIS is questionable. Similar savings have been achieved in other courses at Lowry through aggressive management actions. For example, the Munitions Maintenance Course was reduced by 35 percent this year without incurring any R&D costs.

When the service test was completed on 15 July 1978, there -were still major problems with self-paced instruction and particularly with CMI. To ensure that the area of computer assisted instruction would receive continued attention, the CMI Working Group continued to meet. The group established as their first priority, "to develop specific training for the instructors and managers involved, up to DCT level." It was hoped that the group's action would "promote fuller use of the system through understanding." Secondly, the group would turn their priorities toward developing CBI into a system that would support training requirements. As they stated, "we have got to move from a research to a development mode." As a third aim, the group was intent on "examining the whole CBI system-manpower, procurement, etc—to increase productivity and realized some of the cost savings CBI promises.

CONTRACTED. FIELD. AND OTHER SERVICES TRAINING

COURSE NO.	TITLE	ACAD DAYS	GRAD
1ASC32470-146	Tektronix 7912 DPO System	5	1
1ASC32470-233	Gisholt Balancing Machine Repair	4	10
1ASC32470-237	T-2/T-5 Theodolite Repair/Calib	5	1
4AST32470-005	Optical Tooling Theodolite Cal	10	11
4AST32470-174	Test Set Maint AN/AWM-13A	13	13

RESIDENT COURSES AND GRADUATES (FY78)

2ASR32050	Hi-Reliability Soldering & Electronic Repair Techniques	10	94
2ASR32470-2	Radiac Instrument Repair and Calibration	7	80
3ASR32470-6	A/E 35U-3 Spectrometer Maintenance/Calib	20	60
2ASR32470-8	Acft Engine Test Stand Calibration	8	49
2ASR32470-12	DOD Aims Altitude/Reporting Instr Maint/Cal	10	75
2ASR32470-13	DOD Aims Ident Test Set Maint & Cal	11	63
2ASR32470-14	H/P 8500 Series Spectrum Analyzer Maint/Calib (Disc 780929)	5	--
2ASR32470-15 2ASI	Swept Frequency Measurements	10	--
32 2ASR32470-33	Oxygen Equipment Cleaning and Calibration	8	31
2ASR32470-213	Operation/Calibration Analysis (AN/ARM-135) (Disc 780206)	10	--
2ASR32470-215	UPM/141 Maint/Cal	19	26
	AN/ARM-135 Maint Calibration	26	21

2ASR32470-217	Photometric Instruments, Maint Cal	10	--
3AAR32090	Avionics Systems Superintendent	35	67
3ABS32430-2	Precision Measuring Equipment Spec	150	633
3ABR32430-3	Precision Measuring Equipment Spec (Army)	170	98
3ABR32430-4	Precision Measurement Equip Spec (FAP)	76	--
3ABR32430-5	Precision Measurement Equip Spec (USA-AKQ)	39	--

HISTORY OF THE 3450TH TECHNICAL TRAINING GROUP
METROLOGY TRAINING BRANCH
1 JANUARY 1978 - 30 JUNE 1978

PERSONNEL

Major Francis X. Rodgers, Chief Metrology Training Branch (assigned 15 Jun 1977)

Personnel Resources

Present manning reflects that the branch is overmanned by three instructor personnel. Projected instructor requirements reflect need for eight additional instructors.

OJT

The number of personnel in OJT at the end of this period was 42. Thirteen were eligible for upgrade and 13 were upgraded.

Personnel Strength

	Officers Auth/Asgd	Enlisted Auth/Asgd	Civilians Auth/Asgd	Total Auth/Asgd
Jan-Mar	1/1	159/160	19/18	179/179
Apr-Jun	1/1	128/157	19/19	148/177

In addition to the assigned Air Force personnel there are two Army Warrant Officers, 22 Army enlisted personnel, one Marine Corps enlisted personnel, and 13 Navy enlisted personnel working in the training branch.

TRAINING

The present operation consists of twenty-three active resident courses and two travel team courses. A listing, brief resume of each course, and its status is reflected in the following paragraphs.

course	title	duration weeks
3AAR32090	Avionics Systems Superintendent	7 weeks
3ABR32430-002	Precision Measuring Equipment Specialist	30 weeks
3ABR32430-003	Precision Measuring Equipment Specialist (Army 35H20)	34 weeks
3AZR32470-005	Advanced Electrical-Electronic Measurements	6 weeks
3AZR32470-008	Precision Dimensional and Optical Measuring Technician	6 weeks
3AZR32470-015	Advanced Electronic Maintenance/Calibration	9 weeks
3AZR32470-017	DCLF Reference Measurement and Calibration (Army 35H30)	6 weeks
3AZR32470-018/ 021/022	Microwave Measurement and Calibration	6/6/4 weeks

3AZR32470-019/ 023/024	Physical Measurement and Calibration	6/4/5 weeks
3AZS32470-020	Precise Time and Frequency Calibration Sys.	2 weeks
2ASR32050	Hi-Reliability Soldering and Electronic Repair Techniques	2 weeks
2ASR32470-002	Radiac Instrument Repair and Calibration	1 4/5 weeks
2ASR32470-006	A/E35U-3 Spectrometer Maintenance/Calibration	4 2/5 weeks
2ASR32470-008	Aircraft Engine Test Stand Calibration	1 3/5 weeks
2ASR32470-012	DOD AIMS Altitude/Reporting Instruments Maintenance/Calibration	2 weeks
2ASR32470-013	DOD AIMS Identification Test- Set Maintenance Calibration	4 2/5 weeks
2ASR32470-032	Oxygen Equipment Cleaning and Calibration	1 3/5 weeks
3ASR32470-213	UPM 141 Maintenance/Calibration	4 1/5 weeks
2ASR32470-215	AN/ARM-135( ) Maintenance and Calibration	5 1/5 weeks
4AST32470-005	Optical Tooling and Theodolite Calibration	2 weeks
4AST32470-174	AN/AWM-13A Test Set Maintenance	2 3/5 weeks

Course G3AAR32090, Avionics Systems Superintendent. This is an advanced course designed to train senior NCOs as Avionics systems Superintendents.

Course G3ABR32430-002, Precision Measuring Equipment Specialist. This is a basic course designed to train personnel as specialists to analyze and isolate malfunctions, repair, and calibrate precision electrical-electronic measuring equipment. Blocks VII through XII are self-paced computer managed type of instruction.

On 15 Feb 78 Course G3ABR32430-002 began a Comparative Evaluation between Computer-Managed Instruction (CMI) and Manual Self-Pacing to end 5 Jul 78. This project was directed by General Roberts ATC. Systems Command will fund for continued CMI operation through FY79. The G3ABR32430-002/-003 course implemented self-paced instruction for Blocks III through VI beginning with Class 780612. The length of the basic course G3ABR32430-002/-003 was decreased from 150 days to 145 days beginning with Class 780612.

Proposed program changes are:

1. To implement self-paced instruction for Blocks I and II in October 1978.

2. Begin CMI for entire course in October 1978.

3. Apply CMI to all three shifts of G3ABR32430-002/-003 course operation by December 1978.

Course G3ABR32430-003, Precision Measuring Equipment Specialist (Army MOS 35H20). The first 30 weeks of the course are the same as the G3ABR32430-002 course and the students in both courses are commingled and receive concurrent instruction. The additional four weeks of training are on the operation of equipment in the Army calibration mobile van.

Planning is under was to implement Block XIII of the course under the eight-hour day concept during the last quarter of the calendar year.

Course G3AZR32470-005, Advanced Electrical-Electronic Measurements. This is an advanced course designed to train Marine Corps and Navy personnel operation, application, and calibration of precision electrical-electronic equipment.

Course G3AZR32470-008, Precision Dimensional and Optical Measuring Technician. This is an advanced course designed to train Marine Corps and Navy personnel operation, application, and calibration of dimensional and optical equipment.

Course G3AZR32470-015. Advanced Electronic Maintenance/Calibration. This is an advanced course designed to train personnel digital techniques, solid state logic analysis and micro-electronic troubleshooting techniques.

Course G3AZR32470-017, DCLF Reference Measurement and Calibration (USA MOS 35H30). This is an advanced course designed to train Army personnel principles of metrology, measurement methods, and calibration and repair of standards.

Course G3AZR32470-018/-021/-022, Microwave Measurement and Calibration (-018, USAF, 6 weeks; -021, USA, 6 weeks; -022, USN, 4 weeks). This is a DOD consolidated course designed to train DOD personnel operation, application, and calibration of microwave equipment.

Course G3AZR32470-019/-023/-024, Physical Measurement and Calibration (-019. USAF, 6 weeks; -023, USA, 4 weeks; -024, Navy, 5 weeks). This is a DOD consolidated course designed to train DOD personnel operation, application, and calibration of physical/dimensional equipment.

Course G3AZR32470-020, Precise Time and Frequency Calibration System. This is an advanced course designed to train personnel concepts of and the calibration and adjustment of precise time and frequency calibration equipment.

Course G2ASR32050, Hi-Reliability Soldering and Electronic Repair Techniques. This is an advanced course designed to train personnel soldering and printed circuit board maintenance techniques.

Course G2ASR32470-002, Radiac Instrument Repair and Calibration. This is an advanced course designed to train personnel repair, calibration, and certification of radiation monitoring equipment. Training provided meets requirements for industrial radiological monitors and qualifies student to hold USAF individual user's permit for radioactive isotopes used as calibration source. Planning is underway to include additional equipment and source (Army) and to change course to a. type III supplemental course.

Course G2ASR32470-006, A/E35U-3 Spectrometer Maintenance Calibration. This is an advanced course designed to train personnel operation and troubleshooting of a fluid analysis spectrometer.

Course G2ASR32470-008, Aircraft Engine Test Stand Calibration. This is an advanced course designed to train personnel operation, application, and calibration of aircraft engine test stands.

Course G2ASR32470-012, DOD AIMS Altitude/Reporting Instruments Maintenance/Calibration. This is an advanced course designed to train

personnel troubleshooting, .repair, and calibration of temperature-pressure and altitude reporting test sets.

Course G3ASR32470-013, DOD AIMS Identification Test Set Maintenance/Calibration. This is an advanced course designed to train personnel troubleshooting, repair, and calibration of IFF test sets.

Course G2ASS32470-032, Oxygen Equipment Cleaning and Calibration. This is an advanced course designed to train Navy personnel oxygen cleaning, inspection, and calibration systems. Additional training includes cleaning and calibration of flow meters, calibration of manifold gage system and clean room procedures.

Course G2ASR32470-213, UPM141 Maintenance/Calibration. This is an advanced course designed to train personnel operation, circuit analysis, troubleshooting, and calibration of the AN/UPM141 Radar Test Set.

Course G2ASR32470-215, AN/ARM-135( ) Maintenance and Calibration. This is an advanced course designed to train personnel operation, circuit analysis, troubleshooting, and calibration of the AN/ARM-135( ) Tacan Test Set.

Course G4AST32470-005, Optical Tooling and Theodolite Calibration. This is a travel team course designed to train personnel optical principles and theodolite calibration.

Course G4AST32470-174, AN/AWM-13A Test Set Maintenance. This is a travel team course designed to train personnel circuit analysis, troubleshooting, and calibration of the AN/AWM-ISA Test Set.

Planning is underway to change all courses presently operating on a six-hour day to an eight-hour day except courses G3ABR32430-002 and G3ABR32430-003. Course G3ABR32430-002 will remain on a six-hour day in order to meet TPH because of facility constraints.

FACILITIES

The Metrology Training Branch is housed in Buildings 905, 1308, and 1433. Buildings 1308 and 1433 provide adequate environment to accomplish the assigned mission. Building 905' does not meet environmental standards (temperature-humidity) conducive to satisfy assigned mission.

ENERGY

The energy conservation program, e.g., minimal lighting in non-academic areas, conducted in this branch, have had no adverse impact on training.

MISCELLANEOUS

The following TDY trips were taken in support of the training program during this reporting period:

a. Attend contract training -on new equipment, one man, 16 days, Weinschel Engineering Co., Gaithersburg, Maryland.

b. Attend new equipment training, one man, six days, Hewlett Packard Co., Santa, CA.

c. Attend new equipment training, two men, seven days, Pueblo Depot Activity, Pueblo, CO.

d. Conduct Course G4AST32470-005, two men, 14 days, George AFB, CA, and visit Metrology Engineering Center at General Dynamics to obtain instruction on new US Navy provided equipment, one man, seven days.

e. Conduct Course G4AST32470-005, one man, 14 days, Seymour Johnson AFB, NC.

HISTORY OF THE 3450TH TECHNICAL TRAINING GROUP
METROLOGY TRAINING BRANCH
1JULY 1978 - 31 DECEMBER 1978

KEY PERSONNEL

Major Francis X. Rodgers, Chief, Metrology Training Branch (assigned 15 Jun 1977)

PERSONNEL

Personnel Resources

Present manning reflects that the branch is under manned by 18 instructor personnel. Instructor requirements reflect need for 199 instructors. Identified shortages are from other services. Projected inbounds as of 31 Dec 78 include 11 Marine Corps personnel and one Navy personnel.

OJT

The number of personnel in OJT at the end of this period was 21. Twenty-four were eligible for upgrade and 24 were upgrade.

AF PERSONNEL STRENGTH

	Officers Auth/Asgd	Enlisted Auth/Asgd	Civilians Auth/Asgd	Total Auth/Asgd
Jul - Sep	1/1	128/146	18/17	147/164
Oct - Dec	1/1	134/144	18/18	153/163

In addition to the assigned Air Force personnel, there is one Army Warrant Officer, 29 Army enlisted personnel, one Marine Corps enlisted personnel, and 14 Navy enlisted personnel working in the training branch.

TRAINING

The present operation consists of twenty-seven active resident courses and two travel team courses. A listing, brief resume of each course, and its status is reflected in the following paragraphs.

course	title	weeks duration
G3AAR32090	Avionics Systems Superintendent	4 1/2 weeks
G3ABR32430-002	Precision Measuring Equipment Specialist	29 weeks
G3ABR32430-003	Precision Measuring Equipment Specialist (Army 35H10/20)	33 weeks
G3ABR32430-004	Precision Measuring Equipment Specialist (FAP)	15 2/5 weeks
G3ABR32430-005	Precision Measuring Equipment Specialist (USA-NG)	7 4/5 weeks
G3AQR30830-000	Space systems Equipment Specialist-Phase I	13 2/5 weeks
G3AZR32470-005	Advanced Electrical-Electronics Measurement	6 weeks

G3AZR32470-008	Precision Dimensional and Optical Measuring Technician	6 weeks
G3AZR32470-015	Advanced Electronic Maintenance/Calibration	7 weeks
G3AZR32470-017	DCLF Reference Measurement and Calibration - (USA MOS 35H30)	6 weeks
G3AZR32470-018/ -021/-022	Microwave Measurement and Calibration	6/6/4 weeks
G3AZR32470-019/ -023/-024	Physical Measurement and Calibration	6/4/5 weeks
G3AZR32470-020	Precise Time and Frequency Calibration System	2 weeks
G2ASR32050-000	Hi-Reliability Soldering and Electronic Repair Techniques	1 3/5 weeks
G2ASR32470-002	Radiac Instrument Repair and Calibration	1 2/5 weeks
G2ASR32470-006	A/E35U-3 Spectrometer Maintenance and Calib	4 weeks
G2ASR32470-008	Aircraft Engine Test Stand Calibration	1 3/5 weeks
G2ASR32470-012	DOD AIMS Altitude/Reporting Instruments Maintenance/Calibration	2 weeks
G2ASR32470-013	DOD AIMS Identification Test Set Maintenance and Calibration	4 2/5 weeks
G2ASR32470-015	Swept Frequency Measurements	2 weeks
G2ASR32470-032	Oxygen Equipment Cleaning and Calibration	1 3/5 weeks
G2ASR32470-213	UPM 141 Maintenance/Calibration	3 4/5 weeks
G2ASR32470-215	AN/ARM-135( ) Maintenance and Calibration	5 1/5 weeks
G4AST32470-005	Optical Tooling and Theodolite Calibration	2 weeks
G4AST32470-174	AN/AWM-13A Test Set Maintenance	2 3/5 weeks

Course G3AAR32090-000, Avionics Systems Superintendent. This is an advanced course designed to train senior NCOs as Avionics Systems Superintendents.

Course G3ABR32430-002, Precision Measuring Equipment Specialist. This is a basic course designed to train personnel as specialists to analyze and isolate malfunctions, repair, and calibrate precision electrical-electronic measuring equipment. Instructional design of this course is self-paced computer managed instruction. In addition, this course is operated on three shifts with a six plus two academic day.

The G3ABR32430-002 course has been selected by AFHRL as a course which will be used for research and development through FY 1980. Funding for new projects will be provided by Systems Command.

Course G3ABR32430-003, Precision Measuring Equipment Specialist (Army MOS 35H20). The first 29 weeks of the course are the same as the G3ABR32430-002 course and the students in both courses are commingled and receive concurrent instruction. The additional four weeks of training is on the operation of equipment in the Army calibration mobile van.

Block XIII of this course was implemented under the eight-hour day concept the during last quarter of this calendar year.

Course G3ABR32430-00.4, Precision Measuring Equipment Specialist. This course is designed to meet special needs for German and Canadian students. The course

trains personnel as specialists to analyze and isolate malfunctions, repair, and calibrate electrical-electronic measuring equipment. A prerequisite to course attendance is a knowledge of electronic fundamentals and basic algebra.

Course G3ABR32430-005, Precision Measuring Equipment Specialist. This course is designed to meet special needs for US Army National Guard personnel. The course trains personnel as specialists to analyze and isolate malfunctions, repair, and calibrate electrical-electronic measuring equipment. A prerequisite to course attendance is a knowledge of electronic fundamentals and basic algebra.

Course G3AQR30830-000, Space Systems Equipment Specialist - Phase I. This course is designed to train Air Force personnel in fundamental skills and knowledge prerequisite for entry into course G3ABR30830-000, Space Systems Equipment Specialist. Training includes basic electronic fundamentals and soldering techniques.

Course G3AZR32470-005, Advanced Electrical-Electronic Measurements. This is an advanced course designed to train Marine Corps and Navy personnel operation, application, and calibration of precision electrical-electronic equipment.

Course G3AZR32470-008, Precision Dimensional and Optical Measuring Technician. This is an advanced course designed to train Marine Corps and Navy personnel operation, application, and calibration of dimensional and optical equipment.

Course G3AZR32470-015, Advanced Electronic Measurement/Calibration. This is an advanced course designed to train personnel digital techniques, solid state logic analysis and micro-electronic troubleshooting techniques.

Course G3AZR32470-017, DCLF Reference Measurement and Calibration (USA MOS 35H30). This is an advanced course designed to train Army personnel principles of metrology, measurement methods and calibration and repair of standards.

Course G3AZR32470-018/-021/-022, Microwave Measurement and Calibration (-018, USAF, 6 weeks; -021, USA, 6 weeks; -022, USN, 4 weeks). This is a DOD consolidated course designed to train DOD personnel operation, application, and calibration of microwave equipment.

Course G3AZR32470-019/-023/-024, Physical Measurement and Calibration (-019, USAF, 6 weeks; -023, USA, 4 weeks; -024, USN, 5 weeks). This is a DOD consolidated course designed to train DOD personnel operation, application, and calibration of physical/dimensional equipment.

Course G3AZR32470-020, Precise Time and Frequency Calibration System. This is an advanced course designed to train personnel concepts of and the calibration and adjustment of precise time and frequency calibration equipment.

Course G2ASR32050, Hi-Reliability Soldering and Electronic Repair Techniques. This is an advanced course designed to train personnel soldering and printed circuit board maintenance techniques.

Course G2ASR32470-002, Radiac Instrument Repair and Calibration. This is an advanced course designed to train personnel repair, calibration, and

certification of radiation monitoring equipment. Training provided meets requirements for industrial radiological monitors and qualifies student to hold USAF individual user's permit for radioactive isotopes used as calibration source. Planning is underway to include additional equipment and source (Army) and to change course to a type III supplemental course.

Course G2ASR32470-006, A/E35U-3 Spectrometer Maintenance Calibration. This is an advanced course designed to train personnel operation and troubleshooting of a fluid analysis spectrometer.

Course G2ASR32470-008, Aircraft Engine Test Stand Calibration. This is an advanced course designed to train personnel operation, application, and calibration of aircraft engine test stands.

Course G2ASR32470-012, DOD AIMS Altitude/Reporting Instruments Maintenance/Calibration. This is an advanced course designed to train personnel troubleshooting, repair, and calibration of temperature-pressure and altitude reporting test sets.

Course G2ASR32470-013, DOD AIMS Identification Test Set Maintenance/Calibration. This is an advanced course designed to train personnel troubleshooting, repair, and calibration of IFF test sets.

Course G2ASR32470-015, Swept Frequency Measurements. This is an advanced course designed to train personnel in the concepts of swept frequency measurements. Training includes attenuation, impedance, power, and reflectometer measurements and wave meter calibration.

Course G2ASR32470-032, Oxygen Equipment Cleaning and Calibration. This is an advanced course designed to train Navy personnel oxygen cleaning, inspection, and calibration, systems. Additional training includes cleaning and calibration of flow meters, calibration of manifold gage system and clean procedures.

Course G2ASR32470-213, UPM141 Maintenance/Calibration. This is an advanced course designed to train personnel operation circuit analysis, troubleshooting, and calibration of the AN/UPM141 Radar Test Set.

Course G2ASR32470-215, AN/ARM-135( ) Maintenance and Calibration. This is an advanced course designed to train personnel operation, circuit analysis, troubleshooting, and calibration of the AN/ARM-135( ) Tacan Test Set.

Course G4AST32470-005, Optical Tooling and Theodolite Calibration. This is a travel team course designed to train personnel optical principles and theodolite calibration.

Course G4AST32470-174, AN/ARM-ISA Test Set Maintenance. This is a. travel team course designed to train personnel circuit analysis, troubleshooting, and calibration of the AN/AWM-13A Test Set.

All courses with the exception of the G3ABR32430-002, -003, -004, -005, and G3AQR30830-000, are presently operating on an eight-hour classroom day.

Course number G3AZR32470-018/-021/-022 is scheduled to return to a six plus two academic day in the first quarter of CY79. This change is necessary in order to meet the FY79 TPR.

Course G2ASR32050-000 will be discontinued in the first quarter of CY79. A survey by LTTC/TTGX of the local area determined a zero TPR for the course.

FACILITIES

The Metrology Training Branch is housed in Buildings 905, 1308, and 1433. Buildings 1308 and 1433 provide an adequate environment to accomplish the assigned mission. Building 905 does not meet environmental standards (temperature-humidity) conducive to satisfy assigned mission.

ENERGY

The energy conservation programs, e.g., minimal lighting in nonacademic areas, conducted in this branch, have had no adverse impact on training.

MISCELLANEOUS

The following TDY trips were taken in support of the training program during this reporting period:

a. Participate in WAPS test development, one man, 11 days, Lackland AFB, Texas.

b. Attend the critical design review of X band radar test set, one man, four days, AAI Corporation, Cockeysville, Maryland.

c. Attend Government-Industry Data Exchange Program (GIDEP) work shop, one man, three days, Albuquerque, New Mexico.

HISTORY OF LOWRY TECHHICAL TRAINING CEHTEB

RESIDENT 'COURSE GRADUATES

COURSE NO	TITLE	ACAD DAYS	GRADS
2ASR32050	Hi-Reliability Soldering & Electronic Repair Techniques (Disc 790102)	10	11
2ASR32470-002	Radiac Instrument Repair and Calibration (Disc 790913)	7	86
2ASR32470-006	A/E 35U Spectrometer Maintenance/Calib	20	59
2ASR32470-008	Acft Engine Test Stand Calibration	8	59
2ASE32470-012	DOD Aims Altitude/Reporting Instr Maint/Cal (Disc 791001)	10	115
2ASE32470-013	DOD Aims Ident Set Maint & Cal (Disc 791001)	22	128
2ASB32470-015	Swept Frequency Measurements (Disc 790829)	10	24
2ASH32470-032	Oxygen Equipment Cleaning and Cal	8	30
2ASR32470-213	UPM/141 Maint/Calibration	19	29
2ASR32470-215	AN/ARM-135 Maint Calibration	26	54
3AAR32090	Avionics Systems Superintendent (Disc 791001)	35	41
3ABR30830-001	Space System Equip Spec	148	3
3A3R32430-002	Precision Measuring Equipment Spec	145	496
3ABR32430-003	Precision Measuring Equipment Spec (Army)	165	117
3ABR32430-004	Precision Measurement Equip Spec (FAP)	89	24
3ABR32430-005	Precision Measurement Equip Spec (USA-ANG)	39	16
3ABR99104-001	Systems Repair Tech (taught in 3454 TCHTS)	176	
3AQR30830	Space Systems Equip Spec Phase I (Disc 790604)	67	44
3AZR32470-005	Advanced Electrical-Electronic Measurements	20	306
3AZR32470-008	Precision Dimensional and Optical Measuring Technician	30	61
3AZR32470-015	Advanced Electronic Maint/Cal	35	123
3AZR32470-017	DCLF Ref Measurement/Calibration (35H30)	30	39
3AZR32470-018	Microwave Measurement & Calibration	30	103
3AZR32470-019	Physical Measurement & Calibration	30	106
3AZR32470-020	Precise Time and Freq Cal System	10	28
3AZR32470-021	Microwave Measurement & Calibration (Army)	30	29
3AZR32470-022	Microwave Measurement & Calibration (Navy)	20	274
3AZR32470-023	Physical Measurement & Calibration (Army)	20	30
3AZR32470-024	Physical Measurement & Calibration (Navy)	25	56

CONTRACTED FIELD AND OTHER-SERVICES TRAINING

4AST32470-005	Optical Tooling/Theodolite Calib. Test	10	8
4AST32470-174	Set Maint AN/AWM-13A	13	17

Computer Based Instruction

The status of Computer Based Instruction (CBI) at LTTC during 1980 remained much as it had during 1979. In October of the latter year, Lieutenant Colonel Ballard reported mixed success with the systems. The.3440 TCHTG's self-paced Inventory Management Course had proven cost effective. However the 3450 TCHTG's Precision Measuring Equipment Course (PMEL) and two .former Advanced Instructional System Courses—Materiel Facilities and Weapons Mechanics-- were not found cost effective. LTTC discontinued the last two as CBI courses, and only continued PMEL on the system as a research test .bed for Air Force Human Resources Laboratory (AFHRL). As of 1980, LTTC remained committed to increasing the effectiveness and efficiency of instruction through CBI, although LTTC would not become the lead base for the Branch Level Training Management System until FY 1982 and FY 1983. The 3400 TCHTW anticipated the system to cost $1,447,000 during FY 1982 and expected maintenance costs to be about $137,000 annually beginning in FY 1983.

Type 2 and 3 Resident Courses (FY 1980)

Course Number	Title	Grads		Acad Days		
		Proj	Actual	F	S	WT
3ASS32450-000	Precision Measuring Equip Spec AC/DC Analysis	1				
2ASR32470-006	A/E35U-3 Spectrometer Maint/Cal	52	38		20	
2ASR32470-032	Oxygen Equip Cleaning and Cal	43	30		8	
2ASR32470-213	UPM-141 Maint/Calibration	29	29		19	
2ASR32470-215	AN/ARM-135 Maint Calibration	35	24		26	
3ABR30830-001	Space Systems Equip Specialist	70	64	75	73	103
3ABR32430-002	Precision Measuring Equip Spec	355	344		145	130
3ABH32430-003	Precision Measuring Equip Spec (Army)	265	135		165	155
3ABR32430-004	Precision Measuring Equip Spec (FAP)	17	12		89	80
3ABR32430-005	Precision Measuring Equip Spec (USA-ANG)	28	12		39	
3AZR32470-000	Radiac Instrument Repair and Cal	63	47		9	

Personnel

Personnel Resources

Present manning reflects that the branch is under-manned by 32 instructor personnel. Instructor requirements reflect need for 194 instructors. Projected inbounds as of 30 Jun 80 include one Marine Corps personnel, three Navy personnel, and three Air Force personnel and six Army personnel.

AF PERSONNEL STRENGTH

	Officers Auth/Asgd	Enlisted Auth/Asgd	Civilians Auth/Asgd	Total Auth/Asgd
Jan - Mar	1/1	104/107	18/14	122/121
Apr - Jun	1/1	104/103	18/14	122/117

In addition to the assigned personnel there is one Army Warrant Officer, 38 Army enlisted personnel, 14 Marine Corps enlisted personnel, and 13 Navy enlisted personnel working in the training branch.

AF PERSONNEL STRENGTH

	Officers Auth/Asgd	Enlisted Auth/Asgd	Civilians Auth/Asgd	Total Auth/Asgd
Jul - Sep -	1/1	105/104	18/14	123/118
Oct Dec	1/1	100/98	19/15	119/113

Personnel Resources

Present manning reflects that the branch is under manned by 25 instructor personnel. Instructor requirements reflect need for 190 instructors. Projected infaounds as of 31 Dec 80 include one Marine Corps personnel, four Navy personnel, thirteen Air Force personnel and seventeen Army personnel.

In addition to the assigned personnel there are five Army Warrant Officers, 38 Army enlisted personnel, 15 Marine Corps enlisted personnel, and 14 Navy enlisted personnel working in the training branch.

MISCELLANEOUS

The following TDY trips were taken in support of the training program.

a. Attend TITE Spectrum Analyzer (ALM-175) familiarization course and coordinate 324X0 STS impact on major revisions to the 32450 and 32470 CDCs. one man, 24 days, Beale AFB, CA. Norton AFB, CA. and Nellis AFB, NV.
OH.

b. Attend training on ACS system (Mod 9825), one man, 14 days, Newark AFS,

c. Receive training on the precise timing system of the NAVSTAR satellite, 14-16 Jul 80 at Rockwell International, Los Angeles, CA.

d. Participate in WAPS Test Review, USAF Occupational Measurement Center, 5-28 Aug 80.

e. Conduct Course G4AST32470-174 at George AFB, CA.

f. Technical Assistance Visit to NAVSEACENPAC, San Diego, CA. 25-29 Aug 80.

g. Conduct Course Q4AST32470-174 at Seymour-Johnson, NC, 9-26 Sep 80.

h. Gather data and materials in order to establish a microminiature Soldering Course, 20-24 Got 80, El Toro Marine Air Station and Miramar NAS, CA.

i. Attend GIDEP National Workshop, 20-23 Oct 80, Niagara Falls, Canada.

j. Conduct G4AST32470-174 course, 21 Oct - 4 Nov, at Ramstein, Germany and 5 --19 Nov at Bitburg, Germany.

k. Attend Precise Time and Time Interval Conference at NASA Goddard Space Flight Center, 2-4 Dec 80.

Computer Based Instruction—Background

The Advanced Instructional System (AIS) had begun in the early 1970s as an attempt to use advances in technology to keep pace with instruction needs. The Air Force Human Resources Laboratory (AFHRL) developed the integrated system using the most advanced computers and instruction methods then available. Essentially, the system was designed to facilitate self-paced instruction, then considered by many to be the best, most advanced possible method of learning. Lowry became the test site, and LTTC personnel converted four courses--3ABR32430 Precision Measurement Equipment Specialist (PME), 3ABR46230 002 Weapons Mechanic, 3A3R64530 001 Inventory Management Specialist, and 3ABR64531 000, Material Facilities Specialist — to the new system. McDonnell-Douglas Corporation received a contract for the system on 1 May 1973. In 1978, at the end of the five-year test program, Brigadier General William W. Hoover concluded that the system had merit, but had not met all of its objectives. HQ ATC directed a second test between 15 February and 15 June 1978. The results of the second test were inconclusive. While General Hoover wanted AIS continued into 1979 at AFHRL expense, the system clearly had to show more benefits that it had done to that point.

On 29 September 1978, General Roberts agreed with a recommendation that ATC and the AFHEL share costs where computer based instruction had proved cost-effective. At that time no really good data on the efficiency of AIS in channelized training was available. The Training Systems Directorate at HQ ATC had to make a recommendation on the computer instruction techniques by 1 July1979, so personnel in that unit began a test with the aid of Lowry's Plans and Requirements Division. In reply, Colonel John K. Giles, then Deputy Commander for Training at Lowry, indicated that LTTC had hoped to make the evaluation after more students had attended the course, thus he was concerned about the reliability of data gathered before 1 July. However, he set a schedule designed to complete the evaluation and submit its findings to HQ ATC by 1 June. The ultimate results, reported to Air Force Systems Command—which controlled the AFHRL--must have been disappointing:

> *. . .we have determined that computer support results in a net cost of one manpower position. Since we have no evidence of any student time savings attributable to CMI (Computer Managed Instruction) in that course, and since CMI costs us manpower, we have determined that the 46230 course is not a cost-effective application of CMI.*

By 1980, then, LTTC began to reassess the role of computer based and computer assisted instruction in light of its experiences with AIS. The reassessment pointed primarily to retention of computer instruction in the 3440 TCHTG's Inventory Management Course and the Precision Measuring Equipment Course under the 3450 TCHTG. It recommended continued use of the computer for test scoring and item analysis. Additionally, by 1980 LTTC managers advocated the integration of computer based instruction into a new system called .the Branch Level Training Management System (BLTMS). Not expected until FY 1982 and FY

1983, LTTC already expected BLTMS to cost $1,447,000 during FY 1982 and forecast maintenance costs at $137,000 per year beginning in FY 1983.

Termination of Advanced Instructional System

By early 1981, despite the 1980 assessment that the system was useful in certain courses, the handwriting was in the wall for AIS. The savings in time, money, and manpower originally anticipated never materialized to a sufficient extent. Additionally, many 3400 TCHTW personnel came to believe in the efficiency of lock-step over self-paced instruction. Many students by 1981 also preferred lock-step instruction, as a Commander's Representative team reported: “They like being shown by an instructor — the personal contact." On 19 May 1981, Brigadier General Spence M. Armstrong, Deputy Chief of Staff for Technical Training, HQ ATC, notified General Hall of the results of a meeting held on the 14th between his staff and AFHRL representatives:

They explored options for an affordable, interim fix until we can bring on a cost-effective, state-of-the-art replacement to the Lab's present antiquated system. Unfortunately, no affordable option could be negotiated. As a result, we must now plan for termination of AFHRL computer support effective 30 September 1981.

This letter started a flurry of activity in those courses still using AIS as course managers planned the transition from computer to manual instruction. The 3440 TCHTG's two courses, G3ABH64530 Inventory Management Specialist and G3ABR64531 Material Specialist Course, made the change to lock-step at a cost of some $123,000 for the reconfiguration of classrooms and purchase of training aids. The 3450 TCHTG course went to manual self-paced instruction, thus incurring no reconfiguration costs. The impact of the shifts from self-paced to lock-step instruction affected student production and the training flow severely during the fall of 1981, as described earlier in this chapter. Despite the demise of AIS, however, the future for computer based instruction at LTTC was not blank, as General Armstrong noted in his letter of 19 May:

Our staffs are now working the systems definition for the follow-on computer system and seeking funding avenues to acquire such a system as soon as possible. We see Lowry as the lead ATC base in what will be a command-wide employment under the Branch Level Training Management System.

Branch Level Training Management System (BLTMS)

BLTMS did not, as some personnel at Lowry claimed, stand for "bacon-lettuce-tomato-mustard-sauerkraut." The Branch Level Training Management System was a micro/mini-based computer system designed to increase technical training management efficiency through automation of several training and administrative functions. Designed ultimately to replace AIS, BLTMS differed from the older system in one fundamental way. Where AIS depended upon a "main frame", centralized computer with terminals located in the training branches, BLTMS consisted of separate mini-computers and related software in each training branch. When the AIS computer broke down, it affected every branch. Under BLTMS computer downtime would only "impact the branch that particular unit services. BLTMS installation was planned as a two-stage

program. First the system would provide computer management instruction services, including, for example, statistical compilation, testing, and word processing. A follow-on computer assisted instruction mode would allow' students to sit down in front of terminals and learn as in AIS. 3LTMS, however, even in the latter mode, did not herald a projected return to self-paced instruction on a large scale. Planners projected its use as a remedial rather that primary instruction system.

In May 1981, HQ ATC asked LTTC to provide information that would help determine the training application that should be automated. Captain John M. Sather and MSgt William A. Haley, Computer Based Instruction Systems Software Division, provided that information after consulting closely with numerous LTTC personnel, particularly in the training branches. As a result by September HQ ATC had completed a Data Automation Requirement designed "to acquire a distributed computer processing system consisting of Command Technical Training Center (6) and one at HQ ATC for software development." The Data Automation Requirement package established the basic picture for BLTMS; however, HQ ATC still required a detailed functional analysis to tailor the system to the needs of the centers. A team from HQ ATC led by Captain Joe Jaremko, Instructional System Design Branch, visited Lowry from 13 through 15 October 1981. They visited primarily with personnel from the Faculty Development Division, Training Evaluation Division, 3420 TCHTG Photo Sciences Branch, 3450 TCHTG Metrology Training Branch, and 3460th Disaster Preparedness, Safety, and Instrumentation Branch. As a result of their visits to the technical training centers, the BLTMS Working Group requested additional data required to develop the specific equipment requirements for the planned system. With much effort, Captain Sather collected the needed information and forwarded it to HQ ATC by 31 December 1981. Thus, at the end of 1981 LTTC planners awaited HQ ATC's definitive plans for the installation of BLTMS at Lowry beginning sometime, hopefully, during FY 1982.

TYPE 2 AMD TYPE 3 RESIDENT COURSES AND GRADUATES FY 1981

COURSE		ACAD F	DAYS S	GRADS PROJ	GRADS ACTUAL
2ASR32050-000	Hi-Reliability Soldering/Elec Repair Tech		10	31	21
2ASR32470-006	A/E 35U-3 Spectrometer Maint Cal		20	58	52
2ASR32470-032	Oxygen Equip Cleaning and Cal		19	49	42
2ASR32470-215	AN/ARM-135 Maint Calibration		26	54	33
3ABR30830-001	Space Systems equipment Spec	66	86	66	73
3ABR32430-002	Precision Measuring Equipment Spec		154	434	315
3ABR32430-993	Systems Repair Tech	80	108	14	17
3AZR32470	Radiac Instrument Repair and Cal		9	79	78
3AZR32470-005	Advanced Electrical-Electronic Meas		20	288	268
3AZR32470-008	Precision Dimensional and Optical Measuring Technician		30	83	71
3AZR32470-014	Aircraft Engine Test Stand Cal		13	31	25
3AZR32470-015	Advanced Electronic Maint/Calibration		35	42	25
3AZR32470-016	DOD Aims Identification Test Set Maint/Calibration		22	109	91
3AZR32470-017	DCLF Ref Measurement/Calibration		30	79	46
3AZR32470-018	Microwave Measurement & Calibration		30	100	86
3AZR32470-019	Physical Measurement & Calibration		30	87	77
3AZR32470-020	Precise Time and Freq Cal System		10	21	19
3AZR32470-021	Microwave Measurement & Cal (Army)		30	87	42
3AZR32470-022	Microwave Measurement & Cal (Navy)		20	292	230
3AZR32470-023	Physical Measurement & Cal (Army)		20	86	42
3AZS32470-024	Physical Measurement & Cal (Navy)		25	79	61
3AZR32470-025	DOD Aims Altitude/Reporting		10	110	96
3AZR32470-026	Advanced Electronic Maint/Cal		50	110	99

TYPE 1, 4, 5 OFF-BASE COURSES AND GRADUATES

COURSE	TITLE	ACAD F	DAYS S	GRADS PROJ	GRADS ACTUAL
	TYPE 1				
1ASC32450-003	AIM 9L Universal Rate Table Programming		5	5	8
1ASC32470-166	960M 960 Hardware		10	2	2
1ASC32470-253	Freon Still Oper/Maint		5	14	14
1ASC32470-255	Test Aid/Fast Race Programming		10	2	2
	TYPE 4				
4AST32470-174	TEST SET MAINT AN/AWM-13A		13	27	16

HISTORY OF THE 3450TH TECHNICAL TRAINING GROUP
METROLOGY TRAINING BRANCH
1 JANUARY - 31 JULY 1981

OVERVIEW

A. During this reporting period we had a new branch chief come onboard (Appendix *1).

B. People program/personnel strength (Appendix 2) (Atch 1).

C. Budget (Appendix *3).

D. Course listing/graduates/description (Appendix *4) (Atch 2).

E. New equipment/facilities (Appendix *5).

F. Visits (Appendix #6).

G. The mission of the unit is to conduct assigned resident and travel team training for DOD personnel in accordance with established policy and directives.

COMMANDER'S POINT OF VIEW

------ TPR started increasing during this period as did elimination (attrition) rate.

------ The follow-up Stan-Eval was accomplished during this period with a satisfactory.

------ The decision to take away the computer/AIS was made due to costs. Mainly ATC's cost.

------ The mission of the Metrology Training Branch is being accomplished in spite of such obstacles as shortage of instructors. There is a large amount of students AFI (Awaiting Further Instruction). Another obstacle is the length of time for supply to get in the new equipment we require. This has historically been caused by Supply/Item Manager/AGMC (Aerospace Guidance and Metrology Center).

------ Amount of space for training in existing facilities has still remained a problem.

------ Being commander of an outfit with all four branches of the service has been and will continue to be a challenge. The Air Force being the low man on the totem pole as far as rank is concerned but tops in numbers does not make sense or seem reasonable. This has been one of the inequities of the Interservice Training Agreement/The Air Force Management Engineering formula for assigning AF personnel.

APPENDIX #l

ROSTER OF KEY PERSONNEL

BRANCH CHIEF: Daniel K. Olson, Major (Came onboard 6 May 1981)

TDS CHIEF: Keith W. Rhine, GS-12

Ex-Branch Chief, Capt William F. Herlehy, departed 29 May 1981 to go to the AFROTC program at Kent State University.

PEOPLE

*Military

Authorized 212
Assigned 185

Civilian

Authorized 18
Assigned 16

*Military authorized and assigned in the Metrology Training Branch include all branches of the service. See Atch 1 for breakdown

The major discrepancy between authorized and assigned is due mainly to the Army and Navy. This causes more students to be AFI (Awaiting Further Instruction).

BUDGET

The Metrology Training Branch was allocated $58,000 at the beginning of Fiscal Year 81. The chart which follows details expenditures covering the period 1 January 1981 to 30 June 1981.

ALLOCATIONS	EXPENDITURES
	2nd Quarter FY81 $29,976.26
	3rd Quarter FY81 $46,424.87

APPENDIX #6

IMPORTANT VISITORS

Name of Visitor	Inclusive Date of Visit	Purpose
Stan/Eval	January 1981	Follow-up
AFHRL/McAir/Capt Sather	Throughout Period	To discuss dropping of computer/AIS from Metro logy/logistics/ Munitions training
TSgt Prestion Morrell and CMSgt Austin	June 1981	F-15 TEWSTITE Type IV Lab training

MISCELLANEOUS

The following TDY trips were taken in support of the training program during this reporting period:

a. Conduct course 4AST32470-174 at MacDill AFB, FL, 18 Feb - 6 Mar.

b. To determine usability of NIDA (130) trainer in use at Fort Bliss, X, to applicability to Lowry's training program, 23 - 27 Feb.

c. Attend conference on Signature Analyzers and Logic State Sanalyzers at Kelly AFB, TX, 6 - 8 Apr.

d. To review computer support for AIS training in the 324X0 AFSC at Randolph AFB, TX, 14 Apr.

e. Phase I FOT&E F-15 TEWS TITE at Eglin AFB. FL, 11 - 21 May.

f. Participate in T>0> verification for TACAN Test Set AN/ARN 118(V) at Collins facility. Cedar Rapids, Iowa, 11 - 14 May.

g. Attend Worldwide AF PMEL conference at AGMC, Newark AFS, Ohio, 14 – 19 June.

PERSONNEL STRENGTH REPORT
JUNE 1981

	AUTHORIZED			ASSIGNED		
	AMN	OFF	CIV	AMN	OFF	CIV
THC						
4016		1			1	
32470	1			1		
39230	1			1		
64530	2			2		
70230B	3			3		
sub total	7	1		7	1	
Instructors	112		12	104		10
THCX – TDS						
32470	3		3			
07524 (GS-12)			1			1
07524 (GS-11)			4			4
07250B			1			1
sub total	3		6	3		6
US Army	55	1		40	2	
USMC	15			15		
USN	18			13		
TOTAL	122	1	18	114	1	16

COURSE DESCRIPTION

Course G3ABR32430-002, Precision Measuring Equipment Specialist. This is a basic course designed to train personnel as specialists to analyze and isolate malfunctions, repair, and calibrate precision electrical-electronic measuring equipment. Instructional design of this course is self-paced computer managed instruction. In addition, this course is operated on three shifts with a six plus two academic day.

The G3ABR32430-002 course has been selected by AFHRL as a course which will be used for research and development through FY 1981. Funding for new projects will be provided by Systems Command.

Course G3ABR32430-003, Precision Measuring Equipment Specialist (Army MOS 35H30). The first 154 days of the course are the same as the G3ABR32430-002 course. The additional four weeks of training is on the operation of equipment in the Army calibration mobile van.

*Course G3ABR32430-004, Precision Measuring Equipment Specialist. This course is designed to meet special needs for German and Canadian students. The course trains personnel as specialists to analyze and isolate malfunctions, repair and calibrate electrical-electronic measuring equipment. A prerequisite to course attendance is a knowledge of electronic fundamentals and basic algebra.

*Course G3ABR32430-005, Precision Measuring Equipment Specialist. This course is designed to meet special needs for US Army National Guard personnel. The course trains personnel as specialists to analyze and isolate malfunctions, repair, and calibrate electrical-electronic measuring equipment. A prerequisite to course attendance is a knowledge of electronic fundamentals and basic algebra.

*Course G3ABR32430-006, Precision Measuring Equipment Specialist (USMC 6492/93). This course is designed to meet special needs for US Marine Corps personnel. It includes most of the G3ABR32430-002 course plus a block of instruction strictly on Marine Corps equipment.

*Course G3ABR30830-001, Space Systems Equipment Specialist - Phase I. This course is designed to train Air Force personnel in fundamental skills and knowledges requisite for completion of course G3ABR30830-001, Space Systems Equipment Specialist. Training includes basic electronic fundamentals and soldering techniques.

*Course G3ABR99104-001, Systems Repair Technician - Phase I. This course is designed to train Air Force personnel in fundamental skills and knowledges requisite for completion of course G3ABR99104-001, Systems Repair Technician. Training includes basic electronic fundamentals and soldering techniques.

*Courses G3ABR32430-004, G3ABR32430-005, G3ABR32430-006, G3ABR30830-001, and G3ABR99104-001, were designed to meet special training needs and consist of selected portions of the G3ABR32430-002 course.

Course G3AZR3247-000, Radiac Instrument Repair and Calibration. This is an advanced course designed to train personnel in repair, calibration, and

certification of radiation monitoring equipment. Training provided meets requirements for industrial radiological monitors and qualifies student to hold USAF individual user's permit for radioactive isotopes used as calibration source.

Course G3AZR32470-005, Advanced Electrical-Electronic Measurements. This is an advanced course designed to train Marine Corps and Navy personnel in the operation, application, and calibration of precision electrical-electronic equipment.

Course G3AZR32470-008, Precision Dimensional and Optical Measuring Technician. This is an advanced course designed to train Marine Corps and. Navy personnel operation, application, and calibration of dimensional and optical equipment.

Course G3AZR32470-014, Aircraft Engine Test Stand Calibration. This is an advanced course designed to train personnel operation, application, and calibration of aircraft engine test stands.

Course G3AZH32470-016, DOD AIMS Identification Test Set Maintenance/Calibration. This is an advanced course designed to train personnel troubleshooting, repair, and calibration of IFF test sets.

Course G3AZR32470-017, DCLF Reference Measurement and Calibration (USA MOS 35H30). This is an advanced course designed to train Army personnel principles of metrology, measurement methods, and calibration and repair of standards.

Course G3AZR32470-018/-021/-022, Microwave Measurement and Calibration (-018, USAF, 6 weeks; -021, USA, 6 weeks; -022, USN, 4 weeks). This is a DOD consolidated course designed to train DOD personnel operation, application, and calibration of physical/dimensional equipment.

Course G3AZR32470-019/-023/-024, Physical Measurement and Calibration (-019, USAF, 6 weeks; -023, USA, 4 weeks; -024, USN, 5 weeks). This is a DOD consolidated course designed to train DOD personnel operation, application, and calibration of physical/dimensional equipment.

Course G3AZR32470-020, Precise Time and Frequency Calibration System. This is an advanced course designed to train personnel concepts of and the calibration and adjustment of precise time and frequency calibration equipment.

Course G3AZR32470-025, DOD AIMS Altitude/Reporting Instruments Maintenance/Calibration. This is an advanced course designed to train personnel troubleshooting, repair, and calibration of temperature-pressure and altitude reporting test sets.

Course G3AZR32470-026, Advanced Electronic Maintenance/Calibration. This is an advanced course designed to train personnel digital techniques, solid state logic analysis and micro-electronic troubleshooting techniques.

Course G2ASR32470-006, A/E 35U-3 Spectrometer Maintenance/Calibration. This is an advanced course designed to train personnel operation and troubleshooting of the fluid analysis spectrometer.

Course Q2ASR32470-032, Oxygen Equipment Cleaning and Calibration. This is an advanced course designed to train Navy personnel oxygen cleaning, inspection, and calibration systems. Additional training includes cleaning and calibration of flow meters, calibration of manifold gage system and clean room procedures.

G2ASR32470-215, AN/ARM-135C) Maintenance and Calibration. This is an advanced course designed to train personnel operation, circuit analysis, troubleshooting, and calibration of the AN/ARM-135( ) TACAN Test Set.

Course G4AST32470-174, AN/AWM-13A Test Set Maintenance. This is a travel team course designed to train personnel circuit analysis, troubleshooting, and calibration of the AN/AWM-13A Test Set.

HISTORY OF THE 3450TH TECHNICAL TRAINING GROUP
METROLOGY TRAINING BRANCH
1 JULY - 31 DECEMBER 1981

TABLE OF CONTENTS

CHAPTER I

Mission and Resources

Mission

Conduct assigned resident and travel team training for DOD personnel in accordance-with established policy and directives.

Personnel Resources

The branch is authorized 217 instructor personnel, 18 overhead personnel for Administration. Training Development Section (TDS), Supply (Requirements Section). Also there are four liaison slots - two U.S.Army, one U.S. Navy, and one U.S. Marine.

On board for the period of this report were 200 instructors (short 17). Overhead and liaison is 100%.

Budget

The Metrology Training Branch exhausted its allocated budget for Fiscal Year 1981. The Branch was allocated $31,000 for Fiscal Year 1982 1st and 2nd Quarters.

Expenditures

1st Quarter FY82 $17,000.

CHAPTER II

New Plans, Programs, and Procedures

1. The basic PME course is undergoing a major revision due to the new STS.

2. The Radiac course is also undergoing a major revision.

3. Plans are in the mill to revise the Microwave Course.

4. The Metrology Branch went off the Air Force Human Resources Lab AIS computer 1 Oct 81 and plans are being formulated for a new system.

5. The CDCs that were sent to ECI (32450 - Dec 80 and 32470 - Jan 81) still have not been published.

6. The Stan/Eval and self-inspection programs are alive and well as we received two excellents and two satisfactories in the Oct/Nov Stan/Eval Inspection.

CHAPTER III

Training

Course Listing

The present operation consists of twenty-six active resident courses and one travel team course. A listing, brief resume of each course, and its status is reflected in the following paragraphs.

Course	PDS Code	Title	Days Duration
G3ABE32430-002	PVS	Precision Measuring Equipment Spec	154
G3ABR32430-003	S9S	Precision Measuring Equipment Spec (Army 35H10/20)	179
G3ABR32430-004	Y57	Precision Measuring Equipment Spec (FAP)	89
G3ABR32430-005	Y92	Precision Measuring Equipment Spec (USA-NG)	39
G3ABR32430-006	1YA	Precision Measuring Equipment Spec (Marine)	148
G3ABR30830-001	ZRL	Space Systems Equipment Specialist - Phase I	77
G3ABR99104-001	ZPX	Systems Repair Technician	76
G3AZE32470-000	CTL	Radiac Instrument Repair and Calibration	9
G3AZR32470-005	E9D	Advanced Electrical-Electronic Measurements	20
G3AZR32470-008	L5X	Precision Dimensional and Optical Measuring Technician	30
G3AZR32470-014	ZXS	Aircraft Engine Test Stand Calibration	13
G3AZR32470-016	OB6	DOD AIMS Identification Test Set Maintenance/ Calibration	22
G3AZH32470-017	T3R	DCLF Reference Measurement and Calibration (USA MOS 35H30)	30
G3AZR32470-018/ -021/-022	UDC/ UJ4/UJ5	Microwave Measurement and Calibration	30/30/20
G3AZR32470-019/ -023/-024	MNS UJ6/UJ7	Physical Measurement and Calibration	30/20/25
G3AZR32470-020	UE4	Precise Time and Frequency Calibration System	10
G3AZR32470-025	OB7	DOD AIMS Identification Test Set Maintenance/Calibration	10
G3AZR32470-026	IMP	Advanced Electronic Maintenance/Calibration	50
G2ASR32470-006	QYQ	A/E 35U-3 Spectrometer Maintenance /Calibration	20
G2ASR32470-032	UFV	Oxygen Equipment Cleaning and Calibration	8
G2ASR32470-215	Q72	AN/ARM-135( ) Maintenance/Calibration	26
G4AST32470-174	FKK	AN/AWM-13A Test Set Maintenance	13
G2ASR32050-000	K2G	Hi-Reliability Soldering	10

COURSE DESCRIPTIONS

Basic PME Courses

G3ABR32430-002 Precision Measuring Equipment Specialist 154 days (1232 hours) PDS Code PVS

This is a basic course designed to train personnel, new to the electronics career field, on the principles of electronics and metrology. Course instruction includes the use of Air Force calibration standards to perform calibration, malfunction analysis and isolation, and repair of DC and low frequency AC electrical-electronic precision measuring equipment. Instructional design is self paced and computer managed. Instructional period is six-hours per day with two hours per day outside study.

G3ABR32430-003 Precision Measuring Equipment Specialist (Army 35H10/20) 179 days (1432 hours) PDS Code S9S

This course was developed for US Army personnel. Consists of course G3ABR32430-002 plus an additional block which deals with US Army calibration standards.

*G3ABR32430-004 Precision Measuring Equipment Specialist (FAP) 89 days (712 hours) PDS Code Y57

*G3ABR32430-005 Precision Measuring Equipment Specialist (US-ANG) 39 days (312 hours) PDS Code Y92

*G3ABR32430-006 Precision Measuring Equipment Specialist (USMC) 148 days (1105 hours) PD'S Code 1YA

*G3ABR30830-001 Space Systems Equipment Specialist - Phase I 77 days (616 hours) PDS Code ZRL

*G3ABR99194-001 Systems Repair Technician - Phase I 76 days (608 hours) PDS Code 2PX

* Courses G3abr32430-004, G3ABR32430-005, G3ABR32430-006, G3ABR30830-001 and G3ABR99104-001 were designed to meet special training needs and consist of selected portions of the G3A3R32430-002 course.

Physical/Dimensional Courses

G2ASR32470-032 Oxygen Equipment Cleaning and Calibration
8 days (64 hours) PDS Code UFV

This is an advanced course designed to train Navy personnel in oxygen cleaning, inspection and calibration systems. Instruction includes oxygen instrument calibration room operation and oxygen gage and flow meter cleaning and calibration techniques.

G3AZR32470-000 Radiac Instrument Repair and Calibration
9 days (72 hours) PDS Code CTL

This is an advanced course designed to train personnel to repair, calibrate, and certify, radiation monitoring equipment. Instruction includes atomic physics, health physics, and radiac calibration standard, pocket dosimeter, ion chamber instrument, Geiger-Mueller instrument, and scintillation instrument operation, maintenance, and/or calibration procedures. Instruction is Group Lock Step.

G3AZR32470-008 Precision Dimensional and Optical Measuring Technician 30 days (240 hours) PDS Code L5X

This is an advanced course designed to train Marine Corps and navy personnel in operation, application, and calibration of dimensional and optical equipment. Instruction includes principles of metrology and mathematical analysis of measurement methods.

G3AZR32470-014 Aircraft Engine Test Stand Calibration 13 days (104 hours) PDS Code ZXS

This is an advanced course designed to train personnel in operation, application, and calibration of aircraft engine test stands. Instruction includes jet engine principles, theory of test stand measurement systems, and calibration of turbo-prop jet engine test stands.

G3AZR32470-018 Microwave Measurement and Calibration 30 days (240 hours) PDS Code UDC

This is an advanced, DOD consolidated, course designed to train personnel in operation, application, and calibration of microwave equipment. Instruction includes advanced microwave measurements in impedance, attenuation, frequency and power using dual channel substitution systems and swept frequency methods. Instructional period is six hours per day with two hours per day outside study.

G3AZR32470-021 Microwave Measurement and Calibration 30 days (240 hours) PDS Code UJ4

This course is identical to course G3AZR32470-018 but has a different course number so as to identify Army quotas.

G3AZR32470-022 Microwave Measurement and Calibration 20 days (160 hours) PDS Code UJ5

This course is identical to course G3AZR32470-018 except that it does not contain swept frequency methods. This course number identifies Marine Corps and Navy quotas.

G3AZR32470-019 Physical Measurement and Calibration 30 days (240 hours) PDS Code MNS

This is an advanced, DOD consolidated, course designed to train personnel in operation, application, and calibration of physical/dimensional equipment. Instruction includes principles of metrology, linear and angular, temperature, force, mass and weight, density, viscosity, flow, pressure, rotary motion and

torque, humidity, combustible gas indicators, sound, and vibration measurements.

G3AZB32470-023 Physical Measurement and Calibration 20 days (160 hours) PDS Code UJ6

This course is identical to course G3AZR32470-019 except that it does not contain rotary motion and torque, humidity, gas analysis, sound, vibration and some pressure measurements. This course number is used to identify Army quotas.

G3AZR32470-024 Physical Measurement and Calibration
25 days (200 hours) PDS Code UJ7

This course is identical to course G3AZR32470-019 except that it does not contain linear and angular measurements. This course number identifies Marine Corps and Navy quotas.

Electronics Courses

G2ASH32470-006 Type A/E 35U-3 Spectrometer Maintenance/Calibration 20 days (160 hours) PDS Code QYQ

This is an advanced course designed to train personnel in operation, troubleshooting, and calibration of a fluid analysis spectrometer. Instruction includes introduction to spectrometric oil analysis program, logic symhology as related to spectrometer circuitry, related optical principles, burn and readout principles, and maintenance procedures.

G2ASR32470-215 AN/ARM-135( ) Maintenance/Calibration
26 days (208 hours) PDS Code Q72

This is an advanced course designed to train personnel in the operation of the AN/ARM-135( ) TACAN Test Set, theory of operation, circuit analysis, troubleshooting to the smallest replaceable component/assembly and calibration of the test set, principles of TACAN, solid state devices, operational amplifiers, numbering systems, logic circuits, and equipment/personnel safety practices.

G3AZR32470-005 Advanced Electrical-Electronic Measurements 20 days (160 hours) PDS Code E9D

This is an advanced course designed to train Marine Corps and Navy personnel in operation, application, and calibration of precision electrical-electronic equipment. Instruction includes principles of metrology and mathematical analysis of measurement methods.

G3AZR32470-016 DOD AIMS Identification Test Set Maintenance/Calibration 22 days (176 hours) PDS Code OB6

This is an advanced course designed to train personnel in troubleshooting, repair, and calibration of IFF test sets. Instruction includes solid; state

principles, numbering systems and logic devices, fundamental IFF theory, TACAN fundamentals, and maintenance and calibration of related test sets.

G3AZE32470-017 DCLF Reference Measurement and Calibration (USA MOS 35H30)
30 days (240 hours) PDS Code T3R

This is an advanced course designed to train Army personnel in measurement methods, and calibration and repair of standards. Instruction includes principles of metrology, theory of operation, circuit analysis, and systematic troubleshooting and malfunction isolation techniques on selected Army calibration standards and equipment.

G3AZR3-2470-020 Precise Time and Frequency Calibration System 10
days (80 hours) PDS Code UE4

This is an advanced course designed to train personnel in theory, operation, use and calibration of precise time and frequency calibration equipment. Instruction includes theory of precise time, time interval and frequency measurements, time transfer techniques, and calibration of precise time and frequency console.

G3AZR32470-025 DOD AIMS Altitude/Reporting Instruments Maintenance/Calibration
10 days (30 hours) PDS Code OB7

This .is an advanced course designed to train personnel in troubleshooting, repair and calibration of temperature-pressure and altitude reporting test sets. Instruction includes operation of solid state devices and operational amplifiers, altitude and airspeed principles, logic symbology, and test set maintenance and calibration procedures.

G3AZR32470-026 Advanced Electronic Maintenance/Calibration 50
days (400 hours) PDS Code IMP

This is an advanced course designed to train personnel in theory, operation, application, maintenance and calibration of advanced electronic precision measuring equipment. Instruction includes digital and solid state logic circuit analysis, microelectronic circuit troubleshooting, microprocessor basics, repair, and calibration- techniques. Instruction is Group Lock Step for blocks I and II (electronics theory) and self-paced for blocks III and IV (equipment).

Additional

G2ASR32050-000 Hi-Reliability Soldering and Electronic Repair Techniques

The instructional design for this course is Programmed Self-Instruction. The course provides training for Air Force instructor and maintenance personnel in the skills and knowledges necessary to perform as technicians in the repair of microelectronics equipment. Training will include conduction and resistive soldering, connector pin connections, printed circuit board preparation and conduction soldering, terminal swaging to .printed circuit boards and installation and removal of microminiature devices from printed circuit boards.

Except as listed, the instructional design of the courses is group lock step and operates on an eight-hour classroom day.

Air Force safety regulations require that eyeglasses, when required, must have nonconductive frames. Also, jewelry such as rings, watches, or bracelets may not be worn during classroom hours.

Attendees of the 32470 XXX courses must have attended course G3ABR32430-002 or have an equivalent background.

All course quotas are controlled by HQ ATC/TTPP.

CHAPTER IV

Facilities and Energy Conservation

Facilities

The Metrology Training Branch is housed in building 1433, 1308 and top floor of 905. The basic course and Physical/Dimensional section, Admin, TDS, Supply, and Liaison are located in 1433. The Electronics courses are in 1308 and the Supplemental courses are in 905.

Energy

The energy conservation programs, e.g., minimal lighting in non-academic areas, conducted in this branch, have had no adverse impact on training.

CHAPTER V

Key Personnel and Additional Duty Listing

Key Personnel

Branch Chief	Major Olson
TDS Chief	Mr. Rhine
CDC Writers	MSgt Yarbrough MSgt Biesecker
Basic Course Supervisor	MSgt Wise
Supplemental Supervisor	MSgt Shuman
Physical/Dimensional Supervisor	GySgt Higgens
Electronics Supervisor	MSgt Partirdge
Administrative NCO	SSgt Birdashaw
US Army Liaison	CW02 Taylor MSgt Taylor
US Marine Liaison	MSgt White
US Navy Liaison	ETCM Younkins IMC Devers

Additional Duty Listing

Branch APE Monitor	SSgt Birdashow/Bldg 1433
Alternate	SrA Balajadia/Bldg 1433
Branch Safety NCO	TSgt Stunson/Bldg 1433
Alternate	MSgt LaPorte/Bldg 1433
Branch Safety' NCO	SSgt Rail/Bldg 1308
Alternate	SSgt. Hillen/Bldg 1308
Branch Critique Monitor	SGM Fuller/Bldg 1433
Branch Disaster Preparedness Mon	TSgt Anderson, K./Bldg 1433
Branch Security Manager	TSgt Russell/Bldg 1433
Branch Self-Inspection Monitor	Mr. Rhine/Bldg 1433
Alternate	GySgt Higgens/Bldg 1433
	MSgt Wise/Bldg 1433
	MSgt partridge/Bldg 1308
	SFC Persing/Bldg 905
Branch Maintenance Coordinator	SSgt Gregg/Bldg 1433
Alternate	MSgt LaPorte/Bldg 1433
Branch Scorecard Monitor	MSgt LaPorte/Bldg 1433
Alternate	Sgt Patterson/31d| 1433
Building Custodian (1433)	MSgt LaPorte/Bldg 1433
Alternate	SSgt Gregg/Bldg 1433
Building Custodian (1308)	MSgt Partridge/Bldg 1308
Alternate	MSgt Rath/Bldg 1308
Building Custodian (905)	SFC Persing/Bldg 905
Alternate	SFC Licht/Bldg 905
Conservation Monitor (1433)	Mr. Kair/Bldg 1433
Alternate	MSgt Lancaster/Bldg 1433
Conservation Monitor(1308)	MSgt Lemoi/Bldg 1308
Alternate	TSgt Johnson/Bldg 1308
Conservation Monitor(905)	SFC Persing/Bldg 905
Alternate	SFC Licht/Bldg 905
Publications Monitor	A1C Clevenger/Bldg 1433
Alternate	SrA Balajadia/Bldg 1433
Forms Monitor	A1C Clevenger/Bldg 1433
Alternate	SrA Balajadia/Bldg 1433

Shelter Workers Alternate	TSgt .Anderson, K./Bldg 1433 A1C Northey/Bldg 1433 SSgt Duffey/Bldg 1433 Sgt Romero/Bldg 1433 SSgt Bauman/Bldg 1308 Sgt Rash/Bldg 1308
Branch OJT Monitor	SSgt Johnson, P./Bldg 1308
Branch TO Monitor Alternate	SrA Balajadia/Bldg 1433 A1C Clevenger/Bldg 1433
Unit Career Advisor (3452 SCHS & Branch)	MSgt Partridge/Bldg 1308
Branch Recognition Program	SGM Fuller/Bldg 1433
Center Enlisted Advisory Council Representative	Sgt Fogle/Bldg 1433
Branch Suggestion Monitor	Mr. Rhine/Bldg 1433
Branch Audiovisual Monitor Alternate	MSgt LaPorte/Bldg 1433 SSgt Gregg/Bldg 1433
Branch Inservice Training Coordinator	Mr. Rhine/Bldg 1433
Branch CPR Instructors	SFC Harrington/Bldg 905 SSgt Hummel/Bldg 1433 GySgt Schaefer/Bldg 1433 Sgt Luedtka/Bldg 1308 ET1 Prewitt/Bldg 905
Branch WPC Priority Approving Authorities	Major Olson/Bldg 1433 SGM Fuller/Bldg 1433 Mr. Rhine/Bldg 1433 SSgt Birdashaw/Bldg 1433
Branch Control Center Workers	Major Olson/Bldg 1433 SGM Fuller/Bldg 1433 MSgt Wise/Bldg 1433
Branch TDY Monitor	Mr. Rhine/Bldg 1433
Branch Faculty Advisory Council Members	Mr. Janssen/Bldg 1433 TSgt Lemio/BIdg 1308 SP5 King/Bldg 1433
Branch Public Affairs Branch	SP5 Coff/Bldg 1433
Income Tax Advisors	SSgt Anderson K./Bldg 1433 ET1 Sproull/Bldg 905

Branch PFMB Funds Monitor	MSgt LaPorte/Bldg 1433
Branch Supply Individual Equipment Monitor	MSgt LaPorte/Bldg 1433
Branch Fire Warden	MSgt LaPorte/Bldg 1433 MSgt Partridge/Bldg 1308 MSgt Rath/Bldg 1308
Branch TV Equipment Maintenance Monitor Alternate	MSgt LaPorte/Bldg 1433 SSgt Gregg/Bldg 1433
Fraud, Waste, and Abuse Monitor Alternate	MSgt LaPorte/Bldg 1433 Mr. Rhine/Bldg 1433

CHAPTER VI

Students

Course	Graduates
G3ABR32430-002	181
G3ABR32430-003	79
G3ABR32430-004	12
Q3ABR32430-005	3
G3ABR32430-006	27
G3AZR32470-000	38
G3AZR32470-005	141
G3AZR32470-008	37
G3AZR32470-014	12
G3AZR32470-016	47
G3AZR32470-017	24
G3AZR32470-018/-021/-022	44/21/118
G3AZR32470-019/-023/-024	38/21/31
G3AZR32470-020	11
G3AZR32470-025	49
G3AZR32470-026	51
G2ASR32470-006	28
G2ASR32470-032	21
G2ASR32470-215	17
G4AST32470-174	11
G2ASR32050-000	11
TOTAL	1073

CHAPTER VII

Important Visitors

1. The Branch averages between 2 and 3 tours per week. These tours usually are high-ranking foreign government officials/military, American educators and some industry people and scientists.

2. Notable visitors during this period were:

9 Brazilian Officers
6 Taiwan Scientists
Col Robert F. Broadman - Asst DCS/TT
3 Yemen Air Force Officers
BLTMS Team
LtCol G. E. Markham - Chief ATC/TTX
Capt Rodriguez - Air Staff ATC Representative - Pentagon
Mr. McKnight (GS-15) - Director, AGMC

CHAPTER VIII

Miscellaneous

TDYs

a. 32 days - 1 MSgt participated in WAPS Test Rewrite - USAF Occupational Measurement Center - 13 Jul - 14 Aug 81 - at Randolph AFB, TX.

b. 5 days - 1 SSgt to attend the Fluid Analysis Spectrometer Seminar -5-9 Oct 81 at Baird Corporation, Bedford, Mass.

c. 4 days - QIC and TDS Chief to AGMC, Newark AFS, OH. 14 - 17 Oct 81.

d. 3 weeks - 1 SSgt to attend training program as a Radiological Protection Officer (RPO), 20 Oct - 11 Nov 81 at Ft McClellan, AL.

e. 3 days - 1 TSgt and 1 SSgt to attend factory training on the Micro-Tel 1295 Measurement Receiver Set, 16 - 18 Nov 81 to Micro-Tel Corporation, Baltimore, Maryland.

POM Initiatives

Originally there were 7 POM initiatives submitted from this branch. After reworking and evaluating them three were eliminated and we now have four solid initiatives. The are:

1. Software/Media Writers (Technical)
2. Modification/Extension of Bldg 1433
3. Computer Based Training and Management System
4. Laser/Fiber Optics Calibration Course

CHAPTER IX

Awards and Firsts

Awards

Instructor of the Quarter - SSgt J. E. Bass
SSgt D. Anderson
SSgt W. J. Claude

Promotions

Air Force

MSgt David Bailey
MSgt Donald Biesecker
MSgt David P. LaPorte
SSgt Girard J. Fogle
SSgt Marvin Moomau
Sgt Robert McCall
SSgt Mark A. Wiley
Sgt Jay R. Anderson
Sgt Paul J. Schmitt
SSgt Eugene Krizovsky
A1C Ronnie Jarriel
A1C Michael Mello
A1C Janice L. Poff
A1C Ronald D. Liggins
A1C James A. Drabiszczak
A1C Michael P. Snyder

Army

CW2 Fred L. Taylor
SFC Larry Williams
SP5 Jo Ann Beatty

Navy

IM2 Clayton C. Jedrey
IMC Martin D. Mattson
IMC D. L. Devers

Marines

MSgt David C. White
SSgt Thomas E. Hummel
SSgt Arthur L. Hazen

1982

Branch Level Training Management System

Lowry officials continued to work toward implementation of BLTMS throughout 1982. BLTMS, a computerized management system, was intended for eventual installation at all training branches at Lowry, Chanute, Sheppard, Keesler, Lackland, and Goodfellow Air Force bases during 1984. BLTMS was designed to support branch level information management at the six technical training centers to decrease administrative and give instructors more time for student contact and lesson plan development. BLTMS planners devised the system to automate many branch management actions in the areas of student management, instructor management, test scoring/analysis, course/class management, graduate evaluation and to provide inquiry capability against the data base. Because of the decreasing availability of experienced personnel to serve as instructors, the difficulty experienced recently in acquiring training equipment, and the rapid changes expected in course material, BLTMS designers projected that the system would enter the area of Computer Assisted Instruction (CAD in the 1985-1987 period. However, they quickly pointed out that this did not mean a return to self-paced instruction.

HQ ATC officials studied the information provided them by Captain John M. Sather, Chief of the LTTC Data Base Management Section, on 31 December as discussed in the 1981 LTTC History. By April, the HQ ATC BLTMS Working Group had prepared a draft BLTMS Data Project Plan (DPP) and distributed it to the technical training centers for comments. HQ ATC again evaluated the responses received from each center and drafted the BLTMS Functional Description (FD). LTTC received its copy of the FD in June 1982. The Data Base Management Section, Training Evaluation Division, Faculty Development Division, Registrar Branch, and all training branches reviewed the FD and submitted a consolidated critique to HQ ATC the following month. During the summer of 1982, most of the technical training centers proposed to HQ ATC that their center be the lead center for BLTMS. However, HQ ATC preferred to establish a lead test branch at each of the centers to "provide visibility at each site and an opportunity to identify center unique considerations." In August LTTC responded with a prioritized list of training branches for BLTMS implementation with the Metrology Branch (3450 TCHTG/TTMYM) tabbed as the lead branch at Lowry. Throughout the remainder of the year, HQ ATC reviewed the comments of the draft FD and prepared the System Specifications for release in 1983. At the close of 1982, Captain Sather expected lead branch equipment to be installed at Lowry in September 1983.

TYPE 2 AND TYPE 3 RESIDENT COURSES AND GRADUATES FY 1982

COURSE	TITLE	ACAD F	DAYS S	GRADUATES PROJ	GRADUATES ACTUAL
2ASR32050	Hi-Reliability Soldering/Elec Repair Tech		10	39	35
2ASR32470-006	AE35U-3 Spectrometer Maint/Cal		20	59	49
2ASR32470-032	Oxygen Equip Cleaning & Calib		8	72	61
2ASR32470-215	ANARM-135 Maint/Calib		26	41	33
3ABR30830-001	Space System Equipment Spec	63	89	67	41
3ABR32430-002	Precision Measuring Equip Spec		154	545	415
3ABR32430-003	Precision Measurement Equipment Specialist (Army)		167	235	221
3ABR32430-004	Precision Measurement Equipment Specialist (FAP)		89	24	26
3ABR32430-005	Precision Measurement Equipment Specialist (USA-ANG)		39	14	4
3ABR32430-006	Precision Measurement Equipment Specialist (Marines)		148	111	71
3ABR99104-001	Systems Repair Technician	76	108	14	18
3AZR32470-000	Radiac Instrument Repair & Calib		9	105	85
3AZR32470-005	Advanced Electrical-Electronic Measurements		20	279	273
3AZR32470-008	Precision Dimensional and Optical Measuring Technician		30	85	66
3AZR32470-014	Aircraft Engine Test Stand Calibration		13	59	39
3AZH32470-016	DOD AIMS Identification Test Set Maint/Calibration		22	118	84
3AZR32470-017	DCLF Ref Measurement/Calibration		30	78	63
3AZR32470-018	Microwave Measurement & Calibration		30	138	119
3AZR32470-019	Physical Measurement and Cal		30	111	97
3AZR32470-020	Precise Time and Freq Cal System		10	40	35
3AZR32470-021	Microwave Measurement & Calibration (Army)		30	66	65
3AZR32470-022	Microwave Measurement & Calibration (Navy)		20	282	253
3AZR32470-023	Physical Measurement & Calibration (Army)		20	67	69
3AZR32470-024	Physical Measurement & Calibration (Navy)		25	79	61
3AZR32470-025	DOD Aims Altitude Reporting Maint/Cal		10	103	80
3AZR32470-026	Advanced Electronic Maint/Calibration		50	193	149

TYPE 1, 4, 5 OFF-BASE COURSES AND GRADUATES

COURSE	TITLE	ACAD	DAYS	GRADUATES PROJ	GRADUATES ACTUAL
1ASC32470-255	Testaid/Fast Race Programming		10	3	3

3450th Technical Training Group
Metrology Training Branch

1 January - 30 June 1982

Prepared by
Keith W. Rhine, GM-13

JOHN W. DOUGLAS, Colonel, USAF
Commander
3450th Technical Training Group

TABLE OF CONTENTS

CHAPTER I
Mission and Resources

Mission

Conduct assigned resident and travel team training for DOD personnel in accordance with established policy and directives.

Personnel Resources

The Branch is authorized 193 instructor personnel, 17 overhead personnel for Administration, Training Development Section (TDS), and Supply (Requirements Section). Also there are four liaison authorizations - two U.S. Army, one U.S. Navy, and one U.S. Marine.

On board for the period of this report were 211 instructors. Overhead and liaison is 100%.

Budget (Supply)

The Metrology Training Branch exhausted its allocated budget for Fiscal Year 1981. The Branch was allocated $43,000 for Fiscal Year 1982 1st, 2nd, and 3rd quarters.

Expenditures

1st.-2nd, and 3rd quarters FY82 $47,310.12.

CHAPTER II

New Plans, Programs, and Procedures

1. The basic PME Course is undergoing a major revision due to the new STS.

2. The Radiac Course is undergoing a major revision.

3. The Microwave Course is undergoing a major revision.

4. The Oxygen Equipment Cleaning and Calibration Course is undergoing a major revision.

5. The Physical Measurement and Calibration Courses are undergoing revisions.

CHAPTER III

Training

Course Descriptions

Basic PME Courses

G3ABR32430-002 Precision Measuring Equipment Specialist 154 days (1232 Hours) PDS Code PVS

This is a basic course designed to train personnel, new to the electronics career field, on the principles of electronics and metrology. Course instruction includes the use of Air Force Calibration standards to perform calibration, malfunction analysis and isolation, and repair of DC and low frequency AC electrical-electronic precision measuring equipment. Instructional design is self-paced and group-paced. Instructional period is six-hours per day with two-hours per day outside study.

G3ABR32430-003 Precision Measuring Equipment Specialist (Army 35H10/20) 179 days (1432 Hours) PDS Code S9S

This course was developed for US Army personnel. Consists of course Q3ABR32430-002 plus an additional block which deals with US Army calibration standards.

G3ABR32430-004 Precision Measuring Equipment Specialist (FAP) 89 days (712 Hours) PDS Code Y57

* G3ABR32430-005 Precision Measuring Equipment Specialist (USANQ) 39 days (312 Hours) PDS Code Y92

* G3ABR32430-006 Precision Measuring Equipment Specialist (USMC) 148 days (616 Hours) PDS Code 1YA

* G3ABR30830-001 Space Systems Equipment Specialist - Phase I 77 days (616 Hours) PDS Code ZRL

* G3ABR99104-001, Systems Repair Technician - Phase I 76 days (608 Hours) PDS Code ZPX

* Courses were designed to meet special training needs and consist of selected portions of the G3ABR32430-002 course.

Physical/Dimensional Courses

G3AZR32470-032 Oxygen Equipment Cleaning and Calibration 8 days (64 Hours) PDS Code UFV

This is an advanced course designed to train Navy personnel in oxygen cleaning, inspection and calibration systems. Instruction includes oxygen instrument calibration room operation and oxygen gage and flow meter cleaning and calibration techniques.

G3AZR32470-000 Radiac Instrument Repair and Calibration
9 days (72 hours) PDS Code CTL

This is an advanced course designed to train personnel to repair, calibrate, and certify, radiation monitoring equipment. Instruction includes atomic physics, health physics, and radiac calibration standard, pocket dosimeter, ion chamber instrument, Geiger-Mueller instrument, and scintillation instrument operation, maintenance, and/or calibration procedures. Instruction is Group Lock Step.

G3AZR32470-008 Precision Dimensional and Optical Measuring Technician 30 days
(240 Hours) PDS Code L5X

This is an advanced course designed to train Marine Corps and Navy personnel in operation, application, and calibration of dimensional and optical equipment. Instruction includes principles of metrology and mathematical analysis of measurement methods.

G3AZR32470-014 Aircraft Engine Test Stand Calibration 13 days (104
Hours) PDS Code ZXS

This is an advanced course designed to train personnel in operation, application, and calibration of aircraft engine test stands. Instruction includes jet engine principles, theory of test stand measurement systems, and calibration of turbo-prop jet engine test stands.

G3AZR32470-019 Physical Measurement and Calibration 30 days
(160 Hours) PDS Code MNS

This is an advanced, DOD consolidated, course designed to train personnel in operation, application, and calibration of physical/dimensional equipment. Instruction includes principles of metrology, linear and angular, temperature, force, mass and weight, density, viscosity, flow, pressure, rotary motion and torque, humidity, combustible gas indicators, sound, and vibration measurements.

G3AZR32470-023 Physical Measurement and Calibration (Army) 20 days
(160 Hours) PDS Code UJ6

This course is identical to course G3AZR32470-019 except that it does not contain rotary motion and torque, humidity, gas analysis, sound, vibration and some pressure measurements. This course number is used to identify Army quotas.

G3AZR32470-024 Physical Measurement and Calibration (Navy) 25 days
(200 Hours) PDS Code UJ7

This course is identical to course G3AZr32470-019 except that it does not contain linear and angular measurements. This course number identifies Marine and Navy quotas.

Supplemental Courses

Supplemental Courses

G3A2R32470-005 Advanced Electrical-Electronic Measurements 20 days (160 Hours) PDS Code E9D

This is an advanced course designed to train Marine Corps and Navy personnel in operation, application, and calibration of precision electrical-electronic equipment. Instruction includes principles of metrology and mathematical analysis of measurement methods.

G3AZR32470-017 DCLF Reference Measurement and Calibration (USA MOS 35H30) 30 days (240 Hours) PDS Code T3R

This is an advanced course designed to train Army personnel in measurement methods, and calibration and repair of standards. Instruction includes principles of metrology, theory of operation, circuit analysis, and systematic troubleshooting and malfunction isolation techniques on selected Army calibration standards and equipment.

G3AZR32470-018 Microwave Measurement and Calibration 30 days (240 Hours) PDS Code UDC

This is an advanced, DOD consolidated, course designed to train personnel in operation, application, and calibration of microwave equipment. Instruction includes advanced microwave measurements in impedance, attenuation, frequency and power using dual channel substitution systems and swept frequency methods. Instructional period is six-hours per-day with two-hours per-day outside study.

G3AZR32470-021 Microwave Measurement and Calibration (Army) 30 days (240 Hours) PDS Code UJ4

This course is identical to course G3AZH32470-018 but has a different course number so as to identify Army quotas.

G3AZR32470-022 Microwave Measurement and Calibration (Navy) 20 days (160 Hours) PDS Code UJ5

This course is identical to course G3AZR32470-018 except that it does not contain swept frequency methods. This course number identifies Marine Corps and Navy quotas.

Electronics courses

G2ASR32470-006 Type A/E 35U-3 Spectrometer Maintenance/Calibration 20 days (160 Hours) PDS Code QYQ

This is an advanced course designed to train personnel in operation, troubleshooting, and calibration of a fluid analysis spectrometer. Instruction includes introduction to spectrometric oil analysis program, logic symbology as related to spectrometer circuitry, related optical principles, burn and readout principles, and maintenance procedures.

G2ASR32470-215 AN/ARM-135 () Maintenance/Calibration 26 days
(208 Hours) PDS Code Q72

This is an advanced course designed to train personnel in the operation of the AN/ARM-135 () TACAN Test Set, theory of operation, circuit analysis, troubleshooting to the smallest replaceable component/assembly and calibration of the test set, principles of TACAN, solid state devices, operational amplifiers, numbering systems, logic circuits, and equipment/personnel safety practices.

G3AZR32470-016 DOD AIMS Identification Test Set Maintenance/Calibration 22 days
(176 Hours) PDS Code OB6

This is an advanced course designed to train personnel in troubleshooting, repair, and calibration of IFF test sets. Instruction includes solid state principles, numbering systems and logic devices, fundamental IFF theory, TACAN fundamentals, and maintenance and calibration of related test sets.

G3AZR32470-020 Precise Time and Frequency Calibration System 10 days
(80 Hours) PDS Code UE4

This is an advanced course designed to train personnel in theory, operation, use and calibration of precise, time and frequency calibration equipment. Instruction includes theory of precise time, time interval and frequency measurements, time transfer techniques, and calibration of precise time and frequency console.

G3AZR32470 025 DOD AIMS Altitude/Reporting Instruments Maintenance/Calibration 10 days
(80 Hours) PDS Code OB7

This is an advanced course designed to train personnel in troubleshooting, repair and calibration of temperature-pressure and altitude reporting test sets. Instruction includes operation of solid state devices and operational amplifiers, altitude and airspeed principles, logic symbology, and test set maintenance and calibration procedures.

G3AZR32470-026 Advanced Electronic Maintenance/Calibration 50 days
(400 Hours) PDS Code IMP

This is an advanced course designed to train personnel in theory, operation, application, maintenance and calibration of advanced electronic precision measuring equipment. Instruction includes digital and solid state logic circuit .analysis, microelectronic circuit troubleshooting, microprocessor basics, repair, and calibration techniques. Instruction is Group Lock Step for blocks I and II (electronics theory) and self-paced for blocks III and IV (equipment).

Additional

G2ASR32050-000 Hi-Reliability Soldering and Electronic Repair Techniques

The instructional design for this course is Programmed Self-Instruction. The course provides training for Air Force instructor and maintenance personnel in the skills and knowledges necessary to perform as technicians in the repair of microelectronics equipment. Training will include conduction and resistive soldering, connector pin connections, printed circuit board preparation and

conduction soldering, terminal swaging to printed circuit boards and installation and removal of microminiature devices from printed circuit boards.

Except as listed, the instructional design of the courses is group lock step and operates on an eight-hour classroom day.

Air Force safety regulations require that eyeglasses, when required, must have nonconductive frames. Also, jewelry such as rings, watches, or bracelets may not be worn during classroom hours.

Attendees of the 32470 XXX courses must have attended course G3ABR32430-002 or have an equivalent background.

All course quotas are controlled by HQ ATC/TTPP.

CHAPTER IV

Facilities and Energy Conservation

Facilities

The Metrology Training Branch is housed in building 1433, 1308 and top floor of 905. The basic course and Physical/Dimensional section, Admin, TDS, Supply, and Liaison are located in 1433. The Electronics courses are in 1308 and the Supplemental courses are in 905.

Energy

The energy conservation programs, e.g., minimal lighting in non-academic areas, conducted in this branch, have had no adverse impact on training.

CHAPTER V

Key Personnel and Additional Duty Listing

Key Personnel

Branch Chief	Major Olson
TDS Chief	GM-13 Rhine
CDC Writers	MSgt Yarbrough MSgt Biesecker MSgt Smith
Basic Course Supervisor	MSgt Wise
Supplemental Supervisor	MSgt Shuman
Physical/Dimensional Supervisor	GySgt Higgins
Electronics Supervisor	MSgt Partridge
Administrative NCO	SSgt Birdashaw
US Army Liaison	CW02 Taylor MSQ Taylor
US Marine Liaison	GySgt Schaefer
US Navy Liaison	ETCM Montgomery

Additional Duty Listing

Branch APR Monitor	SSgt Birdashow/1433
Alternate	A1C Clevenger/1433
Branch Safety NCO	TSgt Stunson/1433
Alternate	MSgt LaPorte/1433
Branch Safety NCO	SSgt Rail/1308
Alternate	SSgt Hillen/1308
	SSgt Whalum/905
Branch Critique Monitor	SGM Fuller/1433
Branch Disaster Preparedness Monitor	TSgt Anderson/1433
Branch Security Manager	TSgt Russell/1433
Branch Self-Inspection Monitor	Mr. Rhine/1433
Alternate	GySgt Higgins/1433
	MSgt Wise/1433
	MSgt Aultz/1308
	Mr. Johnson/905
Branch Maintenance Coordinator	SSgt Gregg/1433
Alternate	MSgt LaPorte/1433
Branch Scorecard Monitor	MSgt LaPorte/1433
Alternate	Sgt Patterson/1433
Branch Tool Monitor	MSgt LaPorte/1433
Alternate	Sgt Patterson/1433
Building Custodian (1433)	MSgt LaPorte/1433
Alternate	SSgt Gregg/1433
Building Custodian (1308)	MSgt Aultz/1433
Alternate	TSgt Johnson/1433
Conservation Monitor (1433)	Mr. Kair/1433
Alternate	MSgt Lancaster/1433
Conservation Monitor (1308)	MSgt Lemoi/1308
Alternate	TSgt Johnson/1308
Conservation Monitor (905)	Mr. Johnson/905
Publications Monitor	SSgt Birdashaw/1433
Alternate	A1C Clevenger/1433
Forms. Monitor	A1C Clevenger/1433
Alternate	SrA Balajadia/1433

Shelter Workers Alternate	TSgt Anderson/1433 A1C Northey/1433 SSgt Duffey/1433 Sgt Romero/1433 SSgt Bauman/1308 Sgt Rash/1308
Branch OJT Monitor	MSgt Reitz/1433
Branch TO Monitor Alternate	SrA Balajadia/1433 A1C Clevenger/1433
Unit Career Advisor (3452 SCHS & Branch)	MSgt LaPorte/1433
Branch Recognition Program	SGM Fuller/1433
Center Enlisted Advisory Council Representative Branch	Sgt Fogle/1433
Suggestion Monitor	Mr. Rhine/1433
Branch Audiovisual Monitor Alternate	MSgt LaPorte/1433 SSgt Gregg/1433
Branch Inservice Training Coordinator Branch	Mr. Rhine/1433
CPR Instructors	SSgt Hummel/1433 GySgt Schaefer/1433 Sgt Luedtka/1308 Etl Prewitt/905
Branch WPC Priority Approving Authorities	Major Olson/1433 SGM Fuller/1433 Mr. Rhine/1433 SSgt Birdashaw/1433
Branch Control Center Workers	Major Olson/1433 SGM Fuller/1433 MSgt Wise/1433
Branch TDY Monitor	Mr. Rhine/1433
Branch Faculty Advisory Council Members	Mr. Janssen/1433 SSgt Yager/1433 SSgt Morecroft/1308
Branch Public Affairs Branch	SP5 Coff/1433
Income Tax Advisors	TSgt Anderson/1433 ET1 Sproull/905 Mr. Cutshall/1433
Branch PFMR Funds Monitor	MSgt LaPorte/1433

Branch Supply Individual Equipment Monitor	MSgt LaPorte/1433
Branch Fire Warden	MSgt LaPorte/1433 MSgt Aultz/1308
Branch TV Equipment Maintenance Monitor	MSgt LaPorte/1433
Alternate	SSgt Gregg/1433
Fraud, Waste and Abuse Monitor	MSgt LaPorte/1433
Alternate	Mr. Bhine/1433

CHAPTEB VI

Students Graduated

COURSE		GRADUATES
002		
G3ABR32430-	002	206
G3ABR32430-	003	96
G3ABR32430-	004	8
G3ABR32430-	005	2
G3ABR32430-	006	41
G3AZR32470-	000	45
G3AZR32470-	005	100
G3AZR32470-	008	34
G3AZR32470-	014	23
G3AZR32470-	016	45
G3AZR32470-	017	27
G3AZR32470-	018/021/022	49/27/98
G3AZR32470-	019/023/024	50/28/26
G3AZR32470-	020	22
G3AZR32470-	025	48
G3AZR32470-	026	79
G2ASR32470-	006	24
G2ASR32470-	032	36
G2ASR32470-	215	16
G2ASR32050-	000	20
TOTAL		1150

CHAPTER VII

Miscellaneous

TDYs

a. 5 days - one USN (E-7) participated in a conference on oxygen gage cleaning/certification. (Kelly AFB, TX)

b. 13 days - one USAF (E-7) participated in SKT rewrite, 324X0. (Randolph AFB, TX)

c. 10 days - two USAF (E-7) participated in the Initial Operational Test & Evaluation (IOT&E) on F-15/F-16 AN/ALE-40/45 Countermeasures Dispenser (CMD) and Amplifier Detector Automated Test System (ADATS). (Eglin AFB, FL)

d. 5 days - one USAF (E-5) participated in a conference to determine Radiac Standards and Calibration procedures for the AN/PDR-56. (Newark AFS, OH)

e. 5 days - one USAF civilian (GM-13) and one USAF (E-7) to attend a MAJCOM PMEL functional area managers conference. (Newark AFS, OH)

f. 1 day - one USAF civilian (GS-9) to provide technical assistance to F.E. Warren AFB, WY.

POM Initiatives

1. Software/Media Writers (Technical)
2. Modification/Extension of Bldg 1433
3. Computer Based Training and Management System
4. Laser/Fiber Optics Calibration Course
5. F-15/F-16 Type IV Lab Course

CHAPTER VIII
Awards or Firsts

Awards

Instructor of the Quarter - TSgt Kirk T. Anderson
SSgt Chris H. Christensen
Sgt Michael G. Lasswell
Amn Michael P. Snyder
SrA Eugenio Bonano

Promotions

Air Force

TSgt Griffith, Michael

TSgt Lasswell, Michael

TSgt Hillen, Daniel

TSgt Frazer, Fred

SSgt Rash, Margaret

SSgt Romero, John

SSgt Brake, Raymond

SrA Poole, David

SrA Haugh, Steven

Navy

None

Army

SFC Collier, Alfred

SFC Brubaker, Thomas

SFC Deyo, Michael

SFC Chlarson, Harvey

SFC Pruitt, Joseph

Marine

W01 Ballard, Craig

SSgt Wolfe, Raymond

SSgt Bovier, Phillip

3450TH TECHHICAL TRAINING GROUP

METROLOGY TRAINING BRANCH

1 July - 31 December 1982

Prepared by

KEITH W. RHINE, GM-13

OVERVIEW

The mission of this branch is to develop and conduct assigned resident and travel team training courses for Department of Defense personnel. The Metrology Training Branch accomplishes this mission with a staff of 230 plus highly qualified personnel from all branches of the military services. During the reporting period the branch had an average daily student load of 800 people attending 25 resident courses. Training is conducted on 4 instructional shifts in three separate buildings. Some of the problem areas identified are getting and retaining highly qualified technical staff, shortage of suitable facilities, obtaining and supporting the equipment required to support these training programs. In addition to those problems cited- we experience continuous course development and logistical support problems. POM initiatives, command level visibility and constant attention will correct most of the problems cited. The branch is conducting its assigned mission.

TABLE OF CONTENTS

A. NEW PLANS AND PROGRAMS

1. The basic Precision Measurement Equipment (PME) Specialist Course underwent major revision and was implemented on 6 July 1982.

2. The Radiac Course underwent a major revision and was implemented in August 1982.

3. The Oxygen Equipment Cleaning and Calibration Course underwent a major revision and was implemented in August 1982.

4. The Physical Measurement and Calibration Courses underwent revisions and were implemented on October 1982.

5. The fundamentals portion is to be consolidated with the new electronic principles training program. This will consist of 8 of the 15 blocks of training now conducted in the G3ABR32430-002, 003, 005, and 006 course.

6. The Metrology Training Branch hosted an All Command Conference with the major air command Precision Measuring Equipment coordinators represented. Purpose of conference was to rewrite AFM 39-1, specialty Description for the Precision Measuring Equipment AFSC.

7. The Metrology Training Branch has been selected as the lead branch for implementation of Branch Level Training Management System (BLTMS).

8. The Metrology Training Branch has been directed to develop a Data Automation Requirement (DAR) for Computer Assisted Instruction (CAD. CAI is to be phase II of BLTMS.

9. The Metrology Training Branch conducts training in three buildings; 1433, 1308, and the second floor of 905. A new facility has been approved for FY 84. Facility will be approximately 40,000 square feet and located adjacent to building 1433.

B. AWARDS OR 'FIRSTS'

1. Awards

Name	Grade	Award
Robert C. Lancaster	MSgt	Air Force Commendation Medal
Willard Scherer	SP6	Army Commendation Medal
Richard L. Checketts	SSgt	Air Force Commendation Medal
Richard A. Schaeffer	GySgt	Meritorious Service Medal
Dean E. Partridge	MSgt	Meritorious Service Medal
Don Peterson	SP5	Instructor of the Quarter
Kirk Anderson	TSgt	Instructor of the Quarter

2. Promotions

Name	Promoted Grade	Branch of Service
Ronald D. Liggins	Sgt	Air Force
Keith D. Weedin	Sgt	Air Force
Debra K. Clevenge	SrA	Air Force
Eric A. Northey	SrA	Air Force
Keith H. Breton	Sgt	Air Force
David A. Ohnmacht	TSgt	Air Force
Bennie Milliner	MSgt	Air Force
Chester Wright	TSgt	Air Force
Thomas R. Hettenhouser	TSgt	Air Force
Robert K. McCall	TSgt	Air Force
Ronald Jarriel	SrA	Air Force
Gilbert Tafoya	SrA	Air Force
Jeff L. Williams	SrA	Air Force
Duane L. Moody	TSgt	Air Force
Terry L. Nonken	TSgt	Air Force
Michael Griffith	TSgt	Air Force
Kenneth R. Adams	SSgt	Air Force
Robert H. Odem	MSgt	Air Force
James 0. Johnson	MSgt	Air Force
Larry D. Christy	TSgt	Air Force
Wilfredo Justiniano	SrA	Air Force
Douglas Shiraishi	E-8	Army
Andrew Martin	E-8	Army
Wilbert Walston	E-8	Army
Ronald C. Lamb	E-7	Army
Joseph S. Ferguson	E-7	Army
Thomas L Brubaker	E-7	Army
Alfred L. Collier	E-7	Army
Harvey Chlarson	E-7	Army
Joseph Pruitt	E-7	Army
Jose L. Selva- Rivera	E-7	Army
David J. Lucas	E-7	Army
John D. Petersen	E-6	Army
Michael L. Sproull	E-7	Navy
Henry G. Snowden	E-6	Navy
John R. Wilding	E-7	Navy
Craig S. Ballard	Warrant Officer	Marine
Norman Kair	GS-12	Civilian
Glen Hemingway	GS-12	Civilian
James Huebsch	GS-12	Civilian

C. ROSTER OF KEY PERSONNEL

Position	Name	Rank	Date Assigned
Branch Chief	Olson, Daniel K.	Major	May 1981
NCOIC	Fuller, Scotty R.	SGM	Apr 1980
Chief, TDS	Rhine, Keith W.	GM-13	Jan 1978

Intermediate Supvs:

Basic Course	Kair, Norman	GS-12	Dec 1982
Physical Dimen.	Ferguson, Louis A.	MSgt	Nov 1981
Electronics	Hemingway, Glen A.	GS-12	Dec 1982
Supplemental	Huebsch, James	GS-12	Dec 1982

D. PEOPLE (MILITARY/CIVILIAN ASSIGNED AND AUTHORIZED)

	Air Force	Army	Marines	Navy	Civilian
Authorized	103	56	18	27	26
Assigned	117	49	16	26	26

E. STUDENTS

Course	Title	Proj Grads	Actual Grads
G2ASR32050	Hi-Reliability Soldering/Elec Repair Tech	33	23
G3ABR32430-002	Precision Measuring Equip Spec	223	253
G3ABR32430-003	Precision Measurement Equipment Specialist (Army)	192	204
G3ABR32430-004	Precision Measurement Equipment Specialist (FAP)	22	18
G3ABR32430-005	Precision Measurement Equipment Specialist (USA-ANG)	3	3
G3ABR32430-006	Precision Measurement Equipment Specialist (Marines)	50	33
G3AZR32470-000	Radiac Instrument Repair & Calib	42	33
G3AZR32470-005	Advanced Electrical-Electronic Measurements	144	142
G3AZR32470-014	Aircraft Engine Test Stand Calibration	21	15
G3AZR32470-016	DOD AIMS Identification Test Set Maint/Calibration	50	37
G3AZR32470-017	DCLF Ref Measurement/Calibration (35H30)	40	27
G3AZR32470-018	Microwave Measurement & Calibration	65	58
G3AZR32470-020	Precise Time and Freq Cal System	12	9
G3AZR32470-021	Microwave Measurement & Calibration (Army)	34	19
G3AZR32470-022	Microwave Measurement & Calibration (Navy)	127	120
G3AZR32470-023	Physical Measurement & Calibration (Army)	33	42
G3AZR32470-025	DOD Aims Altitude Reporting Inst. Maint/Cal	31	24
G3AZR32470-026	Advanced Electronic Maint/Calibration	82	51
G3ASR32470-027	Oxygen Equip Cleaning & Calib	33	23
G3AZR32470-028	DOD Aims Test Set Maint and Calib	0	0
G3AZR32470-029	Precision Dimensional and Optical Measuring Technician	24	18
G3AZR32470-030	Physical Measurement & Calibration (Navy)	40	25
G3AZR32470-031	Physical Measurement and Cal	54	48
G3AZR32470-032	AE35U-3 Spectrometer Maint/Cal	32	29
G3AZR32470-033	AN/ARM-135 ( ) Maint/Calib	15	15

F. BUDGET (Supplies)

The Metrology Training Branch was allocated $70,000 at the beginning of FY 82. The chart which follows details expenditures covering the period 1 July 1982 to 31 December 1982.

Allocations		Expenditures	
4th Qtr FY 82	$22,925.27	4th Qtr FY 82	$22,925.27
1st Qtr FY 83	$13,600.00	1st Qtr FY 83	$16,241.67

G. ACQUISITION OF NEW TRAINING EQUIPMENT

Equipment: Trainers (NIDA Model 130)

Purpose: To use a base trainer to support instruction in basic electronics in the 3ABR32430-002, Precision Measuring Equipment Course.

When Delivered: One hundred twenty (120) trainers were funded during this reporting period. Sixty were received.

Evaluation: Trainers are currently under evaluation.

Branch Level Training Management System

1983 was another year of delays for the implementations of the Branch Level Training Management System (BLTMS) at Lowry. During the first four months of 1983, the Data Base Management Section, Operations Division, 3400 TCHTW, made preparations to install 89 terminals, 53 printers, and 32 optical mark readers at sites in approximately 32 buildings in addition to the main computer. Work came to a .temporary halt in May when Headquarters, United States Air Force (HQ USAF) placed BLTMS on an indefinite hold. HQ USAF took this action to allow the General Services Administration time to evaluate the BLTMS equipment acquisition procedure. The Air Staff decided to acquire the BLTMS hardware through its own fully competitive acquisition process rather than an expansion of the Worldwide Military Command and Control System. HQ ATC also prepared a new equipment installation schedule which reflected the hold put on the work. Lowry, still the lead base, was scheduled to receive the equipment in May 1984, a delay of eight months from the previously scheduled date of September 1983.

Throughout the fall of 1983, LTTC civil engineers surveyed BLTMS locations around the base in preparation for the writing of a commercial contract for the electrical installation of the equipment. In October the HQ ATC BLTMS working group met with representatives from Burroughs Corporation to determine if Burroughs equipment would satisfy BLTMS requirements. The following month the BLTMS working group received its first computer from Burroughs—a 325--to evaluate. On 2 December 1983, a BLTMS Project Status Briefing was given to key ATC staff agencies. During the meeting, a new BLTMS schedule was discussed and agreed on, which slipped the implementation date for Lowry to January 1985. The further delay was caused primarily by the ATC Microcomputer Requirements Contract. The HQ ATC Staff Judge Advocate advised the BLTMS project office that the contract must be used unless Burroughs Corporation could not meet BLTMS requirements. This necessitated a February 1984 demonstration by Burroughs. If the demonstration proved successful, an estimated 10 months of software development would follow. If unsuccessful, the equipment would have to be acquired though a competitive bid process and would result in an estimated six month delay.

Applied Electronics Program

In the early and mid-seventies, Air Force officials became concerned over the amount of resources used for formal training. In February 1976, the USAF Deputy Chief of Staff (DCS), Personnel formed a study group to examine ways to cut costs and the number of people involved in training. By March, ATC had been given 12 initiatives, of which 5 were given active consideration. One of the items called for instructing enlisted personnel to do only the specific tasks they would encounter on their first assignment. ATC developed several programs in line with this proposal. In the electronics field, ATC had already been examining proposals to revamp electronics training and the new initiative fit in with the on-going study. The result was the Hasty Spark, later changed to Bright Spark, program.

For several years prior to Bright Spark, there was an informal consensus that basic electronics students were being taught more than necessary for their first assignment. Because of the terminology used in the specialty training standard (the ATC/MAJCOM contract), ATC had a degree of latitude that allowed the course designer to provide more training, usually theory, that was actually needed. Students began their training with the study of electronics principles, which lasted for several weeks, depending on the AFSC. Upon completion of the principles course, they entered the hardware or "sets" phase of training. "Sets" trained the students on equipment the graduates maintained in the field; however, in some cases this was not practical and training was conducted on representative equipment. This approach to electronics training was considered necessary because many graduates had to troubleshoot circuits to remove and replace defective components. In 1976, a HQ ATC training manager, Mr Floyd F. Lewis, concluded that the principles portion of the training was no longer needed because of the nature of the new equipment. Much of the new equipment coming into the AF inventory at that time was designed to be maintained by the removal and replacement of line replaceable units (LRUs). The LRUs were normally a complete piece of equipment in a system, chassis, module, or card. Troubleshooting, as done with the older electronic equipment, was no longer necessary with the newer hardware. Lewis advocated moving the principles training to the "sets" courses .and only teaching the students the minimum amount of theory needed to perform specific tasks.

Originally under Bright Spark, all principles were to be taught in the appropriate "sets" courses and the principles branch was to be eliminated. However, in 1977, based on the experience at Keesler Technical Training Center (KTTC), ATC concluded that certain principles training was common to most avionics/electronics maintenance AFSCs. A 6-week Electronics Principles (EP) course was developed and implemented at LTTC in September 1978. Previously, the EP course lasted 14 weeks.

As designed, Bright Spark stressed training from the "whole-to-the-part" on the actual equipment. Basic electronics principles were taught in relation to the specific hardware the student would encounter on his first assignment. There was to be a shorter period between learning a theory and its application. Training time was to be reduced an average of 25 percent. ATC planners expected increased student motivation and lower elimination rates. AF Manual 66-1, Maintenance Documentation, data were used as the primary source of the information used to determine what EP and maintenance tasks were to be taught.

When ATC developed the Bright Spark concept, the course reductions were planned without extensive consultation with the using commands or revision of the specialty training standards. Problems began to develop with the Bright Spark Program. The poor coordination between ATC and the using commands began to produce criticism of the graduates from the field. Although Bright Spark reduced the amount of electronics theory, it did not improve the hands-on portion of the course sufficiently. A December 1977 evaluation of the program concluded that EP training was now "marginally meeting the job requirements." The report recommended changes in the Bright Spark course content be made, but without lengthening the courses. Only minor revisions were made in the Bright Spark program in the following years. LTTC continued to receive unfavorable Training Quality Reports (TQS) from the field. A 1981 TQR on recent 326XX,

Integrated Avionics Specialists, graduates indicated dissatisfaction with the quality of graduates.

> *The present level of electronics fundamentals taught at tech school for AFSC 326X6,7,8 is not sufficient to build sound logical troubleshooting abilities. A detailed knowledge of system operation is required and this can only be built upon a good basic electronic fundamentals background. . . . In my opinion, this problem can only be corrected by returning to the basics. Only by going back to much more indepth [sic] electronic fundamentals and application can we turn our 'operators' into technicians.*

A message from HQ USAFE echoed similar concerns, "The lack of understanding in basic electronics theory is a major concern in all areas of organizational — and intermediate-level avionics maintenance. The present curriculum fails to provide the technician with enough background to analyze the problem. A good understanding of basic electronics is a prerequisite for thorough comprehension of any avionics system."

Problems also arose over the failure of the Bright Spark program to teach important concepts originally part of the 14-week EP course. Topics such as introduction to computers, digital electronics, binary mathematics, radar principles, and radio principles, were not taught in either the shortened EP course or the 'sets' courses. By 1981 several course supervisors had either withdrawn their course from the Bright Spark EP course, expressed an interest in withdrawing and developing their own course, or had never been included in the original program. The munitions AFSC 404XX, Munitions Loading/Maintenance, found the EP course too detailed for their needs and developed their own EP course. The Television Maintenance AFSCs, 304XX and 316XX, were not receiving sufficient depth in the six-week course and requested the opportunity to develop their own course. The Metrology AFSCs, 308XX and 991XX, were never included in Bright Spark because the EP course was considered totally inadequate for their needs. The EP course was also plagued by problems associated with outdated and obsolete equipment.

In May 1981, the Plans and Requirements Division (now Operations Division), 3400 TCHTW, began a review of the entire Bright Spark program. Wing personnel questioned the basic validity of the Bright Spark concept and agreed to determine if all common core EP training could be conducted in one branch, if there was a need for more than one common core course, or if the inclusion of "Digital Techniques" as a common core subject would solve the EP problem. An ad hoc committee was established in June 1981 and three months later recommended to the HQ ATC Career Field Training Director that an in-depth study of EP and its users be conducted. On 31 October 1981, Colonel Swain tasked Colonel Charles W. Reed, Commander, 3450 TCHTG to accomplish the study. Meanwhile, an ATC Management Effectiveness Inspection. 20-31 July 1981, noted the fragmentation, duplication of manpower and resources, and reduced cost effectiveness of EP training in their report. At that time, three branches within the 3450 TCHTG, as well as three different TCHTGs were all teaching SP courses at LTTC.

To conduct the study, the 3450 TCHTG Commander reluctantly agreed to provide manpower to begin the investigation as an interim step while additional

manpower was requested. The added manpower did not come and the interim measure became a permanent situation. The study group began their work by collecting, collating, and analyzing the results of an Occupational Survey distributed to all Lowry users of EP training by the new group-level Instructional System Development team. The survey results showed that Bright Spark taught only 24 of the 63 areas considered essential for EP students and that the respondents wanted an additional 7 to 35 subject areas taught in EP. The survey also demonstrated that several different “levels of maintenance" emerged and when combined with the total number of subject areas required to be taught, different lengths and depths of course content became apparent to the study group. The study group developed two proposals for modifying EP training at Lowry.

The first proposal, Plan A, called for the addition of Digital Equipment Training to the six-week Bright Spark course and the acquisition of new equipment. Under Plan B, all electronic fundamentals training at Lowry would be consolidated and the Bright Spark EP course eliminated. Three courses were to be developed to satisfy the different lengths required to meet the needs of the system/equipment courses. The study group developed three levels of fundamentals—Organizational, Intermediate, and Depot — to train students in increasingly more complex electronics. In April 1982, the study group briefed Colonel Swain on their work and recommended Plan B be adopted. Plan A, although less costly to implement than Plan B, did not resolve the fragmentation and duplication problems noted by the MEI team, required more instructor positions, and did not include the areas identified by the Occupational Survey as necessary for EP training. Plan B, on the other hand, added the needed EP material to eliminate Bright Spark deficiencies, satisfied the MEI concerns over fragmentation and duplication, was designed to better meet future MAJCOM requirements, but would cost an estimated $.5 million more than Plan A. Colonel Swain gave his verbal approval to Plan B and the development of a System Training Plan (STP) to support it.

The study group from the 3450TCHTG worked feverishly over the summer to complete the STP for submission to HQ ATC. After "the group received input from all agencies on base involved with EP training, the members proposed the establishment of several EP courses based on the three-track proposal approved by Colonel Swain. LTTC submitted the STP on 6 October 1982. HQ ATC approved the STP on 14 February 1933 with only one significant revision. Lieutenant Colonel William M. Bishop, Chief, Sheppard Training Division, DCS/Technical Training, HQ ATC, recommended LTTC develop a single training plan with one course chart and identification number rather than the multiple training courses proposed by Lowry. He also suggested LTTC evaluate the possibility of moving the existing Precision Measuring Equipment Laboratory EP course into the Applied Electronics Program (AEP, the name given to the new course) facility. Lieutenant Colonel Bishop had one bit of distressing news for Lowry, “Resource funding is to be satisfied by Center realignments/trade-offs, Center POM [Program Objective Memorandum] submissions or Command fall-out funds, if available.” . . . Implementation will no doubt be incremental because of resources. Lowry's Operations Division agreed to revise the STP as requested by HQ ATC.

Lowry continued to work toward implementation of AEP during 1983. On 11 June 1983, the 3ABR32430 Precision Measuring Equipment course moved from the

Metrology Branch to the Electronic Principles Branch, 3450 TCKTQ in Bldg 905. This move added 1 Intermediate Supervisor, 3 Instructor Supervisors, and 59 Instructors to the EP Branch and was made without any loss of training. On 8 August 1983, HQ ATC authorized LTTC to begin Course Training Plan development, but with existing manpower only. But Lowry had already assembled a team of writers from each of the 3450th's branches to ensure each AFSC would receive the proper prerequisite skills in the AEP course. The course writers completed their work in October and submitted the Course Training Plan to HQ ATC in November.

The Course Training Plan called for a three-phase implementation of AEP over a one-year period. Phase I, scheduled for implementation in January 1984, included the six AFSCs requiring the complete AEP program. The course would consist of 17 blocks totaling 664 hours (83 academic days) of instruction. Phase II, scheduled for implementation in July 1984, was to last between 45 and 65 academic days and included instruction for 19 different AFSCs. The remaining 9 AFSCs comprised Phase III and would attend class for 55 days. The final phase of AEP was not scheduled to begin until April 1985. Funding was the limiting factor for total implementation of the course for all 34 AFSCs. The funding for Phase I came from base-level funds and internal realignment of resources within the 3400 TCHTW. Although a single course, AEP was essentially the three-track proposal under the umbrella of one course. AEP was designed to satisfy the requirements of 34 AFSCs and the blocks of instruction were sequenced to provide dropout points once the required proficiency levels were attained (from 55 to 83 academic days). As designed, AEP eliminated most of the Bright Spark inadequacies by teaching additional basic electronics theory and better prepared the student to troubleshoot the modern avionics systems encountered in the field.

The combination of electronic fundamentals into AEP also caused the consolidation of equipment and training aids. The NIDA 130 Test Console was being phased into the Metrology portion of the fundamentals course before consolidation and held much promise for use in AEP. The NIDA 130 was a portable electronic instrument containing three independent variable DC power supplies, AC supplies and three sets of connectors allowing for the insertion of three printed circuit cards on the top of the console. The NIDA 130 provided the student with a pre-wired AC/DC power supply system and input-output system and an in-circuit faulting system. The layout of the console provided the instructor with an "at a glance check of students” set-up and as a result he could devote more time to meaningful instruction rather than correcting interconnecting errors. The availability of fault switches enabled the instructor to fault the experiment circuits quickly and give the student realistic troubleshooting experience. The new training device replaced three outdated trainers being used in the various fundamentals classes.

3450TH TECHHICAL TRAINING GROUP

METROLOGY TRAINING BRANCH

1 JANUARY 1983 - 30 JUNE 1983

PREPARED BY

DANIEL K. OLSON, Major, USAF

SIGNIFICANT SUBJECTS

On 11 June 1983, the Basic Course was divided up with the basic blocks one through five, eight, and none going from Bldg 1433 to Bldg 905 becoming part of the Principles Branch. This move allows for all students to go through basic electronics principles before coming to the upper blocks of the Metrology school dealing with equipment calibration using primary standards.

EQUIPMENT OR TRAINING AIDS/DEVICES

A. Additions - Sixty Trainers (Nida Model 130)

B. Impact and/or results - Better and more comprehensive training plus a time savings in Blocks I-V since students no longer have to learn different trainer in each block of instruction.

AWARDS

SSgt Klinger, Raymond M.	ATC NCO Academy	Distinguished Grad
TSgt McQuaide, Dennis C.	ATC NCO Academy	Citizenship Award

PEOPLE

	Officers	Enlisted	Civilians
Authorized	1	112	26
Assigned	1	112	25

KEY PERSONNEL

Name	Tenure	Last Assignment	New Assignment
Daniel K. Olson	6 May 81	RAF Mildenhall Avionics Maint Supvr	Branch Chief Metrology Br.
Jimmy R. Ivey	13 Jul 83	CDC Writer 3460 TCHTG	TDS Chief
Maurice N. Wise	9 Jan 83	Intermediate Supr. (Basic Course)	Asst Branch Chief
James M. Huebsch	9 Jan 83	TDS Tech Writer Metrology Br.	Intermediate Supr. (Suppl Tng)
Glen E. Hemingway	9 Jan 83	TDS Tech Writer Metrology Br.	Intermediate Supr. (Special Tng)
Norman W. Kair	9 Jan 83	Instructor Supr. Metrology Br.	Intermediate Supr. (Basic Course)
Louis A. Ferguson	Aug 82	Calibration Officer Camp Lejeune, NC	Intermediate Supr. (Dimensional Tng)

The previous TDS Chief got a job assignment to Randolph AFB, Texas.

The previous Intermediate Supervisor to the Dimensional Training had a PCS assignment to camp Pendleton, California.

COURSES TAUGHT

TYPE	COURSE NUMBER	TITLE	COURSE LENGTH	GRADUATES PROJ	GRADUATES ACTUAL
3	ABR32430-002	Precision Measuring Equipment Specialist	154	198	172
3	ABR32430-003	Precision Measuring Equipment Specialist (Army)	167	130	108
3	ABR32430-004	Precision Measuring Equipment Specialist (FAP)	99	12	12
3	ABR32430-005	Precision Measuring Equipment Specialist (USA-ANG)	50.6	6	5
3	ABR32430-006	Precision Measuring Equipment Specialist (USMC)	130	56	40
3	AZR32470-000	Radiac Instrument Repair & Calib	7	35	33
3	AZR32470-005	Advanced Electrical-Electronic Measurements	20	168	166
3	AZR32470-014	Aircraft Engine Test Stand Calib	13	22	17
3	AZR32470-017	DCLF Reference Measurement & Cal	30	35	23
3	AZR32470-018	Microwave Measurement & Cal (AF)	30	76	51
3	AZR32470-021	Microwave Measurement & Cal (USA)	30	38	25
3	AZR32470-022	Microwave Measurement & Cal (USN)	20	135	112
3	AZR32470-020	Precise Time & Frequency Cal Sys	10	13	11
3	AZR32470-023	Physical Measurement & Cal (Army)	20	39	32
3	AZR32470-030	Physical Measurement & Cal (NAVY)	35	15	14
3	AZR32470-031	Physical Measurement & Cal (AF)	30	27	20
3	AZR32470-026	Advanced Electronic Maint/Calib	50	86	59
3	AZR32470-027	Oxygen Equipment Cleaning and Cal	7	43	29
3	AZR32470-028	DOD Aims Identification Test Set Maintenance/Calibration	20	44	34
3	AZR32470-029	Precision Optical Measuring Tech	20	39	32
3	AZR32470-032	Type A/E 35U-3 Spectrometer Maint	20	17	15
3	AZR32470-033	AN/ARM-135( ) Maint & Calib	26	10	10
4	AST32470-174	AN/AWM-13A Test Set Maintenance	13	14	14
2	ASR32050-000	Hi-Reliability Soldering	10	28	19

ACQUISITION OF NEW TRAINING EQUIPMENT OE AIDS

EQUIPMENT/AID	PURPOSE	WHEN DELIVERED OR ACCEPTED	FINDINGS OR EVALUATION
Trainers (Nida Model 130)	Conduct fundamentals training in the initial training course (G3ABR32430-002) Precision Measuring Equipment Specialist.	All 120 trainers were funded this reporting period. Sixty (60) of their trainers were received and put into use.	Trainers are currently under evaluation.

TYPE 2 AMD TYPE 3 RESIDENT COURSES AND GRADUATES FY 1983

COURSE	TITLE	ACAD F	DAYS S	GRADUATES PROJ	GRADUATES ACTUAL
2ASR32050-000	Hi-Reliability Soldering/Elec Repair Tech		10	49	35
2ASR32470-006	AE35U-3 Spectrometer Maint/Cal		20	16	14
2ASR32470-032	Oxygen Equip Cleaning & Calib		8	7	10
2ASR32470-215	ANARM135 Maint/Calib		26	8	8
3ABR30830-001	Space System Equipment Spec	63	89	68	87
3ABR32430-002	Precision Measuring Equipment Spec		154	558	661
3ABR32430-003	Precision Measuring Equipment Spec		167	256	228
3ABR32430-004	Precision Measurement Equipment Spec (FAP)		9	15	17
3ABR32430-005	Precision Measurement Equipment Spec (USA-ANG)		51	14	7
3ABR32430-006	Precision Measurement Equipment Spec (Marines)		130	113	83
3ABR99104-001	Systems Repair Technician	76	108	14	15
3AZR32470-000	Radiac Instrument Repair & Calibration		8	71	77
3AZR32470-005	Advanced Electrical-Electronic Measurements		20	361	330
3AZR32470-008	Precision Dimensional and Optical Measuring Technician		30	14	10
3AZR32470-014	Aircraft Engine Test Stand Calibration		13	49	13
3AZR32470-016	DOD AIMS Identification Test Set Maint /Calibration		22	8	6
3AZR32470-017	DCLF Ref Measurement/Calibration		30	78	53
3AZR32470-018	Microwave Measurement & Calibration		30	185	138
3AZR32470-019	Physical Measurement and Cal		30	30	29
3AZR32470-020	Precise Time and Freq Cal System		10	27	24
3AZR32470-021	Microwave Measurement & Calibration (Army)		30	79	45
3AZR32470-022	Microwave Measurement & Calibration (Navy)		20	294	252
3AZR32470-023	Physical Measurement & Calibration (Army)		20	81	59
3AZR32470-024	Physical Measurement & Calibration (Navy)		25	24	25
3AZR32470-026	Advanced Electronic Maint/Calibration		50	182	140
3AZR32470-027	Oxygen Equipment Cleaning & Calibration		7	100	71
3AZR32470-028	DOD Aims Ident Test Set Maint/Calib		20	98	74
3AZR32470-029	Precision Optical Measuring Tech		10	102	78
3AZR32470-030	Physical Measurement and Calibration		35	66	55
3AZR32470-031	Physical Measurement and Calibration		30	77	64
3AZR32470-032	Type AE35U-3 Spectrometer Maint/Cal		20	40	34
3AZR32470-033	ANARM135 Maintenance Calibration		26	31	25

TYPE 1, 4, 5 OFF-BASE COURSES AND GRADUATES

COURSE	TITLE				
1ASC32450-006	7906 Disc Drive Tng		5	2	2
1ASC32470-178	F-16 Nose Radome Elec-Fire Control Antenna		49	12	14
1ASC32470-267	Troubleshooting Microprocessors		4	7	7
4AST32470-174	Test Set Maint ANAWM13A		10	26	24

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Branch Level Training Management System

After months of delays, Lowry finally received its first Branch Level Training Management System (BLTMS)-equipment in 1984. BLTMS was a computerized management system designed to automate many of the branch management actions in the areas of student management, instructor management, test scoring/analysis, course/class management, graduate evaluation, and to provide inquiry capability against the data base. With the use of BLTMS, instructors would have more time to spend with students and lesson plan development. But the program had been plagued by delays almost from the beginning. At the close of 1982, Lowry officials expected the first equipment to arrive at Lowry in September 1983. By December 1983, this date had been extended to December 1984. Part of the delay during 1983 was because of the requirement to evaluate Burroughs equipment and software before going through a competitive bid process. A demonstration scheduled for 14-17 February 1984 did not take place, yet the equipment was ordered for delivery in late 1984. The Burroughs microcomputer hardware and software were judged to be adequate for BLTMS and software development began shortly thereafter.

An area of particular concern to General Usher was the addition of whole student information to the BLTMS data set. He wanted information such as: Article 15, control roster, marital status, and awards available to local commanders to better manage Students Awaiting Training Status and Ineffectives. The overall management of students under quality force initiatives would be greatly enhanced if commanders had real-time access to the student's entire profile (disciplinary as well as academic). Lieutenant Colonel Paul D. Knoke, Assistant for Plans, HQ ATC Deputy Chief of Staff (DCS)/Technical Training, forwarded the whole student information request to HQ ATC DCS/Personnel and expressed his concerns over how the information would be safeguarded to comply with the Privacy Act. HQ ATC also lacked both the whole student information itself and the resources to capture, update, and maintain the data. Lieutenant Colonel Knoke hoped to pass this task to the Deputy Chief of Staff/Personnel. The details involved with providing whole student information were evaluated at HQ ATC but no decision had been reached at the end of 1984.

In June 1984, HQ ATC announced a phased delivery schedule for the Burroughs B-25/29 equipment. The first B-25s for courseware development were scheduled for installation at Lowry in August 1984, the optical mark reader for test scoring and analysis was scheduled for November, the B-29s for updating student records were projected for delivery in January 1985, and the central B-29 for the storage of all records was scheduled for July 1986. Lowry prepared for the delivery by identifying equipment locations and electrical and communications requirements. However, funding problems delayed awarding the site preparation contract until September 1984. The work was expected to be completed 150 days following the notice to proceed.

HQ ATC approved a new equipment delivery schedule on 6 July. Fifteen B-29s, eighty-eight B-25s, fifty-three dot matrix printers, twenty-one letter

quality printers, and four graphic plotters were to be delivered in October and November. But HQ ATC also had some bad news: the software (to manage student and instructor records) and networking, together the "heart" of BLTMS, were postponed indefinitely. General Usher's reaction to this development was predictable: "YUK!" Only vendor software (the Basic programming language, a spreadsheet, a data base -management system, and word processing) and test scoring programs would be delivered with the equipment. Major General Winfield Scott Harpe, HQ ATC DCS/Technical Training, attempted to mollify the situation and notified General Usher that a significant increase in the amount of computer hardware would be delivered during Phase I. Phases II and III were delayed until suitable networking software was available, procured, tested, and implemented. But Lowry quickly recognized the shortcomings with this arrangement, "This package does show an increase in computer hardware support, but without student accounting and instructor management software we will have only limited capabilities." General Usher expressed his view to General Iosue:

> *I am, however, disappointed that the BLTMS software will not be delivered with the hardware as originally planned. As this program, and its follow-on 'MINT," hold great promise for increased efficiency in our training development process and training management, we have been eagerly awaiting its implementation at Lowry. In the interim, we will develop as many programs in-house as is possible and provide them to your staff for possible command-wide use.*

Finally, in early November, the first fifty-five B-25s arrived at Lowry followed by thirty-three B-29s. A HQ ATC Installation Team arrived in November to assist in the equipment installation. In November and December, a Mobile Training Team from Keesler TTC taught three one-week courses, designed to teach the use of the Burroughs equipment and software. Problems remained—no firm date had been set for delivery of the student accounting and networking software. Lowry simply owned a number of microcomputers that could not do much of the work originally envisioned and could not "talk" to each other. The hardware was used primarily as word processors for lesson plans and similar work. A few resourceful Lowryites worked with the vendor-supplied software to develop local programs, but the equipment was still not used to its potential.

Applied Electronics Program

The 1983 LTTC History described the background to the decision to revamp Electronic Principles (EP) training at Lowry and implement the new Applied Electronics Principles (AEP) in place of the Bright Spark program. The Bright Spark program was developed in 1976 in an attempt to reduce the amount of electronics theory taught to basic electronics students. Under the Bright Spark program, basic electronics principles were taught in relation to the specific hardware the student would encounter on his first assignment with a shorter period between learning a theory and its application. However, LTTC began to receive negative feedback from the using commands on the quality of its graduates. This came at a time of increasing fragmentation of EP training at the Center. Certain fundamental concepts, such as introduction to computers, digital electronics, and radio principles were not being taught and caused several course supervisors to withdraw their courses from the Bright Spark EP course. By 1981, three branches within the 3450 TCHTG, as well as three different TCHTGs, were teaching some type of EP course at Lowry.

The 3450 TCHTQ began an extensive study to determine the basic validity of EP training under the Bright Spark concept. The study found Bright Spark woefully inadequate and recommended a major overhaul of the program. In April 1982, Colonel Swain approved the consolidation of all electronics fundamentals training at Lowry, under the title of Applied Electronics Program, and the elimination of the Bright Spark EP course. The 3450 TCHTG study group designed a single course to teach three levels of electronics fundamentals—Organizational, Intermediate, and Depot—Depot level being the most complex.

LTTC officials planned to implement AEP in three phases over a sixteen month period between January 1984 and April 1985. Phase I, scheduled to begin in January 1984, included the six Air Force Specialty Codes (AFSC) which required the entire eighty-three day course. Phase I was divided into seventeen sections totaling 664 hours. Phase II, scheduled for implementation in July 1984, was designed to incorporate an additional nineteen AFSCs which required between forty-five and sixty-five academic days of training. Phase III was scheduled for implementation in April 1985. Nine AFSCs would attend class for fifty-five days and would complete the consolidation of thirty-four different AFSCs into one EP training program. The AEP course, G3AQR32020-006, was sequenced to provide a series of dropout points once the required proficiency levels were attained for a particular AFSC. AEP offered several advantages over Bright Spark. AEP eliminated the fragmentation of EP training at Lowry, reduced the facilities required for EP training, reduced the manpower involved, and most importantly, improved the quality of training. Under ASP, LTTC was prepared to send better-qualified individuals to the field.

Phase I was implemented, as scheduled, on 3 January 1984 and the first students entered the eight-three day course. Trainees learned the basics of electronics; how to troubleshoot amplifiers, power supplies, receivers, and microcomputers; and soldering techniques. The initial class went smoothly and a team which conducted the validation of the course concluded that "the concept of the Applied Electronics Program is a complete success." Course planners had five basic objectives in mind when they developed the AEP course:

(a) Update applied electronics training concurrent with the advances in weapon systems technology.

(b) Employ state-of-the-art training methods and equipment.

(c) Maximize utilization of facilities, manpower, and equipment.

(d) Maximize the amount of hands-on practical application training.

(e) Minimize the unnecessary or nice to know material where and when possible.

All five of the objectives were achieved during the first course. For example, Objective (a) was accomplished through the addition of digital and computer theory to EP and Objective (c) was achieved by increasing the class size to twenty and separating the equipment into common laboratories. The content of AEP needed some refinement, as was normally the case with any new course. The

troubleshooting portions ,of the course came too early in the course for the students to gain the maximum benefit. The first students could not complete certain units of instruction within the times allocated on the Plan of Instruction because of an excessive number of progress checks for the student to complete. The course also suffered from equipment shortages, particularly in the microprocessor area. A shortage of signature and logic analyzers meant a student to equipment ratio of 12:1, rather that the optimal 1:1. Additional equipment had been ordered but was not expected to arrive until April 1985. Course developers used the validation findings and began to revise the course for the beginning of Phase III in April 1985.

At the end of 1983, Phase II was scheduled to begin in July -1984. However, by January 1984, Lowry officials realized that a July implementation would not be possible and requested a postponement until 1 October 1984. The change was necessary because of a shortage of both equipment and the funds to purchase more equipment. A delay until 1 October would make FY 1985 funds available for equipment purchases and allow more time to remodel classrooms. Wing officials were also concerned about exceeding the number of students programmed to be on base during FY 1984 because of the longer course required by some students. The delay gave officials in the 3450 TCHTG more time to fine tune Phase II and insure that enough equipment was on hand.

In April 1984, the USAF Occupational Measurement Center (OMC), Randolph AFB, Texas, completed an Electronic Principles Inventory (EPI). The EPI was a knowledge-based job inventory which identified the range of electronic principles personnel must understand to perform any electronics-oriented job in the Air Force. The EPI was designed for use by training managers to satisfy one of the most important aspects of the instructional systems development (ISD) process — determine exactly what tasks specialists perform on the job before developing a course to train individuals to perform the same job. USAFOMC personnel administered the EPI to 3,692 5- and 7-skill level Air Force members in thirty-two specialties, who had received EP training at LTTC to determine which principles were used on the job. The EPI included 1,366 items or tasks. The results showed that 5-skill level use of EP ranged from under 100 to more than 700 tasks. The results from the 7-skill level members was not conclusive because of the supervisory nature of many of their positions. The EPI concluded that:

Length of time required for training in electronics principles could be adjusted for individual specialties according to number and categories of principles used. . . . Training needs for electronics principles vary with specialty. Some specialties may not need to be included in a formal electronics principles course, whereas others need extensive electronics principles.

Wing officials used the EPI results as an indication of how well AEP fulfilled the needs of the using commands. Captain Alan C. Plyler, Chief, Electronics Principles Training Branch, 3450 TCHTG analyzed the EPI and determined that AEP training was adequate in all but fifteen tasks. He also found twelve tasks that were taught as part of AEP but were not included in the EPI yet supported other EPI tasks. For example, AEP taught Amplifier Principles which was not listed as a separate task in the EPI, yet was used in performing other tasks included in the inventory. As a result of the analysis,

the instructor manpower, student manyears, facilities, and equipment all appeared to be compatible with the revised AEP. However, numerous changes were necessary to the instructional materials to realign AEP with the EPI. Nearly every section of AEP required some minor changes although the overall course content would be quite similar. Significant changes were made in the sequence of the AEP sections. Five of the seventeen sections were rearranged in a different sequence. The 3450 TCHTG planned to add eight of the fifteen deficiencies identified by the EPI to AEP. These changes were being worked at the end of 1984 and were scheduled for implementation in April 1985 with Phase III. 3450 TCHTG officials believed that AEP was accomplishing its objectives and they anxiously anticipated the implementation of Phase III.

3450 TCHTG personnel began work on a related project during 1984. Technical Sergeant Patrick V. Martin and a three-member team began the development of a Computer Assisted Instruction (CAD program to investigate the possibility of using CAI for AEP students. The project was a joint ATC-Air Force Human Resources Laboratory program and was intended for supplementary training for 5- and 7-skill level airmen in avionics career fields. Initially, the project was designed to include 20 hours of instruction in digital electronics, with an overall goal of developing 100 hours of instruction in EP. The course content was derived from the existing AE? course material. The team worked throughout 1984, but experienced software problems and did not anticipate implementation until mid-1985.

B-1B Avionics Training

In addition to armament training for the B-1B, HQ ATC selected LTTC to conduct B-1B specific avionics training. Maintenance training was scheduled for three avionics systems on the new aircraft--offensive avionics systems (OAS), aircraft computer and multiplexing systems, and defensive avionics systems. These systems represented the latest and most modern in avionics technology, while adopting some features from the B-52 and F-16 systems. All of the systems were self-diagnostic and modular which allowed for quick identification and repair of any malfunctioning component. The OAS were responsible for guiding the bomber to its target and aligning and launching its weapons. The computer and multiplexing systems were the brains and nerves of the avionics complex. The Central Integrated Test System and Electrical Multiplexing, were programmed to tell the maintenance technicians the status of systems operation, record flying data, and provide for corrective maintenance. The defensive avionics systems were a total integration of electronic warfare and countermeasure functions to neutralize detection. The defensive systems comprised more than a hundred black boxes called line replaceable units (LRU). Each LRU was designed to be easily accessible for quick removal or installation, by one or two technicians.

HQ SAC developed a new training concept for B-1B avionics training. LTTC was programmed to train three new AFSCs on B-1B avionics systems: 323X1, Offensive Avionics Systems Specialist; 323X2, Aircraft Computer and Multiplexing System Specialist; and 323X3, Defensive Avionics Systems Specialist. Additionally, intermediate level training was programmed for the 32351/2/3, Intermediate Automatic Test Equipment (IATE) Technician, and the 324X0, Precision Measurement Equipment Laboratory (PMEL) Specialist. HQ SAC V wanted LTTC to teach the 323X1/2/3 students the same basic information—the

fundamentals of all three systems. Because of the interrelatedness of the systems, HQ SAC believed that the training should cover all aspects of how to operate the stations. A common core course could be taught to all prospective Automatic Test Equipment (ATE) operators at Lowry with only minor differences in the training required for Digital, Digital/Analog/Video, Radio Frequency, and Radar/Electronic Warfare test station technicians.

The maintenance concept employed by HQ SAC was a three-tiered system—Organizational (0), Intermediate (I), and Depot (D). Organizational or 3-skill level maintenance training taught the student to run simple tests on the LBUs and how to remove and install them. Intermediate or I-skill level maintenance training taught the student how to operate the -test equipment, perform more sophisticated tests and make limited repairs on the LRUs. Depot or D-skill level training taught the student how to make repairs that were either beyond the capability of the field or would incur excessive manhours to accomplish. HQ SAC wanted Lowry to teach the 323X1/2/3 students to the 0 level before arriving in the field. They would be upgraded to the 5-level in the field through an OJT program. The maintenance supervisor would review each airman and recommend only the best for further training. These airmen would then return to Lowry for the 32351/2/3, IATE Technician course and be trained to the I level.

LTTC was only indirectly involved with the initial B-l program in the mid-seventies. However, when the work began again in 1981, Lowry immediately set out to develop courses for the B-1B avionics systems. The work was on a time-compressed schedule because of the short production run and the pressure to put the aircraft in the field on schedule or earlier. The initial ATC planning meeting was held in July 1981. Later that year, LTTC submitted several B-1B avionics training-related initiatives for the FY 1984-1988 POM. As with B-1B armament training, the 3306 TES, Edwards AFB, California, was given responsibility for the ISD process on avionics training. Personnel from the Operations Division, 3400 TCHTW, and the 3450 TCHTG worked with the 3306 TES on the ISD process. Eight personnel from the 3450 TCHTG were assigned to develop courses for the 323X1/2/3 AFSCs. They worked in concert with the 3306 TES and used the 3306 TES's format and materials to develop ISD data and provide an avionics ISD package. Step two of the ISD process (job task identification and development) for the 323X1/2/3 courses was completed in August 1984. Nearly all of 1984 was spent in developing and revising strawman STSs for the 323X1/2/3 AFSCs' into tentative STSs. The strawman STSs were completed in January 1984 and discussed at a B-1B avionics training working group meeting at HQ ATC in March 1984. At this meeting, representatives from LTTC, HQ ATC, SAC, and the B-1B SPO reviewed the strawman STS and made several changes. Mr Albert Leinz, training manager from the Operations Division, agreed to provide a clean draft of the STSs and prepare tentative STSs for official coordination. The tentative STSs were the documents used for the development of the 32351/2/3 and 324X0 courses.

At the end of 1984, training windows were beginning to take shape. For all practical purposes, the 32351/2/3 courses would be the same basic course with only minor content differences and three separate course numbers to facilitate the ATC computer system. The 323X1/2/3 course was scheduled for 120 academic days and with a TPR of 82, 45, and 82 for each AFSC respectively. The 32351/2/3 courses were designed for 90 academic days and the 324X0 course,

Precision Measuring Equipment Laboratory Specialist, was thirty-one academic days.

Training equipment requirements were identified during the ISD process and course development. B-1B avionics training at Lowry required: one Digital Test Station, one Digital/Analog/Video Test Station, one Radio Frequency Test Station, and one Radar/Electronic Warfare Test Station. These stations were designed to provide hands-on training by both 3235X and 32450 personnel in intermediate level maintenance training. Also identified were: one Program Development Station for Abbreviated Jest Language for All Systems Training, one Generic Test Set for less complex LRUs to be run on the IATE, and a proposed Procedural Trainer for LRU troubleshooting. Two Avionics/Armament Maintenance Trainer Systems were required for training organizational level maintenance procedures to trainees in the 323X1/2/3 AFSCs. The Digital and Radio Frequency Test Stations and Avionics/Armament Maintenance Training System were scheduled for arrival at Lowry in March 1986. The Digital/Analog/Video and Radar/Electronic Warfare Test Stations were due for delivery in October 1987. No firm date had been set for delivery of the Program Development Station or Generic Test Set. LTTC did not experience the same type of problems with avionics trainers as they had with armament training equipment.

Resident training at Lowry was scheduled to begin in January 1987, nine months after the arrival of the first equipment. The training was planned for Building 849. B-1B avionics training required five equipment rooms, ten classrooms, and two offices. Air Force Form 332, Base Civil Engineer Work Request, was submitted to the 3415th Civil Engineering Squadron on 1 August 1984 for the modification of a portion of Building 849 for use as a B-1A avionics training facility. The work was scheduled for completion in February, 1986.

TYPE 2 AMD TYPE 3 RESIDENT COURSES AND GRADUATES FY 1983

COURSE	TITLE	ACADF	DAYS	GRADUATE PROJ	GRADUATE ACTUAL
2ASR32050-000	Hi-Reliability Soldering/Elec Repair Tech		10	21	16
2ASR32430-000	Precision Measuring Spec		82	3	2
3ABR32430-002	Precision Measuring Equipment Spec		154	409	415
3ABR32430-003	Precision Measuring Equipment Spec (Army)		167	257	208
3ABR32430-004	Precision Measurement Equipment Spec (FAP)		99	17	17
3ABR32430-005	Precision Measurement Equipment Spec (USA-ANG)		51	35	17
3ABR32430-006	Precision Measurement Equipment Spec (Marines)		130	133	71
3ABR99104-001	Systems Repair Technician	76	112	10	11
3AZR32470-000	Radiac Instrument Repair Technician		8	83	78
3AZR32470-005	Advanced Electrical-Electronic Measurements		30	320	292
3AZR32470-014	Aircraft Engine Test Stand Calibration		13	60	56
3AZR32470-017	DCLF Ref Measurement/Calibration		30	71	43
3AZR32470-018	Microwave Measurement & Calibration		30	224	165
3AZR32470-020	Precise Time and Freq Cal System		10	48	46
3AZR32470-021	Microwave Measurement & Calibration (Army)		30	74	30
3AZR32470-022	Microwave Measurement & Calibration (Navy)		20	246	204
3AZR32470-023	Physical Measurement & Calibration (Army)		20	71	49
3AZR32470-026	Advanced Electronic Maint/Calibration		50	176	146
3AZR32470-027	Oxygen Equipment Cleaning & Calibration		7	118	91
3AZR32470-028	DOD Aims Ident Test Set Maint/Calib		20	94	80
3AZR32470-028	Precision Optical Measuring Tech		20	94	80
3AZR32470-030	Physical Measurement and Calibration		35	124	83
3AZR32470-031	Physical Measurement and Calibration		30	93	79
3AZR32470-032	Type AE35U-3 Spectrometer Maint/Cal		20	74	63
3AZR32470-033	ANARM135 Maintenance Calibration		26	37	32

TYPE 1, 4, 5 OFF-BASE COURSES AND GRADUATES

COURSE	TITLE			
1ASC32470-183	Sys 80 HAG Tape Rec/Repro Operation and Maintenance	10	2	2
1ASC32470-260	F-16 Depot Microwave Test Station	48	24	12
1ASC32470-287	Manual Gyro Systems Operation	5	30	34
1ASC32470-290	Gyro ATE Operation	5	30	32
1ASC32470-291	F-18 (RAAF) Calibration Specialist Tng	5	2	2
1ASC32470-292	5100 Meter Calibrators	5	3	3
1ASC32470-293	5200 AC Calibrators	5	2	2
4AST32470-174	Test Set Maint ANAWM-13A	10	7	4

PROPOSED B-1B IATE TRAINING FOR AFSC 324X0

Based on a General Dynamics proposed training plan, AFSC 324X0 requires extensive maintenance and troubleshooting training to support B-1B Intermediate Automatic Test Equipment (IATE). Based, on a proposed. 323XX STS, maintenance will be performed by AFSC 323XX. PMEL will provide calibration support and repair of Test Set Replaceable Units (TRU). Based on this proposed STS, the 324X0 requires no system specific training.

A 324X0 assigned to a PMEL that supports B-1B .IATE should be provided training in:

1. Analysis of computer controlled test equipment systems (ATE)
2. Software Analysis
3. Microwave
4. Physical Dimensional

These requirements can be met with courses already on line at LTTC.

1. ATE and software analysis - G3AZR32470-026
2. Microwave - G3AZR32470-01S
3. Physical Dimensional - G3AZR32470-031
4.

Maintenance support for the B-1B IATE can be provided by utilizing AFSC 323XX as an operator/maintainer.

1.The operator/maintainer concept has already been proven successful as shown by AFSC 326XX (F-15, F-16, A-10, Fill)

2. The proposed STS for AFSC 323XX requires maintenance training for 323XX technicians. Duplication of this training for 324X0s is not cost effective.

3. AFSC 323XX are assigned to SAC B-1B IATE exclusively. This insures that experienced technicians will always be available for system maintenance.

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3450TH TECHNICAL TRANING GROUP
1 JANUARY 1984 - 30 JUNE 1984

COMMANDER'S POINT OF VIEW

The 3450th Technical Training Group has continued its commitment to excellence in training during this period. Phase I of the Applied Electronics Program (AEP) was implemented on 3 January 1984 with Phase II scheduled for implementation in October 1984. Additionally the Operations and Training Branch was established as a test program 1 January 1984 to provide technical training and resource management expertise to the Group Commander. Continuation of this Branch will enhance the operation of the Group with respect to Training Development. With the many new systems coming on line in the near future, it is imperative that they be implemented correctly the first time to preclude wasting manpower and resources that are at a premium.

NARRATIVE

A. NEW PLANS, PROGRAMS AND PROCEDURES

The first class from the AEP program course entered the revised G3ABR32430-002 Course Block II in April 1984.

The 40,000 sq ft addition to building 1433, which was to begin construction in October 1983, has been slipped to FY-87 due to Defense budget cutbacks.

The first Utilization and Training Workshop for the 324X0 career field was hosted at Lowry 18-22 Jun 84. A draft STS was produced that more accurately reflects field training accomplishment and facilities documentation of actual training received. A tentative date of September 1984 has been set to discuss Supplemental Training matters.

Special Monitoring Status (SMS) was instituted in June 19S4 as a program to focus supervisory attention on the students overall -performance both academically and militarily. A short term program designed to alert the supervisory chain to declining performance and allow appropriate action to be taken. The success of SMS is dependent upon a continuous crossflow of communication between the student's instructor, branch supervisors and the student squadron/detachment. Expectations are high that SMS will be a highly effective management tool.

B. EQUIPMENT OR TRAINING AIDS/DEVICES

One MIS-35128 Laser Test Set Calibrator was received in January 1984 to be added as a Special Training Course for Army personnel. This test set will be used in support of the AN/GVX5 10Km range finder monocular system. This system will eventually be modified to encompass four to five additional weapons systems.

ROSTER OF KEY PERSONNEL

NAME/RANK	POSITION
Major Gregory H. Landers	Branch Chief
MSgt Bennie L. Milliner	Assistant Branch Chief
GS-12 Jimmy R. Ivey	TDS Chief

During this time frame, Major Landers took over the Metrology Training Branch from Major Daniel Olson who became the Chief of the International Training Management Office.

ACQUISITION OF NEW TRAINING EQUIPMENT OF AIDS

NEW ACQUISITIONS

EQUIPMENT/AID	PURPOSE	DELIVERED	FINDINGS/EVAL
MIS-35128 Laser Test Set Calibrator	Calibrate the AN/GVX5 l0Km Range Finder Monocular	Jan 84	Awaiting Army Training Com-mand Guidance

FUTURE PLANNED ACQUISITIONS

EQUIPMENT/AID	PURPOSE	WHEN DELIVERED/ACCEPTANCE TESTING EXPECTED
A/M99T-2 Calibration Van	Calibration of Jet Engine Test Cells	FY-86

Functional testing is not yet completed because of the many changes made by a team of AF personnel including TSgt Christy from the Physical Dimensional Section. The development of this new system was necessitated by the newer, higher powered aircraft entering the inventory. The A/M99T-2 Calibration Van, purchased at a rounded figure of $130,000 per copy, allows the AF PMEL's to keep pace with the changing technology and requirements. It will be an Air Force wide system and will replace the older CTS100 Calibration Trailers. Lowry is programmed to receive two of the first copies to be produced for AF training purposes. Estimated production date is March 1985.

3450TH TECHNICAL TRAINING GROUP
1 JULY 1984 - 31 DECEMBER 1984

METROLOGY TRAINING DIVISION

A. NEW PLANS, PROGRAMS, AND PROCEDURES

A follow-up conference to the Utilization and Training Workshop was held during the month of September. This conference concerned the needs of the field as to the adequacy of the training provided by the Metrology Training Division's advanced courses. Among the suggestions brought up were the ideas to: (1) consolidate the physical/dimensional course with the optical and Jet engine test courses, (2) consolidate the DOD AIMS course with the IFF and Tacan courses, (3) review the need for the Radiac course, and (4) extensively revise the Advanced Electronic Maintenance/Calibration course. These suggestions are currently either being researched, reviewed or implemented.

After being previously delayed (Oct 83) because of the lack of funds, the 40,000 sq. ft. addition to building 1433 is now tentatively scheduled for construction during FY-86. No further word on this project has been received recently.

Although not mentioned in the overview, a word on the Special Monitoring Status implemented in this division during the last history period is warranted here. SMS has proven to be an effective management tool and is now being implemented Group-wide.

B. EQUIPMENT OR TRAINING AIDS/DEVICES

The Army physical/dimensional course recently received the new MIS 30859 Pneumatic Pressure Standard. This item replaces four diaphragm pressure gages with a digital state-of-the-art equipment item.

The microwave measurement and calibration .courses are now in receipt (Dec 85) of 3 HP 8655A Spectrum Analyzers. These items will allow more students to be trained in Spectrum Analysis using the latest equipment available to AF laboratories.

Branch Level Training Management System

By the beginning of the 1980s, Air Training Command faced challenges in managing the trainees in its programs. The Air Force was receiving new systems and equipment, and the operational commands required properly trained personnel. The United States Congress, however, was imposing budgetary constraints on federal expenditures. Air Training Command needed an automated data base for technical training that acquired, stored, and presented information about students in the technical training programs. This included entering and updating personnel information and records, as well as furnishing information to the Registrar. Also included were student reporting, for example, training status, course changes, test scores, and graduation.

The system had to incorporate more functions than student management. Training officials wanted a system that helped to reduce the amount of time instructors were spending on administrative matters. Instructor management required a number of procedures, including entering and updating records, planning and projecting requirements for training, and preparing instructor reports for personnel information, teaching records, and evaluations. An effective system would also include other functional areas, for example, test scoring and analysis, preparation of course materials, facility and equipment scheduling, and availability of supplies. Finally, the system had to meet the unique requirements of each Technical Training Center.

Air Training Command selected the Branch Level Training Management System (BLTMS) to provide automated support to the Centers. Lowry was designated as the first base, to receive the equipment, but the implementation date had to be changed several times. Hardware development was slow, the software was not ready, and although $1.3 million was approved for BLTMS, Air Training Command had not spent any of the money. By the summer of 1983, the future of the program was questionable.

BLTMS used Burroughs Corporation equipment. By the fall of 1984, Burroughs was ready to begin hardware deliveries. However, neither the software for managing student and instructor records nor the networking capability for a common database and information sharing was ready for delivery. The network was a prerequisite for designing and writing the software for student management functions. In addition, optical mark readers for test scoring had not been ordered, and the software for test scoring and analysis was not ready.

By the end of 1984, Lowry had received fifteen B-29 computers, eighty-eight B-25 computers, fifty-three dot matrix printers, twenty-one letter quality printers, and four graphic plotters. The Center completed equipment installation in January 1985. Without the applicable software, however, the equipment was limited primarily to word processor functions.

In-August 1985, forty-one optical mark readers, with automatic feeders and printers, and the test scoring and analysis software, were installed at Lowry by National Computer Systems, Incorporated, or Minneapolis. The software functions included keys for grading tests, revision and validation of test keys, test grading, student test results, and test analysis. For 1986, Lowry officials anticipated receiving the software for graduate evaluation and instructor management as well as the communications network, but delivery of the student management software was not assured.

Headquarters Air Training Command recognized that those using BLTMS, as well, as the systems administrators, would require ongoing training. The wing-level Faculty Development Division at each Technical Training Center seemed to be the appropriate organization for this training. Headquarters personnel from the Deputy Chiefs of Staff for Computer Resources and Technical Training would assist in the training. In addition to technical assistance Headquarters officials provided the Faculty Development Divisions with training literature, lesson plans, and equipment manuals.

Computers were now becoming a valuable addition to offices within Air Training Command. In conjunction with BLTMS, and in order to help personnel at Lowry gain proficiency with the B25 Burroughs computer, the Faculty Development Division of the 3400th Technical Training Wing introduced a course on basic operations and WRITEone word processing procedures. After Janice Naff developed the course and the study guide, Lowry began providing instruction in June 1985. Division officials anticipated that the course would eventually be adopted throughout Air Training Command.

Electronic Training Program

In December, 1984, Major General Larry N. Tibbetts, Air Training Command's Deputy Chief of Staff for Technical Training, approved a project to study the feasibility of a Common Electronic Training Program (CETP) for the Command. The Study would analyze all Air Force electronics training requirements, build a central data base for training requirements, and revise training based on results of the study. General Tibbetts formed a management team that included members from each of the Command's Technical Training Wings. In addition to analyzing electronic requirements at the Technical Training Centers, the program provided an opportunity for the Wings to exchange ideas and experience.

At the first meeting of the management team in February 1985, the participants discussed electronic principles programs at the various Centers. A representative from the 3400th Technical Training Wing informed the group about Lowry's Applied Electronics Program (AE?). Implemented in January 1984, the three-phased program had several objectives: updating applied electronics to advanced weapon system technology, eliminating electronics course fragmentation, introducing modern training methods and equipment, and increasing utilization of facilities, manpower, and practical training. Students in thirty-four career fields and forty-three equipment courses benefited from the new training approach. Lowry expected approximately 3,550 student entries during Fiscal Year 1985 for career fields in electronic principles and 4,300 personnel for training in Fiscal Year 1986.

The management team recommended that the CETP be implemented in Fiscal Year 1988. This would give the Centers time to prepare for changes in training while obtaining additional funding, equipment, and manpower. The team also planned to request thirteen temporary manpower authorizations from Headquarters Air Training Command for a development team. Lowry's training Wing would provide two training developers to work with members of this group. The developers would determine whether existing training materials at the Centers could support CETP instruction. Additionally, an Instructional Systems Development team was formed to create a data base, identify career field training requirements, and help Wing personnel develop course modules.

The management team proposed that the Instructional Systems Development group become permanent positions at the Technical Training Wings to keep the data base updated and electronic principles training current. The team scheduled workshops throughout 1985 at various Centers to develop the CETP initiatives. By following a task analysis approach and comparing training at the various Centers, the Instructional Systems Development team hoped to establish a foundation for further refinement of electronic principles training and avoid disparities among Center programs. From the task list, the team wanted to formulate a course training standard for common electronic principles tasks. The CETP task list would be compared to the existing electronic principles inventory for compilation of a task list to be included in a survey of the courses. Officials planned to develop a new inventory by early 1987, with implementation of CETP courses scheduled in October of the same year.

In the meantime, Lowry's Applied Electronics Program continued training. In March 1985, Headquarters Air Training Command's Logistics Training Division approved implementation of Phase III. That meant an additional none career specialty codes for the program and complete consolidation of thirty-four career fields into one electronic principles program. Officials from Lowry's 3450th Technical Training Group listed several objectives for Phase III entering 1,000 additional students each year, reorganizing materials for more efficient course flow, incorporating validation suggestions from the first phases of the program into Phase III materials, and upgrading facilities and equipment.

Lowry officials published a summary report following extensive course changes generated during Phases I and II. Data derived from enlisted graduates of AEP classes represented several career specialty codes in various branches of the armed services. The report presented corrections and discussed solutions to problems. Lowry prepared for new electronic principles students by increasing the number of instructors and acquiring additional training equipment. Some course sections were realigned to avoid the need for instructors to repeat material.

An annual course review found measurements and evaluation procedures, control documents, curricula materials and instructors to be effective in meeting course objectives. The report prompted school officials to improve training resources. In addition to modifying the training day schedule to improve student flow in school facilities, they ordered equipment for the NIDA-130, the AEP trainer, to raise students' proficiency to the required level.

On 30 July 1985, Lieutenant Colonel William M. Bishop, Chief of the Logistics Training Division at Headquarters Air Training Command, approved a revised training plan for the AEP course. The plan incorporated a new course chart based on data gathered during course validation. School officials wanted to assure a smooth flow of students in ten affected career fields without altering or degrading course content.

At the end of 1985, Lowry officials were preparing for a possible alteration of the Applied Electronics Program course (G3AQR32020 006) following results of the CETP. Although Lowry's electronics training was effective, a core course was needed for all Centers training in electronics to standardize courses and meet the training requirements of various commands throughout the Air Force.

TYPE 2 AMD TYPE 3 RESIDENT COURSES AND GRADUATES FY 1985

COURSE	TITLE	ACAD DAYS F	S	STUDENTS Entd	Grad	Elim
2ASR32430 000	Precision Measuring Equip Spec	--	82	8	5	0
3ABR32430-002	Precision Measuring Equip Spec	83	71	288	299	50
3ABR32430-003	Precision Measurement Equipment Specialist (Army)	83	84	257	105	42
3ABR32430-004	Precision Measurement Equipment Specialist (FAP)	30	64	39	35	0
3ABR32430-005	Precision Measurement Equipment Specialist (USA-ANG)	10	61	30	10	0
3ABR32430-006	Precision Measurement Equipment Specialist (Marines)	78	54	117	111	10
3AZR32470-000	Radiac Instrument Repair & Calib	--	8	114	105	0
3AZR32470-005	Adv Electrical-Electric Measurements	--	30	316	255	5
3AZR32470-014	Aircraft Engine Test Stand Calib	--	13	64	54	0
3AZR32470-017	DCLF Ref Measurement/Calibration	--	30	72	62	3
3AZR32470-018	Microwave Measurement & Calibration	--	30	292	182	1
3AZR32470-020	Precise Time and Freq Cal Sys	--	10	73	61	0
3AZR32470-021	Microwave Measurement & Calibration (Army)	--	30	60	46	4
3AZR32470-022	Microwave Measurement & Calibration (Navy)	--	20	212	202	9
3AZR32470-023	Physical Measurement & Calibration (Army)	--	20	58	55	3
3AZR32470-026	Adv Electronic Maint/Calibration	--	50	220	207	3
3AZR32470-027	Oxygen Equipment Cleaning & Calib	--	7	114	67	1
3AZR32470-028	DOD Aims Ident Test Set Maint/ Calibration	--	20	140	94	0
3AZR32470-029	Precision Optical Measuring Tech	--	20	146	84	3
3AZR32470-030	Physical Measurement & Calibration	--	35	108	84	1
3AZR32470-031	Physical Measurement & Calibration	--	30	153	124	0
3AZR32470-032	Type AE35U-3 Spectrometer Maint/ Calibration	--	20	82	63	1
3AZR32470-033	ANARM135 Maintenance Calibration	--	26	82	61	2

TYPE 1, 4, 5. OFF-BASE COURSE AND GRADUATES

1ASC32450-014	F-16 Self-Test Software	--	10	8	8	0
1ASC32470-181	F-16 Operating Sys Software	--	10	8	8	0
1ASC32470-289	Gyro Test Sys Maint	--	15	10	10	0
1ASC32470-294	Calib Amplifier: FLUKE	--	5	2	2	0
4AST32470-174	Test Set Maint ANAWM-13A	--	10	11	11	0

METROLOGY TRAINING DIVISION

Major G Landers, Division Chief
Mr J Ivey, TDB Chief

1 JANUARY 1985 - 30 JUNE 1985

OVERVIEW

The Metrology Training Division trains students from Air Force, Army, Navy, Marines and allied international students in precision measurement and calibration. The instructor staff as well as the students are interservice, which creates a training environment which unifies all branches of the service in these areas and enhances cross-feed.

During the report period a new 324X0 STS was written, command authorized and published.

The expansion of building 1433 is planned for FY-86.

Three new Automatic Test Equipment packages were obtained for an advanced calibration course.

NARRATIVE

A. NEW PLANS, PROGRAMS AND PROCEDURES

The new 324X0 STS was completed, command approved and published.

The consolidated Physical/Dimensional Course consisting of Optics and Jet Engine Test courses are expected to be on line by January 1986.

The DOD AIMS Course consisting of IFF and TACAN are expected to be on line by March 1986

The Radiac Course was reviewed and training is still required.

B. EQUIPMENT OR TRAINING AIDS/DEVICES

The Advanced Electronic Maintenance/Calibration Course received three of the four Automated Test Equipment packages for the new G3AZR32470-034 Course.

C. PEOPLE PROGRAMS

No input

D. AWARDS OR 'FIRSTS'

No input

1 JULY 1985 - 31 DECEMBER 1985

A. NEW PLANS, PROGRAMS AND PROCEDURES

The consolidated Physical/Dimensional Course which combines -the old Physical Dimensional, Optics, and Jet Engine Test Cell Courses will start on 6 Jan 86. This consolidation saves 13 training days per student while providing a more logical flow of instruction. Navy and Army Physical Dimensional courses have been adjusted to coincide with the Air Force course.

The new Navaids/IFF Diagnostics Principles Course is slated to start 1 Apr 86.

Implementation of the new Advanced Electronic Diagnostic course has been delayed until 1 Oct 86 to satisfy TPR in both this course and the one it replaces.

B. MAJOR PIECES OF EQUIPMENT OR TRAINING AIDS/DEVICES

The Physical/Dimensional Section of the Metrology Division received several new standards: the Hart Temperature Bath (Aug 85), the Laminar Flow Standard (0ct 85), and the 48' Height Transfer Standard (Sep 85).

SMSgt Dean Partridge arrived Nov 85 to take the position of Assistant Division Chief

Branch Level Training Management System

To improve procedures for managing its technical training programs, Air Training Command was introducing an automated data base that acquired, stored, and presented information about students. These functions included entering and updating personnel information and records; providing the Registrar with information; and student progress reporting, for example, training status, course changes, test scores, and graduation.

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The system would incorporate functions other than student management. Training officials wanted to reduce the time management covered a number of procedures: entering and updating records, projecting training requirements, and updating instructor reports for personnel information, teaching records, and evaluations. An effective system also had to encompass test scoring and analysis; provide controls over facilities, equipment, and supplies; assist with preparing course material; and meet requirements at each technical training center.

Air Training Command selected the Branch Level Training Management System (BLTMS) for automated support to the technical training centers. BLTMS used equipment manufactured by the Burroughs Corporation. Slow development and delivery of hardware and software, combined with funding problems, accounted for -delays in implementing the system. By the fall of 1984, Burroughs was ready to begin delivering hardware. In 1984 and 1985, Lowry received B-29 and B-25 computers, dot matrix and letter quality printers, graphic plotters, and optical mark readers. By the end of 1985, the Center had received software for only test scoring and analysis: grading tests, revision and validation of test keys, student test results, and test analysis.

Lowry's BLTMS system was spread among twenty-nine buildings. It consisted of approximately thirty-two master workstations, which supported an additional ninety-one remote workstations. For 1S86, Lowry officials anticipated receiving software for graduate evaluation and instructor management, as well as the communications network, but delivery of student management software remained questionable. Air Training Command released the software for instructor management, but it had to be returned for rewriting after 3400th Technical Training Wing personnel determined that the functional description did not reflect procedural changes to accumulate points for master instructors. The lack of funds delayed development of other items for BLTMS during 1986.

Electronic Principles Training

Electronic principles training at Lowry included courses in avionics, communication and electronic systems, metrology, equipment maintenance, and soldering. In 1976 Air Training Command initiated "Bright Spark,' a project for reducing the amount of electronics theory taught in basic courses. Representatives from the major Air Force commands felt that students could become productive technicians without in-depth electronic training.

Accordingly, trainees learned electronic principles related to the specific equipment available at their first duty station. While reducing training costs, however, the program failed to produce fully-qualified graduates for the Air Force.

In 1982, following a study by the 3450th Technical Training Group to determine the effectiveness of Bright Spark, Lowry began consolidating its electronic fundamentals training under the Applied Electronics Program. The Center implemented the program in three phases: I, January 1984; II, October 1984; and III, April 1985. By 1985, a common course supported thirty-four Air Force Specialty Codes and forty-three equipment courses.

The Applied Electronics Program updated electronic applications to advanced weapons system technology, eliminated course fragmentation, and introduced new training methods and equipment. Lowry trained in five segments: basic electricity and electronic concepts; analog, identifying amplifiers, power supplies, and component circuitry; digital, including theory, number conversions, and combinational logic circuits; microprocessor, covering theory and troubleshooting techniques for newer equipment; and a two-phased soldering course, basic and high reliability. In 1986 the Center incorporated training for Aerospace Photographic System Specialists (AFSC 404X1) as part of the Applied Electronics Program, improving 404X1 training.

In 1984 the Air Force's Occupational Measurement Center at Randolph Air Force Base studied the Lowry approach to electronic training for possible adoption at Air Training Command's other technical training centers. As a result Air Training Command developed the Common Electronic Training Program to analyze Air Force electronics training requirements, build a central training data base, and revise electronics courses. The plan identified requisite electronic training and assisted the command's technical training wings in developing courses to meet common training requirements. The Program Management Team and the Occupational Measurement Center's Instructional Systems Development team identified 116 common electronic items. The command program involved forty-six specialty codes from six training wings, and affected over 10,000 students annually.

After developing task analysis data for the Common Electronic Training Program, project managers determined course control elements for the writing project scheduled to begin in July 1986. Together with Keesler, Lackland, Sheppard, and Chanute Air Force Bases, Lowry was tasked with providing two technical writers to assist in developing courses. The writing teams would compile course materials for subsequent review and testing by program officials. However, Headquarters Air Training Command was unable to fund the writing project, and directed the technical training centers to develop modules for the Common Electronic Training Program. Lowry had to prepare courseware encompassing 92.5 training hours for module 17 (Transmission and Reception Principles), module 18 (Transmitter and Receiver Fault Isolation), module 21 (Introduction to Soldering and Solderless Connections) , and module 22 (Advanced Soldering) .

Lowry's technical writer anticipated completing all assigned modules by April 1987. Coordination with writing teams from other bases slowed the process for reviewing and editing additional program modules. Center officials

still expected to implement the revised courses by May 1988. Lowry's 5,100 students (increased from 3,500 during 1986) programmed for electronic principles courses would benefit from the improved training.

TYPE 2 AND TYPE 3 RESIDENT COURSES AND GRADUATES FY 1986

COURSE	TITLE	STUDENTS Entd	Grad	Elim
3ABR32430-002	Precision Measuring Equip Spec	522	341	40
3ABR32430-003	Precision Meas Equip Spec (Army)	122	177	14
3ABR32430-004	Precision Meas Equip Spec (FAP)	25	20	0
3ABR32430-006	Precision Meas Equip Spec (Marines)	81	83	1
3AZR32470-000	Radiac Instrument Repair & Calibration	97	97	0
3AZR32470-005	Advanced Electrical-Electric Measurements	221	204	2
3AZR32470-017	DCLF Ref Measurement/Calibration	53	52	2
3AZR32470-018	Microwave Measurement/Calibration	159	153	0
3AZR32470-020	Precise Time and Freq Cal Sys	41	43	0
3AZR32470-021	Microwave Measurement & Calibration (Army)	53	49	2
3AZH32470-022	Microwave Measurement & Calibration (Navy)	193	176	3
3AZR32470-023	Physical Measurement & Calibration (Army)	59	57	3
3AZR33470-027	Oxygen Equip Cleaning Calibration	57	58	1
3AZR32470-029	Precision Optical Measuring Tech	51	40	0
3AZR32470-030	Physical Measurement & Calibration (Navy)	47	42	1
3AZR32470-032	Type AE35U-3 Spectrometer Maint/Calib	58	62	0
3AZR32470-034	Advanced Electronic Diagnostics			
3AZR32470-035	Nav Aids and IFF Diagnostics Principles	39	28	1
3AZR32470-036	Physical Measurement & Calibration	53	34	0
3AZR32470-037	Phys Measurement & Calibration (USMC)	42	37	0

Metrology Training Division
1 January - 30 June 1986

The consolidated Physical/Dimensional Course which combines the old Phys/.D, Optics, and Jet Engine Test Cell Courses started on 6 January 1986. The course has been through validation and is now going through minor corrections. The new Navaids/IFF Diagnostics Principles Course started 1 April, and now is in validation. The new Advanced Electronic Diagnostics Course is planned to begin 1 October 1986.

1 July - 31 December 1986

A. New Plans, Programs and Procedures

Metrology has developed and incorporated major course consolidations.

a. The IFF/Nav Aids Course validation is now complete.

b. The new Advanced Electronic Diagnostics Course went on line 1 October, and is now under validation.

c. The Basic Course converted from self-paced to group-paced format on 11 July. This course is also under validation.

d. They are now in the process of writing the course materials for the 3-1 Bomber Automated Test Equipment System. This course is to go on line in March.

B. Major Pieces of Equipment or Training Aids/Devices

The Physical/Dimensional Section has received a new AM 99T2 Test Cell Calibration Trailer to upgrade the Jet Engine Test Ceil Section of their course. This unit includes several new features such as digital readouts, and a single remote controlled turbine to do flow calibrations. (The previous unit required three manually controlled turbines. Each of these had to be physically removed and replaced on the fuel flow line outside the trailer.)

The Special Training Section has received four new 548A Microwave Counters. They will use this to teach new state of the art' techniques in frequency measurement.

HISTORY OF LOWRY AIR FORCE BASE

1 JANUARY - 30 JUNE 1987

A. New Plans, Programs and Procedures

2. Blueprints have been received for the new metrology building. The Army recently held its biannual Critical Task Selection Board. Several advanced courses were moved out of building 1308 which was given to the 3460th Technical Training Group.

a. The Advanced Electronic Diagnostics course has completed its final validation and all changes have been implemented.

b. The in-resident Automated Test Equipment course for the B-1B has been deleted and all equipment orders canceled due to severe problems in acquiring the B-1B Bomber Automated Test Equipment (ATE) system. This system will now be taught by a Mobil Training Team.

c. Due to a near 15% decrease in authorized instructor personnel the Metrology Division is now virtually 100% manned.

d. A supplement has been written and incorporated into CDC 32450 to bring it up to the level required by the new STS. The 7-level CDC did not require any changes.

e. The 40,000 square foot addition to the metrology building is still awaiting congressional funding.

f. The Army's Critical Task Selection Board will, in the near future, cause some changes to three of our courses. These changes will only affect Army students.

g. The TACAN/IFF, Advanced Electronics Diagnostics, Precise Time and Frequency and Spectrometer Maintenance/Calibration courses were all moved out of building 1308. These courses were moved to either building 959 or 1433.

TYPE 2 AMD 3 RESIDENT COURSES AMD GRADUATES FY 1987

Course	TITLE	Endt	STUDENTS Grad	Elim
3ABR32430-002	Prec Meas Equip Spec	628	577	60
3ABR32430-003	Prec Meas Equip Spec (Army)	101	95	5
3ABR32430-004	Prec Meas Equip Spec (FAP)	28	30	0
3ABR32430-006	Prec Meas Equip Spec (Marines)	40	54	2
3AZR32470-000	Radiac Instru Repr & Cal	101	95	0
3AZR32470-005	Adv Elec Measmt	296	289	0
3AZR32470-017	DCLF Ref Meas & Cal	54	48	3
3AZR32470-013	Microwave Meas & Cal	154	155	0
3AZR32470-020	Precise Time & Freq Cal Sys	45	41	0
3AZR32470-021	Microwave Meas & Cal (Army)	45	45	0
3AZR32470-022	Microwave Meas & Cal (Navy)	257	249	5
3AZR32470-023	Phy Meas & Cal (Army)	63	54	3
3AZR32470-026	Adv Elect Maint Cal	0	1	0
3AZR32470-027	Oxygen Equipment Cleaning & Cal	47	46	1
3AZR32470-029	Prec Optics Meas Tech	25	35	0
3AZR32470-030	Phy Meas & Cal	59	63	0
3AZR32470-032	Type AE35U-3 Spectrometer Maint/Cal	64	60	0
3AZR32470-034	Adv Elec Diag	212	168	2
3AZR32470-035	Nav Aids & IFF Diag Princ	82	77	1
3AZR32470-036	Phy Meas & Cal	80	78	0
3AZH32470-037	USMC Phy Meas & Cal	51	51	0