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# MINUTEMAN

GROUND ELECTRONICS SYSTEM  
FOR WS-133B



DDC  
OCT 9 1963

GROUND ELECTRONICS SYSTEM  
FOR WS-133B (MINUTEMAN)

ASSOCIATE CONTRACTOR  
INDOCTRINATION/TRAINING EQUIPMENT  
PLAN

Prepared for  
HEADQUARTERS  
BALLISTIC SYSTEMS DIVISION  
AIR FORCE SYSTEMS COMMAND  
NORTON AIR FORCE BASE  
San Bernardino, California

CONTRACT NUMBER AF04(694)-261

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20 September 1963

This plan supercedes the 1st GES Associate Contractor Training Plan  
submitted 21 June 1963

In Compliance with Task 13.2.3/13.3.3  
of Contract AF04(694)-261

Prepared by *[Signature]*

Supervised by *[Signature]*

Approved by *[Signature]*

## TABLE OF CONTENTS

	PAGE NO.
<b>PART I - Minuteman GES Associate Contractor Training Plan</b>	<b>1- 1</b>
Purpose and Scope	1- 1
Planning Factors	1- 1
Index of Training Courses	1- 3
Course 1001 (MPCS), Course Description	1- 4
Course 1001 (MPCS), Course Chart	1- 5
Course 1002 (SAS), Course Description	1- 8
Course 1002 (SAS), Course Chart	1- 9
Course 1003 (ICCP), Course Description	1- 10
Course 1003 (ICCP), Course Chart	1- 11
Course 1004 (RSS), Course Description	1- 14
Course 1004 (RSS), Course Chart	1- 15
Course 1100 (Gen. Fam.), Course Description	1- 18
Course 1100 (Gen. Fam.), Course Chart	1- 19
Course 1101 (MPCS), Course Description	1- 21
Course 1101 (MPCS), Course Chart	1- 22
Course 1102 (SAS), Course Description	1- 25
Course 1102 (SAS), Course Chart	1- 26
Course 1103 (ICCP), Course Description	1- 27
Course 1103 (ICCP), Course Chart	1- 28
Course 1104 (RSS), Course Description	1- 32
Course 1104 (RSS), Course Chart	1- 33
Course 1105 (OCCP, PSS), Course Description	1- 37
Course 1105 (OCCP, PSS), Course Chart	1- 38

## TABLE OF CONTENTS (Cont.)

	PAGE NO.
Course 1200 (Gen. Fam.), Course Description	1-40
Course 1200 (Gen. Fam.), Course Chart	1-41
Course 1201 (MPCS), Course Description	1-43
Course 1201 (MPCS), Course Chart	1-45
Course 1202 (SAS), Course Description	1-46
Course 1202 (SAS), Course Chart	1-47
Course 1203 (ICCP), Course Description	1-48
Course 1203 (ICCP), Course Chart	1-50
Course 1204 (RSS), Course Description	1-51
Course 1204 (RSS), Course Chart	1-52
Course 1205 (OCCP, PSS), Course Description	1-53
Course 1205 (OCCP, PSS), Course Chart	1-55
Training Schedule	1-56
 <b>PART II - Minuteman GES Associate Contractor Training Equipment Plan</b>	
Purpose and Scope	2-1
Planning Factors	2-1
Index of Training Equipment	2-3
<b>Trainer Descriptions</b>	
C1 - Minuteman System Orientation, Slide Trainer Package	2-6
C2 - Functional Description of Over-all GES, Slide Trainer Package	2-7
C3 - Functional Description of MPCS, Slide Trainer Package	2-8

## TABLE OF CONTENTS (Cont.)

	PAGE NO.
C4 - Functional Description of SAS, Slide Trainer Package	2-9
C5 - Functional Description of ICCP Slide Trainer Package	2-10
C6 - Functional Description of OCCP Slide Trainer Package	2-11
C7 - Functional Description of RSS, Slide Trainer Package	2-12
C8 - Functional Description of PSS, Slide Trainer Package	2-13
C9 - Digital Logic, Slide Trainer Package	2-14
C10- Typical Logic Utilization, Slide Trainer Package	2-15
C11- MPCS Interface, Slide Trainer Package	2-16
C12- LCF, MPCS, Slide Trainer Package	2-17
C13- LF, SAS, Slide Trainer Package	2-18
C14- LCF, MPCS Detail Block Theory, Slide Trainer Package	2-19
C15- LF, SAS Detail Block Theory, Slide Trainer Package	2-20
C16- MPCS Basic Timing Generation, Slide Trainer Package	2-21
C17- MPCS Radio and Cable Timing Distribution, Slide Trainer Package	2-22
C18- MPCS Command Generation, Slide Trainer Package	2-23
C19- MPCS Communications Network Buffering, Slide Trainer Package	2-24
C20- MPCS Command Control Console, Slide Trainer Package	2-25

## TABLE OF CONTENTS (Cont.)

	PAGE NO.
C21- MPCS Status Control Console, Slide Trainer Package	2-26
C22- MPCS, MPCU Block Diagram Slide Trainer Package	2-27
C23- SAS Auxiliary Status Block Diagram, Slide Trainer Package	2-28
C24- LF, Radio Timing Slide Trainer Package	2-29
C25- LF, Cable Timing Slide Trainer Package	2-30
C26- Radio Message Buffer, Slide Trainer Package	2-31
C27- Cable Message Buffer, Slide Trainer Package	2-32
C28- SAS Subsystem Fundamentals Slide Trainer Package	2-33
C29- ICCP, Cable Data Communications System, Slide Trainer Package	2-34
C30- ICCP, Voice Cable Communications System, Slide Trainer Package	2-35
C31- ICCP, SAC Communications, Slide Trainer Package	2-36
C32- OCCP Splice Box Assembly Trainer	2-37
C33- RSS Timing Control, Side Trainer Package	2-38
C34- RSS Transmit Slide Trainer Package	2-39
C35- RSS Receive, Slide Trainer Package	2-40
C36- RSS Divider, Slide Trainer Package	2-41
C37- RSS Antenna Mock-up	2-42
C38- Transparencies	2-43



## TABLE OF CONTENTS (Cont.)

	PAGE NO.
C39- Utility Handbook Reproduction	2-44
C40- GES Diagrams and Schematics for Student Use	2-45
C41- Development of GES Orientation Handbook	2-46
C42- Development of Order Mechanizations	2-47
C43- Development of Flow Charts	2-48
Sylvania GES R & D and GFE Equipment Availability	2-49
<b>APPENDIX A</b>	
Slide Trainer Package Technique	A-1

## LIST OF ILLUSTRATIONS

FIGURE NUMBER	TITLE	PAGE NO.
1-1	Training Course Schedule - Contracted	1-58
1-2	Training Course Schedule - Proposed	1-59
2-1	Test Facility Location	2-51
2-2	Floor Plan, GITP Site No. 1, LCF and LF	2-52
2-3	Floor Plan, GITP Site No. 2, LCF	2-53
2-4	Preliminary Listing of GITP and GFE Equipment Available for Training	2-54

**PART I**  
**MINUTEMAN GES ASSOCIATE CONTRACTOR**  
**TRAINING PLAN**

MINUTEMAN GES  
ASSOCIATE CONTRACTOR TRAINING PLAN

PURPOSE AND SCOPE

This section outlines and defines the training courses to be developed and conducted by Sylvania in accordance with contract AFO-(694)-261, task 13.3.2, 13.3.3 and 18.4. The courses are provided for associate contractors (including the GES contractor), STL, AFBSD, and selected USAF personnel involved in the operation and maintenance of the Minuteman GES. As the proposed training and/or training equipment is necessary in our opinion, but is in excess of limits set forth in Exhibit A section 18.4 of our contract, modification of contract price, terms and conditions will be necessary before the plan may be fully implemented.

PLANNING FACTORS

1. Personnel attending courses outlined in this document will possess previous Minuteman Wing I through V experience or equivalent training.
2. Three separate series of subsystem courses are outlined in this training plan. Only the first two series of subsystem courses are presently under contract.
  - a. The four types of one thousand series courses under contract include the MPCS, SAS, ICCP, and RSS courses, respectively. These courses will not provide detailed training in MGE due to the present scheduling of MGE design, nor will they provide practical demonstration and student performance on actual GES equipment. GES equipment (GITP) is not presently scheduled for training utilization until mid March 1964.
  - b. The six types of the eleven hundred series courses under contract include the Gen. Fam., MPCS, SAS, ICCP, RSS, and OCCP-PSS courses respectively. These courses will not provide practical demonstration and student performance on actual GES (GITP) equipment. Training in this series of courses does provide for theory of operation and handling procedures for MGE.
  - c. The six types of twelve hundred series, not presently under contract but are submitted for planning purposes at this time, include the Gen. Fam., MPCS, SAS, ICCP, RSS, and OCCP-PSS courses respectively. These courses will provide for both practical demonstration and student performance on actual GES equipment (GITP), and training on theory of operation and handling procedures for MGE.
3. Courses are categorized according to subsystem, with the exception of OCCP-PSS which is presented as one course, allowing for the development of proficiencies in the overall GES system or selected subsystem specialties.

4. Where possible, course student loading will be scheduled at the optimum as defined on the course description sheets.
5. Due to the high priority of the program being conducted by the primary equipment users, it may be necessary to schedule equipment exercises for the twelve hundred series course during hours and/or days not normally utilized for formal classroom and equipment activities.
6. Courses will be conducted at Sylvania's West Roxbury, Massachusetts Training Facility, 5 days per week, 8 hours per day. Classroom sessions will be 50 minutes in duration with a 10 minute break each hour. Equipment time, proposed for the twelve hundred series courses, will be a maximum of 4 hours in duration with one 15 minute break every four hours.
7. Personnel attending course 1002, 1102 and 1202 must possess a Secret Crypto clearance in addition to their Secret clearance.
8. In order to permit adequate preparation time to accommodate early training requirements (14 October), preliminary approval of this plan will be required no later than 30 September 1963.
9. The Sylvania GES complex has been divided into several subsystems as indicated in the following list:
  - a. Message Processing and Control Subsystem (MPCS)
  - b. Status Authentication Subsystem (SAS)
  - c. Inside Cable Communications Plant (ICCP)
  - d. Outside Cable Communications Plant (OCCP)
  - e. Radio Subsystem (RSS)
  - f. Power Subsystem (PSS)
10. It is assumed that the word "classes" as used in task 18.4 of Exhibit "A" of our contract refers to that unit of time required to teach MPCS/SAS or ICCP, or RSS, or OCCP/PSS. MPCS/SAS has been considered as one class since SAS is a functional part of MPCS but for security purposes has been defined as a separate subsystem. It is also assumed that the word "Course" as used in task 18.4 of Exhibit "A" of our contract refers to the presentation of one 1000 or 1100 series GES's course excluding the General Familiarization course in the 1100 series.

## INDEX OF TRAINING COURSES

COURSE NUMBER	COURSE TITLE	COURSE DURATION
1001	Message Processing and Control Subsystem (MPCS)	240 Hours
1002	Status Authentication Subsystem (SAS)	40 Hours
1003	Inside Cable Communications Plant (ICCP)	120 Hours
1004	Radio Subsystem (RSS)	120 Hours
1100	Minuteman GES General Familiarization	40 Hours
1101	Message Processing and Control Subsystem (MPCS)	304 Hours
1102	Status Authentication Subsystem (SAS)	56 Hours
1103	Inside Cable Communications (ICCP)	160 Hours
1104	Radio Subsystem (RSS)	160 Hours
1105	Outside Cable Communications Plant (OCCP) Power Subsystem (PSS)	40 Hours
1200	Minuteman GES General Familiarization	40 Hours
1201	Message Processing and Control Subsystem (MPCS)	368 Hours
1202	Status Authentication Subsystem (SAS)	72 Hours
1203	Inside Cable Communications Plant (ICCP)	200 Hours
1204	Radio Subsystem (RSS)	200 Hours
1205	Outside Cable Communications Plant (OCCP) Power Subsystem (PSS)	48 Hours

## COURSE DESCRIPTION

COURSE TITLE: Message Processing and Control Subsystem (MPCS)

COURSE NUMBER: 1001

COURSE LENGTH: 240 Hours

SECURITY CLASSIFICATION: Secret

STUDENT LOAD: Optimum - 8  
Maximum - 10

COURSE OBJECTIVE: To insure that maintenance personnel selected to participate in the 1001 course are knowledgeable in the theory and operational principles applicable to the MPCS.

COURSE SCOPE: Training includes a functional description of the overall GES with specific emphasis afforded the MPCS. Scope of the training is designed to also include theory of operation, detailed circuit analysis, diagnosing, and fault isolation in the command control console, status control console, MPCU, magnetic drum, associated timing and control circuitry, and other essential components of the MPCS.

METHOD OF PRESENTATION:	TIME ALLOTTED:
Theoretical instruction	216 Hours
Student participation in problem analysis	24 Hours

RECOMMENDED FOR: Electronic Maintenance Personnel

COURSE PREREQUISITES: The trainee assigned to this course must have the following qualifications:

1. Familiarity with large scale automatic data processing system philosophy.
2. Training and experience in electrical and electronic theory as applied to automatic digital solid state data processing equipment including boolean algebra, computer numbering systems, transistor theory, and computer logic techniques.
3. Knowledge of electromechanical fundamentals associated with ancillary equipment such as printers, card readers, and drum memories.

<b>COURSE CHART</b>	
<b>NO.:</b> 1001	
<b>TITLE:</b> Message Processing and Control Subsystem (MPCS)	
<b>I</b> 2 Hours	<b>MINUTEMAN WING VI ORIENTATION</b>  Training Facility Administrative Procedures (0.25 Hour) Minuteman Wing VI Orientation (1.75 Hours)
<b>II</b> 2.5 Hours	<b>GES ORIENTATION</b>  Functional Description of ICCP (1 Hour) Functional Description of OCCP (0.25 Hour) Functional Description of RSS (1 Hour) Functional Description of PSS (0.25 Hour)
<b>III</b> 3.5 Hours	<b>MPCS DESCRIPTION</b>  Functional Description of MPCS (3.5 Hours)
<b>IV</b> 20 Hours	<b>OPERATIONAL PROGRAM</b>  Introduction (8 Hours) Basic Functions of Individual Programs (4 Hours) Operational Program Logical Flow (4 Hours) Operational Program Information Flow (4 Hours)
<b>V</b> 4 Hours	<b>BASIC CIRCUITS</b>  Logic Circuits (1 Hour) Pulse Circuits (1 Hour) Special Circuits (2 Hours)
<b>VI</b> 8 Hours	<b>BASIC LOGIC AND LOGIC CONFIGURATIONS</b>  Sylvania's Utilization of 806B (1 Hour) Basic Counters (1 Hour) AND, OR, Exclusive OR and Comparator Circuits (1.5 Hours) Serial Adders (1 Hour) Introduction of Mechanizations (1 Hour) Practical Exercises (2.5 Hours)
<b>VII</b> 8 Hours	<b>MESSAGE FORMATS</b>  Critical Commands (2 Hours) Non-Critical Commands (6 Hours)

## COURSE CHART

**NO.:** 1001

**TITLE:** Message Processing and Control Subsystem (MPCS)

VIII 4 Hours	<p><b>POWER SUPPLIES</b></p> <p>Console Power Supplies (1 Hour) LCF, MPCU Power Supplies (3 Hours)</p>
IX 12 Hours	<p><b>CYCLE TIMING CONTROL DISTRIBUTOR</b></p> <p>Counters (2 Hours) Timing Functions (6 Hours) Review, Exam No. 1, and Critique (4 Hours)</p>
X 76 Hours	<p><b>MESSAGE PROCESSING CONTROL UNIT (MPCU)</b></p> <p>Introduction (8 Hours) Basic Drum Memory Circuits (4 Hours) Drum Memory and Associated Timing (4 Hours) Parallel Instructions (8 Hours) Serial Instructions, Non Read/Write (8 Hours) Read and Write Instruction (12 Hours) Instruction Extraction (8 Hours) Control Circuits for Display Track (4 Hours) Input Output Track Interface (4 Hours) Diagnostic Techniques (4 Hours) Exercise Routines (4 Hours) DIR Interface (4 Hours) Review, Exam No. 2, and Critique (4 Hours)</p>
XI 20 Hours	<p><b>COMMUNICATION NETWORK SYSTEM BUFFER</b></p> <p>Radio Input/Output Functions (4 Hours) Cable Input/Output Functions (4 Hours) Status Cable Input (6 Hours) Transmitter Control (4 Hours) Remote Sync. (2 Hours)</p>
XII 16 Hours	<p><b>COMMAND CONTROL CONSOLE</b></p> <p>Description of Switches and Indicators (4 Hours) Operator Routines (4 Hours) Console Wiring and Circuits (7 Hours) Card Reader (1 Hour)</p>



<b>COURSE CHART</b>	
<b>NO.:</b> 1001	
<b>TITLE:</b> Message Processing and Control Subsystem (MPCS)	
XIII 8 Hours	<p><b>GREENWICH MEAN TIME STANDARD</b></p> <p>Preset Clock Circuitry (1 Hour)            Save Field Clock Circuitry (1 Hour)            Incrementing Clock Field (1 Hour)            Operational Program Applied to GMT (1 Hour)            Calibration Circuitry and Procedures (4 Hours)</p>
XIV 20 Hours	<p><b>STATUS CONTROL CONSOLE</b></p> <p>Description of Switches and Indicator (4 Hours)            Operating Procedures (4 Hours)            Console Wiring and Circuits (6 Hours)            MAD Memory and Display Circuits (6 Hours)</p>
XV 16 Hours	<p><b>COMMAND GENERATING UNIT</b></p> <p>Introduction (8 Hours)            Logic Operation (6 Hours)            Miscellaneous Functions (2 Hours)</p>
XVI 12 Hours	<p><b>LINE PRINTER AND BUFFER</b></p> <p>Line Printer (8 Hours)            Line Printer Buffer (4 Hours)</p>
XVII 4 Hours	<p><b>INTRODUCTION TO MGE</b></p> <p>Introduction to MPCS/MGE (4 Hours)</p>
XVIII 4 Hours	<p><b>COURSE REVIEW AND TERMINATION</b></p> <p>Review, Exam No. 3, and Critique (4 Hours)</p>

COURSE DESCRIPTION

COURSE TITLE: Status Authentication Subsystem (SAS)  
COURSE NUMBER: 1002  
COURSE LENGTH: 40 Hours  
SECURITY CLASSIFICATION: Secret Crypto  
STUDENT LOAD Optimum- 8  
Maximum- 10

COURSE OBJECTIVE: This course provides selected maintenance personnel with the theory and operational procedures applicable to the SAS.

COURSE SCOPE: Training includes the functional role of the SAS in the GES, its association with the MPCS, detailed theory of operation, diagnosing and fault isolation techniques. The SAS equipment associated with both the LCF and LF will be covered in detail.

METHOD OF PRESENTATION:	TIME ALLOTTED:
Theoretical Instruction	36 Hours
Student participation in problem analysis	4 Hours

RECOMMENDED FOR: Electronic Maintenance Personnel

COURSE PREREQUISITES: The trainee assigned to this course must have the following qualifications:

1. Secret Crypto clearance in addition to a secret clearance.
2. Must have successfully completed course No. 1001.

**COURSE CHART**

**NO.:** 1002

**TITLE:** Status Authentication Subsystem (SAS)

I 2 Hours	<p><b>SAS DESCRIPTION</b></p> <p>Introduction (0.5 Hour)                  Functional Descriptions (1 Hour)                  SAS Fundamentals (0.5 Hour)</p>
II 3 Hours	<p><b>SAS SPECIALIZED CIRCUITS AND POWER SUPPLIES</b></p> <p>Specialized Circuits (0.5 Hour)                  Power Supplies (2.5 Hours)</p>
III 13 Hours	<p><b>SAS THEORY OF OPERATION AT THE LCF</b></p> <p>Tuning and Controls (1 Hour)                  Detailed Theory of Operation (12 Hours)</p>
IV 18 Hours	<p><b>SAS THEORY OF OPERATION AT THE LF</b></p> <p>Detail Theory of Operation (18 Hours)</p>
V 2 Hours	<p><b>INTRODUCTION TO MGE</b></p> <p>Introduction to MGE (2 Hours)</p>
VI 2 Hours	<p><b>COURSE REVIEW AND TERMINATION</b></p> <p>Review, Exam No. 1, and Critique (2 Hours)</p>

## COURSE DESCRIPTION

COURSE TITLE: Inside Cable Communications Plant (ICCP)  
 COURSE NUMBER: 1003  
 COURSE LENGTH: 120 Hours  
 SECURITY CLASSIFICATION: Secret  
 STUDENT LOAD: Optimum - 8  
 Maximum - 10

COURSE OBJECTIVE: To insure that maintenance personnel selected to participate in the 1003 course are knowledgeable in the theory and operational procedures applicable to the ICCP.

COURSE SCOPE: This course is designed to provide for training of selected personnel in the skills and knowledge that may be required of them while performing technical assignments related to the Inside Cable Communications Plant. Training will be designed to include theory of operation, detailed circuit analysis and malfunction isolation of the command and status system, launch enable system, missile away system, primary alert system, hardened voice system emergency war order systems one and two, maintenance communication network, pressurization and alarm system, cable system SAC communication interface and all other essential components of the ICCP.

METHOD OF PRESENTATION:	TIME ALLOTTED:
Theoretical Instructions	108 Hours
Student participation in problem analysis	12 Hours

RECOMMENDED FOR: Electronic Maintenance Personnel

COURSE PREREQUISITES: The trainee assigned to this course must have the following qualifications:

1. Familiarity with large scale voice and cable transmission and receiving philosophy.
2. Training and experience in electrical and electronic theory as applied to voice and cable transmission and receiving equipment including transistor theory, digital logic circuits, and analogue circuit techniques.

### COURSE CHART

**NO.:** 1003

**TITLE:** Inside Cable Communications Plant (ICCP)

I 2 Hours	<p><b>MINUTEMAN WING VI ORIENTATION</b></p> <p>Training Facility Administrative Procedures (0.25 Hour) Minuteman Wing VI Orientation (1.75 Hours)</p>
II 2.5 Hours	<p><b>GES ORIENTATION</b></p> <p>Functional Description of MPCS (1 Hour) Functional Description of OCCP (0.25 Hour) Functional Description of RSS (1 Hour) Functional Description of PSS (0.25 Hour)</p>
III 4 Hours	<p><b>ICCP DESCRIPTION DATA</b></p> <p>Functional Description of ICCP Data (4 Hours)</p>
IV 20 Hours	<p><b>BASIC CIRCUITS AND POWER SUPPLIES</b></p> <p>Digital Circuits (4 Hours) Analogue Circuits (8 Hours) Special Circuits (4 Hours) Power Supplies (4 Hours)</p>
V 4 Hours	<p><b>COMMAND AND STATUS SUBSYSTEM INTRODUCTION</b></p> <p>Transmit Mode Requirements (1 Hour) Receive Mode Requirements (1 Hour) General System Solutions (1 Hour) Route Through Capability and Interface (1 Hour)</p>
VI 12 Hours	<p><b>DETAILED COMMAND AND STATUS SUBSYSTEM DESCRIPTION</b></p> <p>Commands, Transmit/Receive (4 Hours) Status, Transmit/Receive (3 Hours) Mode Switching Capabilities (1 Hour) Review, Exam No. 1, and Critique (4 Hours)</p>

### COURSE CHART

**NO.:** 1003

**TITLE:** Inside Cable Communications Plant (ICCP)

VII 32 Hours	<p><b>CABLE DATA COMMUNICATIONS SYNCHRONIZATION</b></p> <p>System Requirements (2 Hours)            General System Solution (14 Hours)            Master Synchronization (5 Hours)            LCF Command Synchronization (5 Hours)            LF Status Synchronization (3 Hours)            LF Synchronization Logic (3 Hours)</p>
VIII 4 Hours	<p><b>MISSILE AWAY SUBSYSTEM</b></p> <p>System Requirements (1 Hour)            General System Solution (1 Hour)            LCF Equipment (1 Hour)            LF Equipment (1 Hour)</p>
IX 4 Hours	<p><b>LAUNCH ENABLE SUBSYSTEM</b></p> <p>Systems Requirements (1 Hour)            General System Solution (1 Hour)            LCF Equipment (1 Hour)            LF Equipment (1 Hour)</p>
X 8 Hours	<p><b>CABLE DATA RACK LAYOUT AND CABLE ROUTING</b></p> <p>Rack Layout (2 Hours)            Cable Routing (2 Hours)            Review, Exam No. 2, and Critique (4 Hours)</p>
XI 4 Hours	<p><b>INTRODUCTION TO VOICE CABLE COMMUNICATIONS SYSTEM</b></p> <p>Voice Cable System Philosophy (2 Hours)            SAC Communications System (2 Hours)</p>
XII 3 Hours	<p><b>HARDENED VOICE SYSTEM - HVC (VOICE CABLE SYSTEM)</b></p> <p>Block Diagrams (0.5 Hour)            Equipment (2 Hours)            Interface (0.5 Hour)</p>

<b>COURSE CHART</b>	
<b>NO.:</b> 1003	
<b>TITLE:</b> Inside Cable Communications Plant (ICCP)	
XIII 1 Hour	<p><b>EMERGENCY WAR ORDER - EWO - 2 (VOICE CABLE SYSTEM)</b></p> <p>Block Diagram (0.25 Hour) Equipment (0.75 Hour)</p>
XIV 2 Hours	<p><b>EMERGENCY WAR ORDER - FWO - 1 (VOICE CABLE SYSTEM)</b></p> <p>Block Diagram (0.5 Hour) Equipment (1 Hour) Interface (0.5 Hour)</p>
XV 3 Hours	<p><b>PRIMARY ALERT SYSTEM - PAS (VOICE CABLE SYSTEM)</b></p> <p>Block Diagram (1.5 Hours) Equipment (0.5 Hour) Interface (1 Hour)</p>
XVI 5.5 Hours	<p><b>MAINTENANCE COMMUNICATION NETWORK (VOICE CABLE SYSTEM)</b></p> <p>Interphone Block Diagram (1 Hour) Interphone Equipment at LCF (1 Hour) Interphone Equipment at LF (1 Hour) Interphone Interfaces at LCF and LF (0.5 Hour) Direct Line Block Diagram (0.25 Hour) Direct Line Equipment (1 Hour) Direct Line Interfaces (0.25 Hour) Dial Line Block Diagram (0.5 Hour)</p>
XVII 4 Hours	<p><b>VOICE SWITCH AND CONTROL (VOICE CABLE SYSTEM)</b></p> <p>Block Diagram (2 Hours) Equipment (1 Hour) Interfaces (1 Hour)</p>
XVIII 5 Hours	<p><b>VOICE CABLE DATA RACK LAYOUT AND CABLE ROUTING</b></p> <p>Racks Layout (1 Hour) Cable Routing (1 Hour) Review, Exam No. 3 and Critique (3 Hours)</p>

## COURSE DESCRIPTION

COURSE TITLE: Radio Subsystem (RSS)  
 COURSE NUMBER: 1004  
 COURSE LENGTH: 120 Hours  
 SECURITY CLASSIFICATION: Secret  
 STUDENT LOAD: Optimum - 8  
 Maximum- 10

COURSE OBJECTIVE: To insure that course attendees possess technical proficiencies in the theory and operational procedures applicable to RSS.

COURSE SCOPE: This course is composed of a detailed technical description of the RSS including the antenna system, timing circuits, transmitting mode receiving mode, and all other associated electronics.

METHOD OF PRESENTATION:	TIME ALLCOTTFD:
Theoretical Instruction	108 Hours
Student participation in problem analysis	12 Hours

RECOMMENDED FOR: Electronic Maintenance Personnel

COURSE PREREQUISITES: The trainee assigned to this course must have the following qualifications:

1. Familiarity with radio system data transmission and receiving techniques.
2. Training and experience in electrical and electronic theory as applied to radio system data transmission, including transistor theory, digital logic techniques, analogue techniques as applied to radio systems, and antenna systems.



<b>COURSE CHART</b>	
<b>NO.:</b> 1004	
<b>TITLE:</b> Radio Subsystem (RSS)	
<b>I</b> 2 Hours	<b>MINUTEMAN WING VI ORIENTATION</b>  Training Facility Administrative Procedures (0.25 Hour) Minuteman Wing VI Orientation (1.75 Hours)
<b>II</b> 2.5 Hours	<b>GES ORIENTATION</b>  Functional Description of MPCS (1 Hour) Functional Description of ICCP (1 Hour) Functional Description of OCCP (0.25 Hour) Functional Description of PSS (0.25 Hour)
<b>III</b> 4 Hours	<b>INTRODUCTION TO RADIO SUBSYSTEM</b>  Introduction to RSS (2 Hours) Rack and Drawer Layout (0.5 Hour) Receiver Data Flow (0.5 Hour) Exciter Data Flow (0.5 Hour) Transmitter Data Flow (0.5 Hour)
<b>IV</b> 4 Hours	<b>ANTENNA AND ANTENNA TUNER</b>  Physical Description (2 Hours) Characteristics (2 Hours)
<b>V</b> 4 Hours	<b>MESSAGE FORMAT</b>  Message Characteristics (2 Hours) Message Parameters (1 Hour) Message Formats (1 Hour)
<b>VI</b> 16 Hours	<b>RSS BLOCKS DIAGRAM (TRANSMIT/RECEIVE)</b>  Front End Circuitry (1 Hour) Mixing and Integrating Circuitry (2 Hours) Detection (2 Hours) Timing and Synthesis (2 Hours) Exciter (2 Hours) Operational Programmer (2 Hours) Synchronization (2 Hours) RF Power Amplifier (1 Hour) RF Power Amplifier Control (2 Hours)

<b>COURSE CHART</b>	
<b>NO.:</b> 1004	
<b>TITLE:</b> Radio Subsystem (RSS)	
VII 22 Hours	<p><b>RSS, LOGIC LEVEL (TRANSMIT/RECEIVE)</b></p> <p>Front End Circuitry (1 Hour)            Mixing and Integrating Circuitry (2 Hours)            Detection (2 Hours)            Timing and Synthesis (2 Hours)            Exciter (2 Hours)            Operational Programmer (2 Hours)            Synchronization (2 Hours)            RF Power Amplifier (1 Hour)            RF Power Amplifier Control (2 Hours)            Review, Exam No. 1, and Critique (6 Hours)</p>
VIII 4 Hours	<p><b>PRECISION OSCILLATOR</b></p> <p>General Description (1 Hour)            Function Design (0.5 Hour)            Oscillator Circuitry (2 Hours)            Oscillator Oven and Crystal Oven (0.5 Hour)</p>
IX 4 Hours	<p><b>VARIABLE DIVIDER</b></p> <p>General Description (1 Hour)            Block Diagram Analysis (1 Hour)            Circuit Analysis (2 Hours)</p>
X 4 Hours	<p><b>DIVIDERS</b></p> <p>Regenerative Frequency Divider (2 Hours)            Digital Dividers (2 Hours)</p>
XI 8 Hours	<p><b>RECFIVER SCHEMATICS</b></p> <p>Receiver Circuits - Front End (0.5 Hour)            Receiver Circuits - Receiving and Integration (1 Hour)            Receiver Circuits - Digital Phase Detection (1.5 Hours)            Receiver Circuits - Timing (1 Hour)            Receiver Circuits - Exciter (1 Hour)            Receiver Circuits - Operational Programmer (1 Hour)            Receiver Circuits - Self Verification (1 Hour)            Receiver Circuits - Synchronization (1 Hour)</p>

## COURSE CHART

NO.: 1004

TITLE: Radio Subsystem (RSS)

XII 14 Hours	<p><b>TRANSMITTER SCHEMATICS</b></p> <p>Preamplifier (1 Hour)  RF Amplifier (2 Hours)  Standing Wave Ratio Indicator No. 1, and No. 2 (1 Hour)  Excitation Control (1.5 Hours)  Self Verification (1 Hour)  Power and T-R Control (0.5 Hour)  Output Filter (0.5 Hour)  T-R Switch and Electrical Surge Arrestors (0.5 Hour)  Review, Exam No. 2, and Critique (6 Hours)</p>
XIII 4 Hours	<p><b>RACK AND DRAWER LAYOUT</b></p> <p>General Description (1 Hour)  Functional Description (1 Hour)  RFI Reduction Techniques (1 Hour)  Marking and Identification (1 Hour)</p>
XIV 4 Hours	<p><b>INTERFACES</b></p> <p>Interfaces at the LCF (2 Hours)  Interfaces at the LF (2 Hours)</p>
XV 4 Hours	<p><b>RSS POWER SUPPLIES</b></p> <p>General Description (1 Hour)  Functional Design (1 Hour)  Regulation (2 Hours)</p>
XVI 11.5 Hours	<p><b>MAINTENANCE PHILOSOPHY</b></p> <p>Rack, Drawer, Card at the LCF (6.5 Hours)  Rack, Drawer, Card at the LF (5 Hours)</p>
XVII 8 Hours	<p><b>COURSE REVIEW AND TERMINATION</b></p> <p>Review (4 Hours)  Final Exam (2 Hours)  Critique (2 Hours)</p>

COURSE DESCRIPTION

COURSE TITLE: Minuteman GES General Familiarization  
COURSE NUMBER: 1100  
COURSE LENGTH: 40 Hours  
SECURITY CLASSIFICATION: Secret  
STUDENT LOAD: Optimum - 8  
Maximum-10

COURSE OBJECTIVE: This course provides a functional description of the over-all GES and defines the over-all philosophy of each individual subsystem.

COURSE SCOPE: Training includes GES interface with other Minuteman systems, a functional description of the over-all GES and each GES subsystem. The scope of training will provide management personnel with exposure to system and subsystem philosophy which will assist them in performing their supervisory responsibilities.

METHOD OF PRESENTATION:	TIME ALLOTTED:
Lecture	38 Hours
Student Testing	2 Hours

RECOMMENDED FOR: Supervisory Personnel

COURSE PREREQUISITES: The trainee assigned to this course must have the following qualification:

1. Familiarity with large electronic system philosophy equivalent to that found in missile systems.

<b>COURSE CHART</b>	
<b>NO.:</b> 1100	
<b>TITLE:</b> Minuteman GES General Familiarization	
<b>I</b> 2 Hours	<b>MINUTEMAN WING VI ORIENTATION</b>  Training Facility Administrative Procedures (0.25 Hour) Minuteman Wing VI Orientation (1.75 Hours)
<b>II</b> 3.5 Hours	<b>GES ORIENTATION</b>  Functional Description of MPCS (1 Hour) Functional Description of ICCP (1 Hour) Functional Description of OCCP (0.25 Hour) Functional Description of RSS (1 Hour) Functional Description of PSS (0.25 Hour)
<b>III</b> 3.5 Hours	<b>MPCS DESCRIPTION</b>  Introduction to MPCS Principles of Operation (3.5 Hours)
<b>IV</b> 2 Hours	<b>GES MESSAGE FORMATS</b>  Critical Commands (1 Hour) Non-Critical Commands (1 Hour)
<b>V</b> 19 Hours	<b>OPERATIONAL PROGRAM</b>  Introduction (7 Hours) Basic Functions of Individual Programs (4 Hours) Operational Program Logical Flow (4 Hours) Operational Program Information Flow (4 Hours)
<b>VI</b> 4 Hours	<b>CONSOLE OPERATION</b>  Command Control Console (2 Hours) Status Control Console (2 Hours)
<b>VII</b> 3 Hours	<b>ICCP DESCRIPTION</b>  Functional Description of Data Cable System (1 Hour) Functional Description of Voice Cable System (2 Hours)

**COURSE CHART**

**NO.:** 1100 (cont.)

**TITLE:** Minuteman GES General Familiarization

VIII 3 Hours	<p><b>COURSE REVIEW AND TERMINATION</b></p> <p>Review, Final Exam, Critique (3 Hours)</p>

## COURSE DESCRIPTION

COURSE TITLE: Message Processing and Control Subsystem (MPCS)

COURSE NUMBER: 1101

COURSE LENGTH: 304 Hours

SECURITY CLASSIFICATION: Secret

STUDENT LOAD: Optimum - 8  
Maximum - 10

**COURSE OBJECTIVE:** To insure that maintenance personnel selected to participate in the 1101 course are knowledgeable in the theory and operational procedures that are applicable to the Message Processing and Control Subsystem.

**COURSE SCOPE:** Training includes a functional description of the over-all GES with specific emphasis afforded the Message Processing and Control Subsystem. Scope of training is designed to also include theory of operation, detailed circuit analysis, diagnosing and fault isolation in the command control console, status control console, MPCU, magnetic drum, associated timing and control circuitry and all other essential components of the MPCS. Training also provides for operating and handling procedures for specialized Maintenance Ground Equipment (MGE).

METHOD OF PRESENTATION:	TIME ALLOTTED:
Theoretical instruction	274 Hours
Student participation in problem analysis	30 Hours

**RECOMMENDED FOR:** Electronic Maintenance Personnel

**COURSE PREREQUISITES:** The trainee assigned to this course must have the following qualifications:

1. Familiarity with large scale automatic data processing system philosophy.
2. Training and experience in electrical and electronic theory as applied to automatic digital solid state data processing equipment including boolean algebra, computer numbering systems, transistor theory, and computer logic techniques.
3. Knowledge of electromechanical fundamentals associated with ancillary equipment such as printers, card readers, and drum memories.

<b>COURSE CHART</b>	
<b>NO. :</b> 1101	
<b>TITLE:</b> Message Processing and Control Subsystem (MPCS)	
<b>I</b>	<b>MINUTEMAN WING VI ORIENTATION</b> Training Facility Administrative Procedures (0.25 Hour) Minuteman Wing VI Orientation (1.75 Hours) <b>2 Hours</b>
<b>II</b>	<b>GES ORIENTATION</b> Functional Description of ICCP (1 Hour) Functional Description of OCCP (0.25 Hour) Functional Description of RSS (1 Hour) Functional Description of PSS (0.25 Hour) <b>2.5 Hours</b>
<b>III</b>	<b>MPCS DESCRIPTION</b> Functional Description of MPCS (3.5 Hours) <b>3.5 Hours</b>
<b>IV</b>	<b>OPERATIONAL PROGRAM</b> Introduction (8 Hours) Basic Functions of Individual Programs (4 Hours) Operational Program Logical Flow (4 Hours) Operational Program Information Flow (4 Hours) <b>20 Hours</b>
<b>V</b>	<b>BASIC CIRCUITS</b> Logic Circuits (1 Hour) Pulse Circuits (1 Hour) Special Circuits (2 Hours) <b>4 Hours</b>
<b>VI</b>	<b>BASIC LOGIC AND LOGIC CONFIGURATIONS</b> Sylvania's Utilization of 806B (1 Hour) Basic Counters (1 Hour) AND, OR, Exclusive OR and Comparator Circuits (1.5 Hours) Serial Adders (1 Hour) Introduction of Mechanizations (1 Hour) Practical Exercises (2.5 Hours) <b>8 Hours</b>
<b>VII</b>	<b>MESSAGE FORMATS</b> Critical Commands (2 Hours) Non-Critical Commands (6 Hours) <b>8 Hours</b>



<b>COURSE CHART</b>	
<b>NO.:</b> 1101	
<b>TITLE:</b> Message Processing and Control Subsystem (MPCS)	
VIII 4 Hours	<p><b>POWER SUPPLIES</b></p> <p>Console Power Supplies, "A" Design (1 Hour) LCF, MPCU Power Supplies, "B" Design (3 Hours)</p>
IX 12 Hours	<p><b>CYCLE TIMING CONTROL DISTRIBUTOR</b></p> <p>Counters (2 Hours) Timing Functions (6 Hours) Review, Exam No. 1, and Critique (4 Hours)</p>
X 92 Hours	<p><b>MESSAGE PROCESSING CONTROL UNIT (MPCU)</b></p> <p>Introduction (8 Hours) Basic Drum Memory Circuits (4 Hours) Drum Memory and Associated Timing (4 Hours) Parallel Instructions (8 Hours) Serial Instructions, Non Read/Write (8 Hours) Read and Write Instructions (12 Hours) Instruction Extraction (8 Hours) Introduction to MPCS Programming Techniques (16 Hours) Control Circuits for Display Track (4 Hours) Input Output Track Interface (4 Hours) Diagnostic Techniques (4 Hours) Exercise Routines (4 Hours) DIR Interface (4 Hours) Review, Exam No. 2, and Critique (4 Hours)</p>
XI 20 Hours	<p><b>COMMUNICATION NETWORK SYSTEM BUFFER</b></p> <p>Radio Input/Output Functions (4 Hours) Cable Input/Output Functions (4 Hours) Status Cable Input (6 Hours) Transmitter Control (4 Hours) Remote Sync. (2 Hours)</p>
XII 16 Hours	<p><b>COMMAND CONTROL CONSOLE</b></p> <p>Description of Switches and Indicators (4 Hours) Operator Routines (4 Hours) Console Wiring and Circuits (7 Hours) Card Reader (1 Hour)</p>

<b>COURSE CHART</b>	
<b>NO.:</b> 1101	
<b>TITLE:</b> Message Processing and Control Subsystem (MPCS)	
XIII 12 Hours	<b>GREENWICH MEAN TIME STANDARD</b> Preset Clock Circuitry (2 Hours) Preset Clock Circuitry (1 Hour) Save Field Clock Circuitry (1 Hour) Incrementing Clock Field (1 Hour) Operational Program Applied to GMT (1 Hour) Calibration Circuitry and Procedures (6 Hours)
XIV 20 Hours	<b>STATUS CONTROL CONSOLE</b> Description of Switches and Indicators (4 Hours) Operating Procedures (4 Hours) Console Wiring and Circuits (6 Hours) MAD Memory and Display Circuits (6 Hours)
XV 16 Hours	<b>COMMAND GENERATING UNIT</b> Introduction (8 Hours) Logic Operation (6 Hours) Miscellaneous Functions (2 Hours)
XVI 20 Hours	<b>LINE PRINTER AND BUFFER</b> Line Printer (12 Hours) Line Printer Buffer (4 Hours) Review, Exam No. 3, and Critique (4 Hours)
XVII 36 Hours	<b>MGE AND MAINTENANCE PHILOSOPHY</b> Introduction to MPCS/MGE (4 Hours) Diagnostic Program Techniques (4 Hours) MGE Equipment (28 Hours)
XVIII 8 Hours	<b>COURSE REVIEW AND TERMINATION</b> Review (2 Hours) Final Exam (4 Hours) Critique (2 Hours)

## COURSE DESCRIPTION

COURSE TITLE: Status Authentication Subsystem (SAS)  
 COURSE NUMBER: 1102  
 COURSE LENGTH: 56 Hours  
 SECURITY CLASSIFICATION: Secret Crypto  
 STUDENT LOAD: Optimum- 8  
 Maximum- 10

COURSE OBJECTIVE: This course provides the knowledge necessary to operate and maintain the SAS equipment.

COURSE SCOPE: Training includes the functional role of the SAS in the GES, its association with the MPCS, detailed theory of operation diagnosing, and fault isolation. The SAS equipment associated with both the LCF and LF will be covered in detail. Training also provides for operating and handling procedures for specialized Maintenance Ground Equipment (MGE).

METHOD OF PRESENTATION:	TIME ALLOTTED:
Theoretical Instruction	50 Hours
Student participation in problem analysis	6 Hours

RECOMMENDED FOR: Electronic Maintenance Personnel

COURSE PREREQUISITES: The trainee assigned to this course must have the following qualifications:

1. Secret crypto clearance in addition to a secret clearance.
2. Must have successfully completed course No. 1101.

<b>COURSE CHART</b>	
<b>NO.:</b> 1102	
<b>TITLE:</b> Status Authentication Subsystem (SAS)	
<b>I</b> 2 Hours	<b>SAS DESCRIPTION</b>  Introduction (0.5 Hour) Functional Description (1 Hour) SAS Fundamentals (0.5 Hour)
<b>II</b> 3 Hours	<b>SAS SPECIALIZED CIRCUITS AND POWER SUPPLIES</b>  Specialized Circuits (0.5 Hour) Power Supplies, "C" Design (2.5 Hours)
<b>III</b> 13 Hours	<b>SAS THEORY OF OPERATION AT THE LCF</b>  Timing and Controls (1 Hour) Detailed Theory of Operation (12 Hours)
<b>IV</b> 18 Hours	<b>SAS THEORY OF OPERATION AT THE LF</b>  Detail Theory of Operation (18 Hour)
<b>V</b> 17 Hours	<b>MGE AND MAINTENANCE PHILOSOPHY</b>  Introduction to MGE (1 Hour) MGE Equipment (16 Hours)
<b>VI</b> 3 Hours	<b>COURSE REVIEW AND TERMINATION</b>  Review, Exam No. 1, and Critique (3 Hours)

## COURSE DESCRIPTION

COURSE TITLE: Inside Cable Communications Plant (ICCP)  
 COURSE NUMBER: 1103  
 COURSE LENGTH: 160  
 SECURITY CLASSIFICATION: Secret  
 STUDENT LOAD: Optimum- 8  
 Maximum- 10

COURSE OBJECTIVE: To insure that maintenance personnel selected to participate in the 1103 course are knowledgeable in the theory and operational procedures that are applicable to the Inside Cable Communications Plant.

COURSE SCOPE: This course is designed to provide for training of selected personnel in the skills and knowledge that may be required of them while performing technical assignments related to the Inside Cable Communications Plant. Training will be designed to include theory of operation, detailed circuit analysis and malfunction isolation of the command and status system, launch enable system, missile away system, primary alert system, hardened voice system, emergency war order systems one and two, maintenance communication network, pressurization and alarm system, cable system, SAC communication interface and all other essential components of the ICCP. Training also provides for operating and handling procedures for specialized Maintenance Ground Equipment (MGE).

## METHOD OF PRESENTATION:

Theoretical Instruction  
 Student participation in  
 problem analysis

## TIME ALLOTTED:

144 Hours  
 16 Hours

RECOMMENDED FOR: Electronic Maintenance Personnel

COURSE PREREQUISITES: The trainee assigned to this course must have the following qualifications:

1. Familiarity with large scale voice and cable transmission and receiving philosophy.
2. Training and experience in electrical and electronic theory as applied to voice and cable transmission and receiving equipment including: transistor theory, digital logic circuits, and analogue circuit techniques.

<b>COURSE CHART</b>	
<b>NO.:</b> 1103	
<b>TITLE:</b> Inside Cable Communications Plant (ICCP)	
<b>I</b> 2 Hours	<p><b>MINUTEMAN WING VI ORIENTATION</b></p> <p>Training Facility Administrative Procedures (0.25 Hour) Minuteman Wing VI Orientation (1.75 Hours)</p>
<b>II</b> 2.5 Hours	<p><b>GES ORIENTATION</b></p> <p>Functional Description of MPCS (1 Hour) Functional Description of OCCP (0.25 Hour) Functional Description of RSS (1 Hour) Functional Description of PSS (0.25 Hour)</p>
<b>III</b> 4 Hours	<p><b>ICCP DESCRIPTION DATA</b></p> <p>Functional Description of ICCP Data (4 Hours)</p>
<b>IV</b> 20 Hours	<p><b>BASIC CIRCUITS AND POWER SUPPLIES</b></p> <p>Digital Circuits (4 Hours) Analogue Circuits (8 Hours) Special Circuits (4 Hours) Power Supplies (4 Hours)</p>
<b>V</b> 4 Hours	<p><b>COMMAND AND STATUS SUBSYSTEM INTRODUCTION</b></p> <p>Transmit Mode Requirements (1 Hour) Receive Mode Requirements (1 Hour) General System Solutions (1 Hour) Route Through Capability and Interface (1 Hour)</p>
<b>VI</b> 12 Hours	<p><b>DETAILED COMMAND AND STATUS SUBSYSTEM DESCRIPTION</b></p> <p>Commands, Transmit/Receive (4 Hours) Status, Transmit/Receive (3 Hours) Mode Switching Capabilities (1 Hour) Review, Exam No. 1, and Critique (4 Hours)</p>

<b>COURSE CHART</b>	
<b>NO.:</b> 1103	
<b>TITLE:</b> Inside Cable Communications Plant (ICCP)	
VII 32 Hours	<b>CABLE DATA COMMUNICATIONS SYNCHRONIZATION</b>  System Requirements (2 Hours) General System Solution (14 Hours) Master Synchronization (5 Hours) LCF Command Synchronization (5 Hours) LF Status Synchronization (3 Hours) LF Synchronization Logic (3 Hours)
VIII 4 Hours	<b>MISSILE AWAY SUBSYSTEM</b>  System Requirements (1 Hour) General System Solution (1 Hour) LCF Equipment (1 Hour) LF Equipment (1 Hour)
IX 4 Hours	<b>LAUNCH ENABLE SUBSYSTEM</b>  Systems Requirements (1 Hour) General System Solution (1 Hour) LCF Equipment (1 Hour) LF Equipment (1 Hour)
X 8 Hours	<b>CABLE DATA RACK LAYOUT AND CABLE ROUTING</b>  Rack Layout (2 Hours) Cable Routing (2 Hours) Review, Exam No. 2, and Critique (4 Hours)
XI 6 Hours	<b>PRESSURIZATION ALARM SYSTEM</b>  Block Diagram (1 Hour) Equipment (5 Hours)
XII 4 Hours	<b>INTRODUCTION TO VOICE CABLE COMMUNICATIONS SYSTEM</b>  Voice Cable System Philosophy (2 Hours) SAC Communications System (2 Hours)
XIII 3 Hours	<b>HARDENED VOICE SYSTEM - HVC (VOICE CABLE SYSTEM)</b>  Block Diagram (0.5 Hour) Equipment (2 Hours) Interface (0.5 Hour)

<b>COURSE CHART</b>	
<b>NO. :</b> 1103	
<b>TITLE:</b> Inside Cable Communications Plant (ICCP)	
<b>XIV</b> 1 Hour	<b>EMERGENCY WAR ORDER—EWO—2 (VOICE CABLE SYSTEM)</b>  Block Diagram (0.25 Hour) Equipment (0.75 Hour)
<b>XV</b> 2 Hours	<b>EMERGENCY WAR ORDER—EWO—1 (VOICE CABLE SYSTEM)</b>  Block Diagram (0.5 Hour) Equipment (1 Hour) Interface (0.5 Hour)
<b>XVI</b> 3 Hours	<b>PRIMARY ALERT SYSTEM—PAS (VOICE CABLE SYSTEM)</b>  Block Diagram (1.5 Hours) Equipment (0.5 Hour) Interface (1 Hour)
<b>XVII</b> 5.5 Hours	<b>MAINTENANCE COMMUNICATIONS NETWORK (VOICE CABLE SYSTEM)</b>  Interphone Block Diagram (1 Hour) Interphone Equipment at LCF (1 Hour) Interphone Equipment at LF (1 Hour) Interphone Interfaces at LCF and LF (0.5 Hour) Direct Sine Block Diagram (0.25 Hour) Direct Sine Equipment (1 Hour) Direct Sine Interfaces (0.25 Hour) Dial Line Block Diagram (0.5 Hour)
<b>XVIII</b> 4 Hours	<b>VOICE SWITCH AND CONTROL (VOICE CABLE SYSTEM)</b>  Block Diagram (2 Hours) Equipment (1 Hour) Interfaces (1 Hour)
<b>XIX</b> 5 Hours	<b>VOICE CABLE DATA RACK LAYOUT AND CABLE ROUTING</b>  Rack Layout (1 Hour) Cable Routing (1 Hour) Review, Exam No. 3 and Critique (3 Hours)



**COURSE CHART**

**NO.:** 1103

**TITLE:** Inside Cable Communications Plant (ICCP)

XX 4 Hours	<p><b>FAULT ISOLATION RACK</b></p> <p>Fault Isolation Rack (4 Hours)</p>
XXI 26 Hours	<p><b>MGE AND MAINTENANCE PROCEDURES</b></p> <p>MGE Equipment (22 Hours) Maintenance Procedures (4 Hours)</p>
XXII 4 Hours	<p><b>COURSE REVIEW AND TERMINATION</b></p> <p>Reviews (1 Hour) Final Exam (2 Hours) Critique (1 Hour)</p>

## COURSE DESCRIPTION

COURSE TITLE: Radio Subsystem (RSS)  
 COURSE NUMBER: 1104  
 COURSE LENGTH: 160 Hours  
 SECURITY CLASSIFICATION: Secret  
 STUDENT LOAD: Optimum- 8  
 Maximum- 10

**COURSE OBJECTIVE:** To insure that course attendees possess the technical proficiencies to rapidly and satisfactorily perform Radio Subsystem maintenance responsibilities.

**COURSE SCOPE:** This course is composed of a detailed technical description of the RSS including the antenna system, timing circuits, transmitting mode, receiving mode and all other associated electronics. Training also provides for specialized Maintenance Ground Equipment. (MGE)

METHOD OF PRESENTATION	TIME ALLOTTED:
Theoretical Instruction	134 Hours
Student participation in problem analysis	26 Hours

**RECOMMENDED FOR:** Electronic Maintenance Personnel

**COURSE PREREQUISITES:** The trainee assigned to this course must have the following qualifications:

1. Familiarity with radio system data transmission and receiving techniques.
2. Training and experience in electrical and electronic theory as applied to radio system data transmission, including transistor theory, digital logic techniques, analogue techniques as applied to radio system, and antenna systems.

<b>COURSE CHART</b>	
<b>NO.:</b>	1104
<b>TITLE:</b>	Radio Subsystem (RSS)
<b>I</b> 2 Hours	<b>MINUTEMAN WING VI ORIENTATION</b>  Training Facility Administrative Procedures (0.25 Hour) Minuteman Wing VI Orientation (1.75 Hours)
<b>II</b> 2.5 Hours	<b>GES ORIENTATION</b>  Functional Description of MPCS (1 Hour) Functional Description of ICCP (1 Hour) Functional Description of OCCP (0.25 Hour) Functional Description of PSS (0.25 Hour)
<b>III</b> 4 Hours	<b>INTRODUCTION TO RADIO SUBSYSTEM</b>  Introduction to RSS (2 Hours) Rack and Drawer Layout (0.5 Hour) Receiver Data Flow (0.5 Hour) Exciter Data Flow (0.5 Hour) Transmitter Data Flow (0.5 Hour)
<b>IV</b> 4 Hours	<b>ANTENNA AND ANTENNA TUNER</b>  Physical Description (2 Hours) Characteristics (2 Hours)
<b>V</b> 4 Hours	<b>MESSAGE FORMAT</b>  Message Characteristics (2 Hours) Message Parameters (1 Hour) Message Formats (1 Hour)
<b>VI</b> 16 Hours	<b>RSS BLOCK DIAGRAM (TRANSMIT/RECEIVE)</b>  Front End Circuitry (1 Hour) Mixing and Integrating Circuitry (2 Hours) Detection (2 Hours) Timing and Synthesis (2 Hours) Exciter (2 Hours) Operational Programmer (2 Hours) Synchronization (2 Hours) R.F. Power Amplifier (1 Hour) R.F. Power Amplifier Control (2 Hours)

<b>COURSE CHART</b>	
<b>NO.:</b>	1104
<b>TITLE:</b>	Radio Subsystem (RSS)
<b>VII</b> 22 Hours	<p><b>RSS LOGIC LEVEL (TRANSMIT/RECEIVE)</b></p> <p>Front End Circuitry (1 Hour)  Mixing and Integrating Circuitry (2 Hours)  Detection (2 Hours)  Timing and Synthesis (2 Hours)  Exciter (2 Hours)  Operational Programmer (2 Hours)  Synchronization (2 Hours)  R. F. Power Amplifier (1 Hour)  R. F. Power Amplifier Control (2 Hours)  Review, Exam No. 1, and Critique (6 Hours)</p>
<b>VIII</b> 4 Hours	<p><b>PRECISION OSCILLATOR</b></p> <p>General Description (1 Hour)  Function Design (0.5 Hour)  Oscillator Circuitry (2 Hours)  Oscillator Oven and Crystal Oven (0.5 Hour)</p>
<b>IX</b> 4 Hours	<p><b>VARIABLE DIVIDER</b></p> <p>General Description (1 Hour)  Block Diagram Analysis (1 Hour)  Circuit Analysis (2 Hours)</p>
<b>X</b> 4 Hours	<p><b>DIVIDERS</b></p> <p>Regenerative Frequency Divider (2 Hours)  Digital Dividers (2 Hours)</p>
<b>XI</b> 8 Hours	<p><b>RECEIVER SCHEMATICS</b></p> <p>Receiver Circuits—Front End (0.5 Hour)  Receiver Circuits—Receiving and Integration (1 Hour)  Receiver Circuits—Digital Phase Detection (1, 5 Hours)  Receiver Circuits—Tuning (1 Hour)  Receiver Circuits—Exciter (1 Hour)  Receiver Circuits—Operational Programmer (1 Hour)  Receiver Circuits—Self Verification (1 Hour)  Receiver Circuits—Synchronization (1 Hour)</p>

<b>COURSE CHART</b>	
<b>NO.:</b> 1104 <b>TITLE:</b> Radio Subsystem (RSS)	
<b>XII</b> 14 Hours	<b>TRANSMITTER SCHEMATICS</b>  Preamplifier (1 Hour) R. F. Amplifier (2 Hours) Standing Wave Ratio Indicator No. 1 and No. 2 (1 Hour) Excitation Control (1.5 Hours) Self-Verification (1 Hour) Power and T-R Control (0.5 Hour) Output Filter (0.5 Hour) T-R Switch and Electrical Surge Arrestors (0.5 Hour) Review, Exam No. 2, and Critique (6 Hours)
<b>XIII</b> 4 Hours	<b>RACK AND DRAWER LAYOUT</b>  General Description (1 Hour) Functional Description (1 Hour) R. F. I. Reduction Techniques (1 Hour) Marking and Identification (1 Hour)
<b>XIV</b> 4 Hours	<b>INTERFACES</b>  Interfaces at the LCF (2 Hours) Interfaces at the LF (2 Hours)
<b>XV</b> 10 Hours	<b>RSS POWER SUPPLIES</b>  General Description (1 Hour) Functional Design (1 Hour) Regulation (2 Hours) Review, Exam No. 3 and Critique (6 Hours)
<b>XVI</b> 45.5 Hours	<b>MAINTENANCE PHILOSOPHY AND MGE</b>  Rack, Drawer, Card at the LCF (6.5 Hours) Rack, Drawer, Card at the LF (5 Hours) Introduction to MGE (2 Hours) MGE Operational Description (2 Hours) MGE Detailed Block Diagram (8 Hours) Power Supply Evaluator (4 Hours) Digital Dividers (2 Hours) Synchronization Methods (6 Hours) Comparator/Sampler (4 Hours) Power Amplifier Evaluator (6 Hours)

**COURSE CHART**

**NO.:** 1104

**TITLE:** Radio Subsystem (RSS)

XVII 8 Hours	COURSE REVIEW AND TERMINATION
	Review (4 Hours)
	Final Exam (2 Hours)
	Critique (2 Hours)

## COURSE DESCRIPTION

**COURSE TITLE:** Outside Cable Communications Plant (OCCP) and Power Subsystem (PSS)

**COURSE NUMBER:** 1105

**COURSE LENGTH:** 40 Hours

**SECURITY CLASSIFICATION:** Secret

**STUDENT LOAD:** Optimum- 8  
Maximum- 10

**COURSE OBJECTIVE:** To provide course attendees with the theory and operational skills required to assure satisfactory performance while executing technical responsibilities related to OCCP and PSS.

**COURSE SCOPE:** To present detailed technical information on the OCCP and PSS which will include theory of operations and detailed circuit analysis on the pressurization alarm system, splice case assembly, cable configuration, primary power sources, battery charges, motor generator set, control equipment, and distribution equipment. Theory and operations of the Maintenance Ground Equipment (MGE) is included to qualify the trainee for its effective utilization.

<b>METHOD OF PRESENTATION:</b>	<b>TIME ALLOTTED:</b>
Theoretical Instruction	36 Hours
Student participation in problem analysis	4 Hours

**RECOMMENDED FOR:** Electronic Maintenance Personnel

**COURSE PREREQUISITES:** The trainee assigned to this course must have the following qualifications:

1. Familiarity with techniques involving power generation through the use of motor generator sets.
2. Training and experience in electrical and electronic theory as applied to motor generators, such as A.C. motors, D.C. motors, transistor theory, regulators, generators, and battery chargers.
3. Training and experience in electrical and electronic theory as applied to cable communications techniques, including bridge circuits, servo systems, and cable splicing.
4. Familiarity with pneumatic equipment associated with cable communications techniques.

<b>COURSE CHART</b>	
<b>NO. :</b>	1105
<b>TITLE:</b>	OCCP and PSS
<b>I</b> 2 Hours	<p><b>MINUTEMAN WING VI ORIENTATION</b></p> <p>Training Facility Administrative Procedures (0.25 Hour) Minuteman Wing VI Orientation (1.75 Hours)</p>
<b>II</b> 2 Hours	<p><b>GES ORIENTATION</b></p> <p>Functional Description of MPCS (0.5 Hour) Functional Description of ICCP (1 Hour) Functional Description of RSS (0.5 Hour)</p>
<b>III</b> 6 Hours	<p><b>PRESSURIZATION ALARM SYSTEM (OCCP)</b></p> <p>Block Diagram (1 Hour) Equipment (5 Hours)</p>
<b>IV</b> 2 Hours	<p><b>OUTSIDE CABLE ASSEMBLES (OCCP)</b></p> <p>Cable (0.25 Hour) Splice Case Assembly (0.50 Hour) Air Compressor Dryer (0.50 Hour) Cable Air Pressure Adapter (0.75 Hour)</p>
<b>V</b> 5 Hours	<p><b>MGE AND MAINTENANCE PROCEDURES (OCCP)</b></p> <p>Fault Isolation Procedures (0.50 Hour) Cable Splicing Techniques (2 Hours) MGE Theory of Operation (2 Hours) Maintenance Procedures (0.50 Hour)</p>
<b>VI</b> 1 Hour	<p><b>PRIMARY POWER (PSS)</b></p> <p>Commercial (0.25 Hour) Standby Power (0.50 Hour) DC Power (0.25 Hour)</p>
<b>VII</b> 0.5 Hour	<p><b>INTRODUCTION TO CONVERSION EQUIPMENT (PSS)</b></p> <p>Primary Power to DC (0.25 Hour) Primary Power to Special Purpose AC (0.25 Hour)</p>



<b>COURSE CHART</b>	
<b>NO.:</b> 1105	
<b>TITLE:</b> OCCP and PSS	
VIII 2 Hours	<b>BATTERY CHARGERS (PSS)</b>  160 Volt Battery Set (1 Hour) 32 Volt Battery Set (1 Hour)
IX 8 Hours	<b>MOTOR-GENERATOR SET (PSS)</b>  Motor (2 Hours) Generator (2 Hours) Control Equipment (4 Hours)
X 2 Hours	<b>DISTRIBUTION EQUIPMENT (PSS)</b>  LCC Power Panel (0.25 Hour) Power Distribution Junctions (0.5 Hour) Protective Devices (0.25 Hour) Cabling (1 Hour)
XI 0.5 Hours	<b>SURVIVAL LIGHTING EQUIPMENT (PSS)</b>  Equipment (0.50 Hour)
XII 5 Hours	<b>MGE AND MAINTENANCE PROCEDURES (PSS)</b>  MGE Theory of Operation (3 Hours) Maintenance Procedures (2 Hours)
XIII 4 Hours	<b>COURSE REVIEW AND TERMINATION (PSS)</b>  Review (1 Hour) Final Exam (2 Hours) Critique (1 Hour)

## COURSE DESCRIPTION

COURSE TITLE: Minuteman GES General Familiarization  
 COURSE NUMBER: 1200  
 COURSE LENGTH: 40 Hours  
 SECURITY CLASSIFICATION: Secret  
 STUDENT LOAD: Optimum - 8  
 Maximum - 10

COURSE OBJECTIVE: This course provides a functional description of the overall GES and defines the overall philosophy of each individual subsystem.

COURSE SCOPE: Training includes GES interface with other Minuteman systems and a functional description of the overall GES and each GES subsystem. The scope of training will provide management personnel with exposure to system and subsystem philosophy which will assist them in performing their supervisory responsibilities.

METHOD OF PRESENTATION:	TIME ALLOTTED:
Lecture	34 Hours
Student Testing	2 Hours
Equipment Demonstration on GES GTP equipment as con- figured at site 1 and site 2 installations	4 Hours

RECOMMENDED FOR: Supervisory Personnel

COURSE PREREQUISITES: The trainee assigned to this course must have the following qualifications:

1. Familiarity with large electronic system philosophy equivalent to that found in missile systems.

<b>COURSE CHART</b>	
<b>NO.:</b>	1200
<b>TITLE:</b>	Minuteman GES General Familiarization
<b>I</b> 2 Hours	<b>MINUTEMAN WING VI ORIENTATION</b>  Training Facility Administrative Procedures (0.25 Hour) Minuteman Wing VI Orientation (1.75 Hours)
<b>II</b> 3.5 Hours	<b>GES ORIENTATION</b>  Functional Description of MPCS (1 Hour) Functional Description of ICCP (1 Hour) Functional Description of OCCP (0.25 Hour) Functional Description of RSS (1 Hour) Functional Description of PSS (0.25 Hour)
<b>III</b> 3.5 Hours	<b>MPCS DESCRIPTION</b>  Introduction to MPCS Principles of Operation (3.5 Hours)
<b>IV</b> 2 Hours	<b>GES MESSAGE FORMATS</b>  Critical Commands (1 Hour) Non-Critical Commands (1 Hour)
<b>V</b> 19 Hours	<b>OPERATIONAL PROGRAM</b>  Introduction (7 Hours) Basic Functions of Individual Programs (4 Hours) Operational Program Logical Flow (4 Hours) Operational Program Information Flow (4 Hours)
<b>VI</b> 4 Hours	<b>CONSOLE OPERATION (TO BE CONDUCTED AT GITP AREA)</b>  Command Control Console (2 Hours) Status Control Console (2 Hours)
<b>VII</b> 3 Hours	<b>ICCP DESCRIPTION</b>  Functional Description of Data Cable System (1 Hour) Functional Description of Voice Cable System (2 Hours)

**COURSE CHART**

**NO.:** 1200 (cont.)

**TITLE:** Minuteman GES General Familiarization

VIII 3 Hours	<p>COURSE REVIEW AND TERMINATION</p> <p>Review, Final Exam, Critique (3 Hours)</p>

## COURSE DESCRIPTION

**COURSE TITLE:** Message Processing and Control Subsystem (MPCS)

**COURSE NUMBER:** 1201

**COURSE LENGTH:** 368 Hours

**SECURITY CLASSIFICATION:** Secret

**STUDENT LOAD:** Optimum- 8  
Maximum- 10

**COURSE OBJECTIVE:** To insure that maintenance personnel selected to participate in the 1201 course are knowledgeable in the maintenance and operational procedures that are applicable to the Message Processing and Control Subsystem.

**COURSE SCOPE:** Training includes a functional description of the over-all GES with specific emphasis afforded the Message Processing and Control Subsystem. Scope of training is designed to also include theory of operation, detailed circuit analysis, inspecting, testing, preventive maintenance, diagnosing and repairing of the command control console, status control console, MPCU, magnetic drum, associated timing and control circuitry and all other essential components of the MPCS. Training also provides for operating and handling procedures for specialized Maintenance Ground Equipment (MGE).

<b>METHOD OF PRESENTATION:</b>	<b>TIME ALLOTTED:</b>
Theoretical instruction	274 Hours
Student participation in problem analysis	30 Hours
Practical demonstration and student performance on GES GTP equipment as configured at site 1 and site 2 installations	64 Hours

**RECOMMENDED FOR:** Electronic Maintenance Personnel

**COURSE PREREQUISITES:** The trainee assigned to this course must have the following qualifications:

1. Familiarity with large scale automatic data processing system philosophy.
2. Training and experience in electrical and electronic theory as applied to automatic digital solid state data processing equipment including boolean algebra, computer numbering systems, transistor theory, and computer logic techniques.

COURSE DESCRIPTION (Cont.)

3. Knowledge of electromechanical fundamentals associated with ancillary equipment such as printers, card readers, and drum memories.
4. Experience with operation and usage of standard electronic test equipment such as meters, oscilloscopes, frequency generators, and counters.

**COURSE CHART**

**NO. :** 1201

**TITLE:** Message Processing and Control Subsystem (MPCS)

I thru XVIII 304 Hours	<p>MPCS COURSE No. 1201</p> <p>All eighteen sections of course 1101 are included in course 1201. (304 Hours)</p>
XIX 64 Hours	<p>LABORATORY EQUIPMENT, PRACTICAL EXERCISES</p> <p>This block of instructions will be devoted to student performance on actual GES equipment (64 Hours)</p>

## COURSE DESCRIPTION

COURSE TITLE: Status Authentication Subsystem (SAS)  
 COURSE NUMBER: 1202  
 COURSE LENGTH: 72 Hours  
 SECURITY CLASSIFICATION: Secret Crypto  
 STUDENT LOAD: Optimum- 8  
 Maximum- 10

COURSE OBJECTIVE: This course provides the knowledge necessary to operate and maintain the SAS equipment.

COURSE SCOPE: Training includes the functional role of the SAS subsystem in the GES, its association with the MPCS, detailed theory of operation, inspection, testing, preventive maintenance, diagnosing, and repairing. The SAS equipment associated with both the LCF and LF will be covered in detail. Training also provides for operating and handling procedures for specialized Maintenance Ground Equipment (MGE).

METHOD OF PRESENTATION:	TIME ALLOTTED:
Theoretical Instruction	50 Hours
Student participation in problem analysis	6 Hours
Practical demonstration and student performance on GES GTP equipment as configured at site 1 and site 2 installations	16 Hours

RECOMMENDED FOR: Electronic Maintenance Personnel

COURSE PREREQUISITES: The trainee assigned to this course must have the following qualifications:

1. Secret Crypto clearance in addition to a secret clearance.
2. Must have successfully completed course No. 1201.



**COURSE CHART**

**NO.:** 1202

**TITLE:** Status Authentication Subsystem (SAS)

<p>I thru VI 56 Hours</p>	<p>SAS COURSE No. 1202</p> <p>All six sections of course 1102 are included in course 1202. (56 Hours)</p>
<p>VII 16 Hours</p>	<p>LABORATORY EQUIPMENT, PRACTICAL EXERCISES</p> <p>This block of instruction will be devoted to student performance on actual GES equipment (16 Hours)</p>

## COURSE DESCRIPTION

**COURSE TITLE:** Inside Cable Communications Plant (ICCP)  
**COURSE NUMBER:** 1203  
**COURSE LENGTH:** 200  
**SECURITY CLASSIFICATION:** Secret  
**STUDENT LOAD:** Optimum- 8  
Maximum- 10

**COURSE OBJECTIVE:** To insure that maintenance personnel selected to participate in the 1203 course are knowledgeable in the maintenance and operational procedures that are applicable to the Inside Cable Communications Plant.

**COURSE SCOPE:** This course is designed to provide for training of selected personnel in the skills and knowledge that may be required of them while performing technical assignments related to the Inside Cable Communications Plant. Training will be designed to include theory of operation, detailed circuit analysis and malfunction isolation of the command and status system, launch enable system, missile away system, primary alert system, hardened voice system, emergency war order systems one and two, maintenance communication network, pressurization and alarm system, cable system, SAC communication interface and all other essential components of the ICCP. Training also provides for operating and handling procedures for specialized Maintenance Ground Equipment (MGE).

METHOD OF PRESENTATION:	TIME ALLOTTED:
Theoretical Instruction	144 Hours
Student participation in problem analysis	16 Hours
Practical demonstration and student performance on GES GTP equipment as configured at site 1 and site 2 installations	40 Hours

**RECOMMENDED FOR:** Electronic Maintenance Personnel

**COURSE PREREQUISITES:** The trainee assigned to this course must have the following qualifications:

1. Familiarity with large scale voice and cable transmission and receiving philosophy.
2. Training and experience in electrical and electronic theory as applied to voice and cable transmission and receiving equipment including transistor theory, digital logic circuits, and analogue circuit techniques.

COURSE DESCRIPTION (Cont.)

3. Experience with operation and usage of standard electronic test equipment such as meters, oscilloscopes, frequency generators, and counters.

**COURSE CHART**

**NO.:** 1203

**TITLE:** Inside Cable Communications Plant (ICCP)

I thru XXII  
160 Hours

ICCP COURSE No. 1203

All twenty-two sections of course 1103 are included in course 1203.  
(160 Hours)

XXIII  
40 Hours

LABORATORY EQUIPMENT, PRACTICAL EXERCISES

This block of instruction will be devoted to student performance on  
actual GES equipment (40 Hours)

## COURSE DESCRIPTION

COURSE TITLE: Radio Subsystem (RSS)  
 COURSE NUMBER: 1204  
 COURSE LENGTH: 200 Hours  
 SECURITY CLASSIFICATION: Secret  
 STUDENT LOAD: Optimum- 8  
 Maximum- 10

**COURSE OBJECTIVE:** To insure that course attendees possess the technical proficiencies to rapidly and satisfactorily perform Radio Subsystem maintenance responsibilities.

**COURSE SCOPE:** This course is composed of a detailed technical description of the RSS including the antenna system, timing circuits, transmitting mode, receiving mode and all other associated electronics. Training also provides for specialized Maintenance Ground Equipment (MGE).

METHOD OF PRESENTATION:	TIME ALLOTTED:
Theoretical Instruction	134 Hours
Student participation in problem analysis	26 Hours
Practical demonstration and student performance on GES GTP equipment as configured at site 1 and site 2 installation	40 Hours

**RECOMMENDED FOR:** Electronic Maintenance Personnel

**COURSE PREREQUISITES:** The trainee assigned to this course must have the following qualifications:

1. Familiarity with radio system data transmission and receiving techniques.
2. Training and experience in electrical and electronic theory as applied to radio system data transmission including transistor theory, digital logic techniques, analogue techniques as applied to radio systems, and antenna systems.
3. Experience with operation and usage of standard electronic test equipment such as meters, oscilloscopes, frequency generators and counters.

**COURSE CHART**

**NO.:** 1204

**TITLE:** Radio Subsystem (RSS)

<p>I thru XVII 160 Hours</p>	<p>RSS COURSE No. 1204</p> <p>All seventeen sections of course 1104 are included in course 1201. (160 Hours)</p>
<p>XVIII 40 Hours</p>	<p>LABORATORY EQUIPMENT, PRACTICAL EXERCISES</p> <p>This block of instruction will be devoted to student performance on actual GES equipment. (40 Hours)</p>

## COURSE DESCRIPTION

**COURSE TITLE:** Outside Cable Communications Plant (OCCP)  
Power Subsystem (PSS)

**COURSE NUMBER:** 1205

**COURSE LENGTH:** 48 Hours

**SECURITY CLASSIFICATION:** Secret

**STUDENT LOAD:** Optimum - 8  
Maximum - 10

**COURSE OBJECTIVE:** To provide the job knowledge necessary to enable selected personnel to operate and maintain the PSS.

**COURSE SCOPE:** To prevent detailed technical information on the OCCP and PSS which will include theory of operations and detailed circuit analysis on the pressurization alarm system, splice case assembly, cable configuration, primary power sources, battery charges, motor generator set, control equipment, and distribution equipment. Theory and operations of the Maintenance Ground Equipment (MGE) is included to qualify the trainee for its effective utilization.

METHOD OF PRESENTATION:	TIME ALLOTTED
Theoretical Instruction	36 Hours
Student participation in problem analysis	4 Hours
Practical demonstration and student performance on GES GTP equipment as configured at site 1 and site 2 installations	8 Hours

**RECOMMENDED FOR:** Electronic Maintenance Personnel

**COURSE PREREQUISITES:** The trainee assigned to this course must have the following qualifications:

1. Familiarity with techniques involving power generation through the use of motor generator sets.
2. Training and experience in electrical and electronic theory as applied to motor generators, such as A.C. motors, D.C. motors, transistor theory, regulators, generators, and battery chargers.
3. Training and experience in electrical and electronic theory as applied to cable communications techniques, including bridge circuits, servo systems, and cable splicing.

COURSE DESCRIPTION (Cont.)

4. Familiarity with pneumatic equipment associated with cable communications techniques.
5. Experience with operation and usage of standard electronic test equipment such as meters and oscilloscopes.



**COURSE CHART**

**NO.:** 1205

**TITLE:** Outside Cable Communications Plant (OCCP), Power Subsystem (PSS)

I thru XIII  
40 Hours

OCCP, PSS COURSE No. 1205

All thirteen sections of course 1105 are included in course 1205.  
(40 Hours)

XIV  
8 Hours

LABORATORY EQUIPMENT, PRACTICAL EXERCISES

This block of instruction will be devoted to student performance on  
actual GES equipment (8 Hours)

## TRAINING SCHEDULE

The training schedule contained on figure 1-1 is designed to satisfy training as defined in task 13.3.2, 13.3.3 and 18.4 of contract AF04(694)-261. Training which exceeds the boundaries established by this schedule will require contract modification and additional funding by the procuring agency.

Sylvania is not under contract to provide or in any way implement the training outlined on the schedule contained on figure 1-2. The training delineated on this schedule is for planning purposes only. It is submitted for BSD consideration and is designed to accommodate established and unknown GES training requirements of BSD selected military and civilian personnel who are or will be involved with all Minuteman R & D and A & CO functions which either exist or will develop on any Minuteman activity up to and including Wing VI.

Scheduling has been designed to provide for the development of individual maintenance and operational proficiencies in the overall GES or in specific subsystem specialties. Personnel who are required to become knowledgeable in the overall GES complex can satisfy this requirement by attending subsystem courses which are presented sequentially and are depicted on the schedule by broken line attachments or cross-hatched course blocks. One exception to this general rule is the MPCS SAS combination. Although SAS is essentially an integral part of the MPCS, scheduling in the indicated fashion does not exclude personnel from MPCS training due to the absence of the required security clearance.

On the basis of the recommended maximum number of attendees per course, these schedules, if fully implemented, can provide training for personnel as indicated on the following charts.

## COVERED BY CONTRACT AFO4(694)-261

COURSE NUMBER	COURSE TITLE	COURSE LENGTH	NUMBER OF TRAINED PERSONNEL RESULTING FROM SCHEDULING ON FIG. 1-1
1001/1002	MPCS/SAS	280 Hours	10
1003	ICCP	120 Hours	10
1004	RSS	120 Hours	10
1100	Gen. Fam.	40 Hours	20
1101/1102	MPCS/SAS	360 Hours	20
1103	ICCP	160 Hours	20
1104	RSS	160 Hours	20
1105	OCCP/PSS	40 Hours	<u>20</u>
		TOTAL	130

## NOT COVERED BY CONTRACT AFO4(694)-261 - FOR PLANNING PURPOSES ONLY

COURSE NUMBER	COURSE TITLE	COURSE LENGTH	NUMBER OF TRAINED PERSONNEL RESULTING FROM SCHEDULE ON FIG. 1-2
1200	Gen. Fam.	40 Hours	60
1201/1202	MPCS/SAS	440 Hours	60
1203	ICCP	200 Hours	60
1204	RSS	200 Hours	60
1205	OCCP/PSS	48 Hours	<u>60</u>
		TOTAL	300

In order to insure adequate implementation of the schedule defined on Figure 1-2 and at the same time allow sufficient flexibility to accommodate moderate expansion for future unpredictable training requirements, it is recommended that the procuring agency provide for no less than six instructors for the complete effort which extends from May 1964 until August 1965.

MINUTEMAN GROUND ELECTRONICS SYSTEM  
ASSOCIATE CONTRACTOR TRAINING PLAN

COVERED BY CONTRACT AF04(694)261

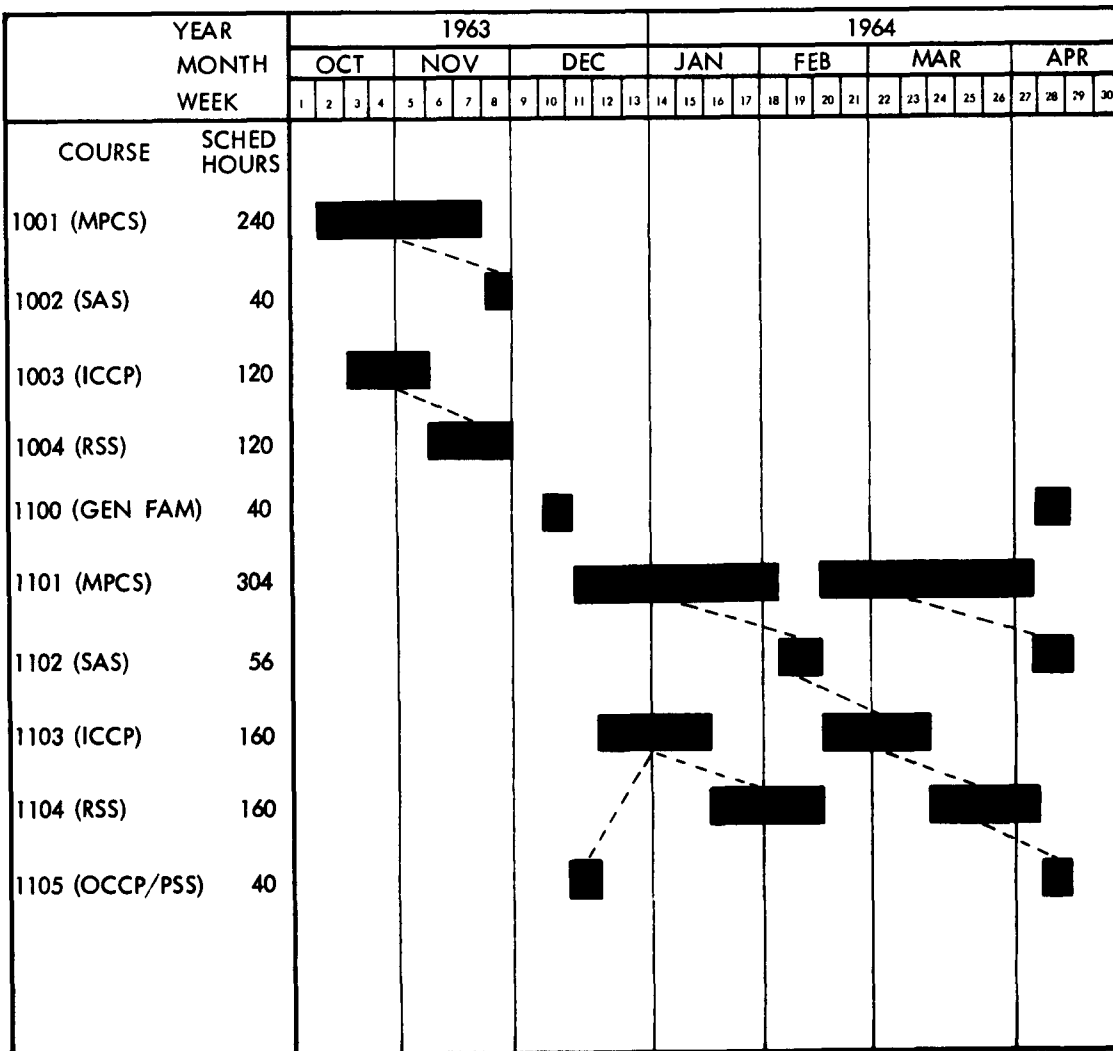


Fig. 1-1. Training Course Schedule - Contracted





MPO-SR 13-3-301

PART II  
MINUTEMAN GES ASSOCIATE CONTRACTOR  
TRAINING EQUIPMENT PLAN

MINUTEMAN GES ASSOCIATE CONTRACTOR  
TRAINING EQUIPMENT PLAN

PURPOSE AND SCOPE

The purpose of this plan is to define the various categories of training equipment that are being recommended to support Associate Contractor training as outlined in task 13.3.2 and 13.3.3 of contract AF04(694)-261. Supplemental direction by the Ballistic Systems Division (BSD) as defined in the minutes of the April 8-9 Wing VI Associate Contractor training meeting provided the basic guidance used in the development of this plan.

It is understood that contract AF04(694)-261 requires that Sylvania provide only the planning effort necessary to recommend training equipment to be used in support of training for personnel specified in task 13.3.2 and 13.3.3 of our contract.

Under the terms of the present contract Sylvania is not required to either design or fabricate training equipment recommended in this plan; however, Sylvania is prepared to proceed with the development of all or any part of the specified training equipment as soon as it is placed on contract by the procuring agency.

PLANNING FACTORS

1. In an effort to reduce expenditures for training equipment, research and development hardware resulting from the AF04(694)-261 contract will be utilized to a maximum.
2. Existing assets such as GTP equipment will be identified by Figure "A" number.
3. The GES LCF-LF mock-up as configured at the Site I installation will be utilized to whatever degree is deemed necessary to insure satisfactory individual performance.



4. Delineation of GITP time allocation to individual subsystem courses is contained in the twelve hundred series courses located in the training section of this plan.

5. Lesson plans are not a contractual requirement and, although they will probably be developed by Sylvania, no mention of them will be found in this plan.

6. Budgetary estimates will be included only for that equipment to be procured specifically for the training program.

7. In order to insure early availability of training equipment it is recommended that timely preliminary approval be provided by the procuring agency.

## INDEX OF TRAINING EQUIPMENT

<u>TRAINER NUMBER</u>	<u>TRAINER TITLE</u>
C1	MINUTEMAN System Orientation, Slide Trainer Package*
C2	Functional Description of Over-all GES, Slide Trainer Package
C3	Functional Description of MPCCS, Slide Trainer Package
C4	Functional Description of SAS, Slide Trainer Package
C5	Functional Description of ICCP, Slide Trainer Package
C6	Functional Description of OCCP, Slide Trainer Package
C7	Functional Description of RSS, Slide Trainer Package
C8	Functional Description of PSS, Slide Trainer Package
C9	Digital Logic, Slide Trainer Package
C10	Typical Logic Utilization, Slide Trainer Package
C11	MPCS Interface, Slide Trainer Package
C12	LCF, MPCCS, Slide Trainer Package
C13	LF, SAS, Slide Trainer Package
C14	LCF, MPCCS Detail Block Theory, Slide Trainer Package
C15	LF, SAS Detail Block Theory, Slide Trainer Package

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\*See Appendix A for an explanation of the Slide Trainer Package Technique.

## INDEX OF TRAINING EQUIPMENT (Cont.)

<u>TRAINER NUMBER</u>	<u>TRAINER TITLE</u>
C16	MPCS Basic Timing Generation, Slide Trainer Package
C17	MPCS Radio and Cable Timing Distribution, Slide Trainer Package
C18	MPCS Command Generation, Slide Trainer Package
C19	MPCS Communications Network Buffering, Slide Trainer Package
C20	MPCS Command Control Console, Slide Trainer Package
C21	MPCS Status Control Console, Slide Trainer Package
C22	MPCS, MPCU Block Diagram, Slide Trainer Package
C23	SAS Auxiliary Status Block Diagram, Slide Trainer Package
C24	LF, Radio Timing, Slide Trainer Package
C25	LF, Cable Timing, Slide Trainer Package
C26	Radio Message Buffer, Slide Trainer Package
C27	Cable Message Buffer, Slide Trainer Package
C28	SAS Fundamentals, Slide Trainer Package
C29	ICCP, Cable Data Communications System, Slide Trainer Package

## INDEX OF TRAINING EQUIPMENT (Cont.)

<u>TRAINER NUMBER</u>	<u>TRAINER TITLE</u>
C30	ICCP, Voice Cable Communications System, Slide Trainer Package
C31	ICCP, SAC Communications, Slide Trainer Package
C32	OCCP Splice Box Assembly Trainer
C33	RSS Timing Control, Slide Trainer Package
C34	RSS Transmit, Slide Trainer Package
C35	RSS Receive, Slide Trainer Package
C36	RSS Divider, Slide Trainer Package
C37	RSS Antenna Mock-Up
C38	Transparencies
C39	Utility Handbook Reproduction
C40	GES Diagrams and Schematics for Student Use
C41	Development of GES Orientation Handbook
C42	Development of Order Mechanizations
C43	Development of Flow Charts
N/A	Listing of Available Training Equipment

TRAINER DESCRIPTION

A. TRAINER NUMBER AND TITLE:

C1 - Minuteman System Orientation, Slide Trainer Package.

B. PURPOSE OF TRAINER:

This trainer will be utilized by the instructor to familiarize the trainee with Minuteman System philosophy.

C. DESCRIPTION OF TRAINER:

A series of twenty-four - 35 MM slides will be used to sequentially step through the functional operations of a Minuteman Wing. These various functions will be presented by the use of animated slide techniques. Appendix A contains a description of the Slide Trainer Package Technique.

D. TRAINER UTILIZED IN:

Course numbers 1001, 1003, 1004, 1100, 1101, 1103-1105, 1200, 1201, 1203-1205.

E. BUDGETING ESTIMATE:

\$1,326.

TRAINER DESCRIPTION

A. TRAINER NUMBER AND TITLE:

C2 - Functional Description of Overall GES, Slide Trainer Package.

B. PURPOSE OF TRAINER:

This trainer will be used by the instructor to familiarize the student with the overall GES.

C. DESCRIPTION OF TRAINER:

A series of thirty-six 35 MM slides will be used to sequentially progress through the GES. Information flow will be illustrated, using animated techniques, as it is developed and channeled throughout the system in relation to time.

D. TRAINER UTILIZED IN:

Course numbers 1001, 1003, 1004, 1100, 1101, 1103-1105, 1200, 1201, 1203-1205.

E. BUDGETING ESTIMATE:

\$1,405.

TRAINER DESCRIPTION

A. TRAINER NUMBER AND TITLE:

C-3 - Functional Description of MPCS, Slide Trainer Package.

B. PURPOSE OF TRAINER:

This trainer will be used by the instructor for student familiarization with the MPCS.

C. DESCRIPTION OF TRAINER:

A series of forty-four 35 MM slides will be used to sequentially progress through the MPCS. This series of slides will aid in explaining the MPCS down to its major component block diagram level. The flow of information will be illustrated, by animation with respect to correct MPCS timing sequences.

D. TRAINER UTILIZED IN:

Course numbers 1001, 1003, 1004, 1100, 1101, 1103-1105, 1200, 1201, 1203-1205.

E. BUDGETING ESTIMATE:

\$1,220.

TRAINER DESCRIPTION

A. TRAINER NUMBER AND TITLE:

C4 - Functional Description of SAS, Slide Trainer Package.

B. PURPOSE OF TRAINER:

This trainer will be used by the instructor for student familiarization with the SAS.

C. DESCRIPTION OF TRAINER:

A series of thirty-six 35 MM slides will be used to sequentially progress through the SAS. This series of slides will aid in explaining the SAS down to the major component block diagram level.

D. TRAINER UTILIZED IN:

Course numbers 1002, 1102, 1202.

E. BUDGETING ESTIMATE:

\$1,019.



TRAINER DESCRIPTION

A. TRAINER NUMBER AND TITLE:

C5 - Functional Description of ICCP, Slide Trainer Package.

B. PURPOSE OF TRAINER:

This trainer will be used by the instructor for student familiarization with the ICCP.

C. DESCRIPTION OF TRAINER:

A series of thirty-six 35 MM slides will be used to sequentially progress through the ICCP. This series of slides will aid in explaining the ICCP's many different communications systems down to their major component block diagram level.

D. TRAINER UTILIZED IN:

Course numbers 1001, 1003, 1004, 1100, 1101, 1103-1105, 1200, 1201, 1203-1205.

E. BUDGETING ESTIMATE:

\$1,250.

TRAINER DESCRIPTION

A. TRAINER NUMBER AND TITLE:

C6 - Functional Description of OCCP, Slide Trainer Package.

B. PURPOSE OF TRAINER:

This trainer will be used by the instructor for student familiarization with the OCCP.

C. DESCRIPTION OF TRAINER:

A series of twelve 35 MM slides will be used to sequentially progress through the OCCP. This series of slides will aid in explaining the OCCP down to the major component block diagram level.

D. TRAINER UTILIZED IN:

Course numbers 1001, 1003, 1004, 1100, 1101, 1103-1105, 1200, 1201, 1203-1205.

E. BUDGETING ESTIMATE:

\$741.

TRAINER DESCRIPTION

A. TRAINER NUMBER AND TITLE:

C7 - Functional Description of RSS, Slide Trainer Package.

B. PURPOSE OF TRAINER:

This trainer will be used by the instructor for student familiarization with the RSS.

C. DESCRIPTION OF TRAINER:

A series of forty-four 35 MM slides will be used to sequentially progress through the RSS. This series of slides will aid in explaining the RSS's timing, transmitting and receiving functions down to their major component block diagram level.

D. TRAINER UTILIZED IN:

Course numbers 1001, 1003, 1004, 1100, 1101, 1103-1105, 1200, 1201, 1203-1205.

E. BUDGETING ESTIMATE:

\$1,373.

TRAINER DESCRIPTION

A. TRAINER NUMBER AND TITLE:

C8 - Functional Description of PSS, Slide Trainer Package

B. PURPOSE OF TRAINER:

This trainer will be used by the instructor for student familiarization with the PSS.

C. DESCRIPTION OF TRAINER:

A series of twelve 35 MM slides will be used to sequentially progress through the PSS. This series of slides will aid in explaining the PSS down to its major component block diagram level.

D. TRAINER UTILIZED IN:

Course numbers 1001, 1003, 1004, 1100, 1101, 1103-1105, 1200, 1201, 1203-1205.

E. BUDGETING ESTIMATE:

\$741

TRAINER DESCRIPTION

A. TRAINER NUMBER AND TITLE:

C9 - Digital Logic, Slide Trainer Package

B. PURPOSE OF TRAINER:

This trainer will be utilized by the instructor for student introduction into the various types of logic circuits used in the GES.

C. DESCRIPTION OF TRAINER:

A series of thirty-six 35 MM slides will be utilized to animate the various inputs and outputs of each logic circuit. All of these circuits will be connected in a hypothetical logic configuration to show their interrelationships under different input conditions.

D. TRAINER UTILIZED IN:

Course numbers 1001, 1003, 1101, 1103, 1201, 1203.

E. BUDGETING ESTIMATE:

\$1,328

TRAINER DESCRIPTION

A. TRAINER NUMBER AND TITLE:

C10 - Typical Logic Utilization, Slide Trainer Package

B. PURPOSE OF TRAINER:

This trainer will be utilized by the instructor to demonstrate implementation of GES logic circuits into an actual GES circuit.

C. DESCRIPTION OF TRAINER:

A series of sixteen 35MM slides will be utilized to illustrate the logical operation of an actual GES circuit. This circuit will be chosen so as to reflect many of the various logic techniques used in the GES.

D. TRAINER UTILIZED IN:

Course numbers 1001, 1003, 1101, 1103, 1201, 1203.

E. BUDGETING ESTIMATE:

\$983

**TRAINER DESCRIPTION**

**A. TRAINER NUMBER AND TITLE:**

C11 - MPCS Interface, Slide Trainer Package

**B. PURPOSE OF TRAINER:**

This trainer will be utilized by the instructor to illustrate the operational and command interfaces of the MPCS with other GES equipment.

**C. DESCRIPTION OF TRAINER:**

A series of forty 35MM slides will be utilized to show the operational and command flows between the MPCS and other GES equipment. This series of slides will illustrate the philosophy and principles involved down to the major component block diagram level of the MPCS.

**D. TRAINER UTILIZED IN:**

Course numbers 1001, 1101, 1201.

**E. BUDGETING ESTIMATE: \$1,284**

**TRAINER DESCRIPTION**

- A. TRAINER NUMBER AND TITLE:**  
C12 - LCF, MPCS, Slide Trainer Package
- B. PURPOSE OF TRAINER:**  
This trainer will be used by the instructor to illustrate the major logic blocks and their relationship to each other for the MPCS at the LCF.
- C. DESCRIPTION OF TRAINER:**  
A series of thirty-one 35MM slides will be used to show an animated flow of information between the major logic blocks of the MPCS at the LCF.
- D. TRAINER UTILIZED IN:**  
Course numbers 1001, 1101, 1201.
- E. BUDGETING ESTIMATE: \$1,097**



TRAINER DESCRIPTION

A. TRAINER NUMBER AND TITLE:

C13 - LF, SAS, Slide Trainer Package

B. PURPOSE OF TRAINER:

This trainer will be used by the instructor to illustrate the major logic blocks and their relationship to each other for the SAS at the LF.

C. DESCRIPTION OF TRAINER:

A series of eighteen 35MM slides will be used to show an animated flow of information between the major logic blocks of the SAS at the LF.

D. TRAINER UTILIZED IN:

Course numbers 1002, 1102, 1202.

E. BUDGETING ESTIMATE:

\$909

**TRAINER DESCRIPTION**

**A. TRAINER NUMBER AND TITLE:**

C14 - LCF, MPCS Detail Block Theory, Slide Trainer Package

**B. PURPOSE OF TRAINER:**

This trainer will be used by the instructor to illustrate details for information flow within each major logic block for the MPCS at the LCF.

**C. DESCRIPTION OF TRAINER:**

A series of forty-two 35MM slides will be used to show an animated flow of data within each major logic block of the MPCS at the LCF. This trainer will serve as an introduction to the basic philosophy involved in each logic block before the student studies circuit details using logic prints.

**D. TRAINER UTILIZED IN:**

Course numbers 1001, 1101, 1201.

**E. BUDGETING ESTIMATE: \$1,448**

TRAINER DESCRIPTION

A. TRAINER NUMBER AND TITLE:

C15 - LF, SAS Detail Block Theory, Slide Trainer Package

B. PURPOSE OF TRAINER:

This trainer will be used by the instructor to illustrate details of information flow within each major logic block of the SAS at the LF.

C. DESCRIPTION OF TRAINER:

A series of twenty-eight 35MM slides will be used to show an animated flow of data within each major logic block of the SAS at the LF. This trainer will serve as an introduction to the basic philosophy involved in each logic block before the student studies circuit details using logic prints.

D. TRAINER UTILIZED IN:

Course numbers 1002, 1102, 1202.

E. BUDGETING ESTIMATE:

\$937

**TRAINER DESCRIPTION**

**A. TRAINER NUMBER AND TITLE:**

C16 - MPCS Basic Timing Generation, Slide Trainer Package

**B. PURPOSE OF TRAINER:**

This trainer will be used by the instructor to illustrate the principles of MPCS timing generation logic.

**C. DESCRIPTION OF TRAINER:**

A series of twenty-eight 35MM slides will be used to show the basic principles involved in MPCS timing circuits before the trainee is required to analyze logic prints for details of operation.

**D. TRAINER UTILIZED IN:**

Course numbers 1001, 1101, 1201.

**E. BUDGETING ESTIMATE: \$1,098**

**TRAINER DESCRIPTION**

**A. TRAINER NUMBER AND TITLE:**

C17 - MPCs Radio and Cable Timing Distribution, Slide Trainer Package

**B. PURPOSE OF TRAINER:**

This trainer will be used by the instructor to illustrate the principles of MPCs radio and cable timing distribution logic.

**C. DESCRIPTION OF TRAINER:**

A series of thirty 35 MM slides will be used to animate the philosophy involved in information flow within the MPCs radio and cable timing distribution logic. This trainer will serve as an introduction to the basic principles involved before the trainee progresses to the logic prints for details of operation.

**D. TRAINER UTILIZED IN:**

Course numbers 1001, 1101, 1201.

**E. BUDGETING ESTIMATE: \$1097**

**TRAINER DESCRIPTION**

**A. TRAINER NUMBER AND TITLE:**

C18 - MPCs Command Generation, Slide Trainer Package

**B. PURPOSE OF TRAINER:**

This trainer will be used by the instructor to illustrate the principles of MPCs command generation logic.

**C. DESCRIPTION OF TRAINER:**

A series of sixteen 35 MM slides will be used to show the philosophy involved in MPCs command generation logic. This trainer will serve as an introduction to the principles involved before the trainee progresses to the logic prints for details of operation.

**D. TRAINER UTILIZED IN:**

Course numbers 1001, 1101, 1201.

**E. BUDGETING ESTIMATE: \$828**

**TRAINER DESCRIPTION**

**A. TRAINER NUMBER AND TITLE:**

C19 – MPCS Communications Network Buffering, Slide Trainer Package

**B. PURPOSE OF TRAINER:**

This trainer will be used by the instructor to illustrate the principles of MPCS communication network buffering logic.

**C. DESCRIPTION OF TRAINER:**

A series of twenty-seven 35 MM slides will be utilized in illustrating philosophy involved in MPCS communication network buffering logic.

This trainer will serve as an introduction to the principles involved before the trainee progresses to the logic prints for details of operation.

**D. TRAINER UTILIZED IN:**

Course numbers 1001, 1101, 1201.

**E. BUDGETING ESTIMATE: \$1,088**

**TRAINER DESCRIPTION**

**A. TRAINER NUMBER AND TITLE:**

C20 – MPCS, Command Control Console, Slide Trainer Package

**B. PURPOSE OF TRAINER:**

This trainer will be used by the instructor to illustrate operation of the command control console.

**C. DESCRIPTION OF TRAINER:**

A series of thirty-three 35 MM slides will be used in illustrating the operational and monitoring procedures of the command control console. This trainer will familiarize the trainee with operational and monitoring procedures of this console so that he may better appreciate GES/MPCS operation, thereby making constructive use of training time on the actual equipment.

**D. TRAINER UTILIZED IN:**

Course numbers 1001, 1101, 1201.

**E. BUDGETING ESTIMATE: \$1,103**



**TRAINER DESCRIPTION**

**A. TRAINER NUMBER AND TITLE:**

C21 – MPCS Status Control Console, Slide Trainer Package

**B. PURPOSE OF TRAINER:**

This trainer will be used by the instructor to illustrate operation of the status control console.

**C. DESCRIPTION OF TRAINER:**

A series of thirty-three 35 MM slides will be used in illustrating the operational procedures and monitoring of the status control console. This trainer will familiarize the trainee with operational and monitoring procedures of this console so that he may better appreciate GES/MPCS operation, thereby making constructive use of training time on the actual equipment.

**D. TRAINER UTILIZED IN:**

Course numbers 1001, 1101, 1201.

**E. BUDGETING ESTIMATE: \$1,103**

**TRAINER DESCRIPTION**

- A. TRAINER NUMBER AND TITLE:**  
C22 – MPCS, MPCU Block Diagram, Slide Trainer Package
- B. PURPOSE OF TRAINER:**  
This trainer will be used by the instructor to illustrate information flow within the MPCU (Message Processing Control Unit).
- C. DESCRIPTION OF TRAINER:**  
A series of eighty-eight 35 MM slides will be used to illustrate the MPCU timing, instruction read-in, data in-out, and instruction processing philosophies on a block diagram level. This trainer will serve as an introduction to the principles involved before the details of each operation are presented to the trainee using logic prints.
- D. TRAINER UTILIZED IN:**  
Course numbers 1001, 1101, 1201.
- E. BUDGETING ESTIMATE: \$1,887**

TRAINER DESCRIPTION

A. TRAINER NUMBER AND TITLE:

C23 -SAS Auxiliary Status Block Diagram, Slide Training Package.

B. PURPOSE OF TRAINER:

This trainer will be used by the instructor to illustrate information flow within the SAS auxiliary status system.

C. DESCRIPTION OF TRAINER:

A series of eleven 35 MM slides will be used to illustrate information flow within the auxiliary status system. This trainer will serve as an introduction to the principles involved before the trainee progresses to the logic prints for details of operation.

D. TRAINER UTILIZED IN:

Course numbers 1002, 1102, 1202.

E. BUDGETING ESTIMATE: \$817.

TRAINER DESCRIPTION

A. TRAINER NUMBER AND TITLE:

C24--LF, Radio Timing, Slide Trainer Package.

B. PURPOSE OF TRAINER:

This trainer will be used by the instructor to illustrate the philosophy of radio timing in the LF.

C. DESCRIPTION OF TRAINER:

A series of eleven 35 MM slides will be used to illustrate timing for the radio at the LF. This trainer will serve as an introduction to the principles involved before the trainee progresses to the logic prints for a detail timing circuit analysis.

D. TRAINER UTILIZED IN:

Course numbers 1002, 1004, 1102, 1104, 1202, 1204.

E. BUDGETING ESTIMATE: \$817.

TRAINER DESCRIPTION

A. TRAINER NUMBER AND TITLE:

C25 - LF, Cable Timing, Slide Trainer Package

B. PURPOSE OF TRAINER:

This trainer will be used by the instructor to illustrate the philosophy of cable timing in the LF.

C. DESCRIPTION OF TRAINER:

A series of eleven 35 MM slides will be used to illustrate timing for the cable at the LF. This trainer will serve as an introduction to the principles involved before the trainee progresses to the logic prints for a detail cable timing analysis.

D. TRAINER UTILIZED IN:

Course numbers 1002, 1102, 1202.

E. BUDGETING ESTIMATE: \$817

TRAINER DESCRIPTION

A. TRAINER NUMBER AND TITLE:

C26 - Radio Message Buffer, Slide Trainer Package.

B. PURPOSE OF TRAINER:

This trainer will be utilized by the instructor to illustrate the principles of the radio message buffering logic.

C. DESCRIPTION OF TRAINER:

A series of eighteen 35 MM slides will be used to show the philosophy involved in the radio message buffering logic. This trainer will serve as an introduction to the basic principles involved before the trainee goes to logic prints for details of operation.

D. TRAINER UTILIZED IN:

Course numbers 1004, 1104, 1204.

E. BUDGETING ESTIMATE: \$909.

TRAINER DESCRIPTION

A. TRAINER NUMBER AND TITLE:

C27 - Cable Message Buffer, Slide Trainer Package.

B. PURPOSE OF TRAINER:

This trainer will be utilized by the instructor to illustrate the principles of cable message buffering logic.

C. DESCRIPTION OF TRAINER:

A series of eighteen 35 MM slides will be used to show the philosophy involved in the cable message buffering logic. This trainer will serve as an introduction to the basic principles involved before the trainee goes to logic prints for details of operation.

D. TRAINER UTILIZED IN:

Course numbers 1001, 1002, 1101, 1102, 1201, 1202.

E. BUDGETING ESTIMATE: \$909.

TRAINER DESCRIPTION

A. TRAINER NUMBER AND TITLE:

C28-SAS Fundamentals, Slide Trainer Package.

B. PURPOSE OF TRAINER:

This trainer will be utilized by the instructor to illustrate the complex philosophy involved in the operation of the SAS.

C. DESCRIPTION OF TRAINER:

A series of thirty-six 35 MM slides will be used to illustrate the principle of operation used in the SAS. This trainer will introduce the trainee to the basic concepts of the subsystem before he is required to analyze logic prints.

D. TRAINER UTILIZED IN:

Course numbers 1002, 1102, 1202.

E. BUDGETING ESTIMATE: \$1,250.



**TRAINER DESCRIPTION**

**A. TRAINER NUMBER AND TITLE:**

**C29 - ICCP, Cable Data Communications Systems, Slide Trainer Package**

**B. PURPOSE OF TRAINER:**

**This trainer will be utilized by the instructor to illustrate the philosophy involved in operation of the Cable Data Communications equipment in the ICCP.**

**C. DESCRIPTION OF TRAINER:**

**A series of forty eight 35 MM slides will be used to illustrate the principles of operation involved in the four major component systems of the Cable Data Communication System. This trainer will introduce the trainee to the basic concepts of this system before he is required to analyze circuit prints.**

**D. TRAINER UTILIZED IN:**

**Course numbers 1003, 1103, 1203.**

**E. BUDGETING ESTIMATE: \$1,230**

**TRAINER DESCRIPTION**

- A. TRAINER NUMBER AND TITLE:**  
C30 – ICCP, Voice Cable Communications System, Slide Trainer Package
- B. PURPOSE OF TRAINER:**  
This trainer will be utilized by the instructor to illustrate the philosophy involved in the operation of Voice Cable Communication equipment in the ICCP.
- C. DESCRIPTION OF TRAINER:**  
A series of thirty-two 35 MM slides will be used to illustrate the principles of operation involved in the six major component systems of the Voice Cable Communications System. This trainer will introduce the trainee to the basic concepts of this system before he is required to analyze circuit prints.
- D. TRAINER UTILIZED IN:**  
Course numbers 1003, 1103, 1203.
- E. BUDGETING ESTIMATE: \$1097**

**TRAINER DESCRIPTION**

- A. **TRAINER NUMBER AND TITLE:**  
C31 – ICCP, SAC Communications, Slide Trainer Package
- B. **PURPOSE OF TRAINER:**  
This trainer will be utilized by the instructor to illustrate the principles involved in ICCP interface with SAC communications equipment.
- C. **DESCRIPTION OF TRAINER:**  
A series of twenty-five 35 MM slides will be used to illustrate the interface of SAC Communications equipment with the GES via ICCP. This trainer will familiarize the trainee with the overall philosophy involved before he is required to analyze interface details.
- D. **TRAINER UTILIZED IN:**  
Course numbers 1003, 1103, 1203.
- E. **BUDGETING ESTIMATE: \$941**

**TRAINER DESCRIPTION**

- A. **TRAINER NUMBER AND TITLE:**  
C32 – OCCP Splice Box Assembly Trainer
- B. **PURPOSE OF TRAINER:**  
This trainer will be used to give the trainee the required abilities involved in maintenance of an OCCP splice box.
- C. **DESCRIPTION OF TRAINER:**  
Two trainers of this type will be required and will be composed of actual splice box assemblies used in the GES. These splice box assemblies will include cable, sensing devices, cable connectors, alarm system, and splice box.
- D. **TRAINER UTILIZED IN:**  
Course numbers 1105, 1205.
- E. **BUDGETING ESTIMATE: \$1,457**

**TRAINER DESCRIPTION**

- A. **TRAINER NUMBER AND TITLE:**  
C33 – RSS Timing Control, Slide Trainer Package
- B. **PURPOSE OF TRAINER:**  
This trainer will be used by the instructor to illustrate the principle of RSS timing control circuits.
- C. **DESCRIPTION OF TRAINER:**  
A series of twenty 35 MM slides will be used to illustrate these principles. This trainer will introduce the trainee to the basic concepts of RSS timing control logic before he is required to analyze the circuit prints in detail.
- D. **TRAINER UTILIZED IN:**  
Course numbers 1004, 1104, 1204.
- E. **BUDGETING ESTIMATE: \$915**

**TRAINER DESCRIPTION**

- A. TRAINER NUMBER AND TITLE:**  
C34 – RSS Transmit, Slide Trainer Package
- B. PURPOSE OF TRAINER:**  
This trainer will be used by the instructor to illustrate the principle of the transmitting circuits in the RSS.
- C. DESCRIPTION OF TRAINER:**  
A series of twelve 35 MM slides will be utilized to illustrate these principles. This trainer will introduce the trainee to the basic concepts of RSS transmission techniques before he is required to analyze circuit prints in detail.
- D. TRAINER UTILIZED IN:**  
Course numbers 1004, 1104, 1204.
- E. BUDGETING ESTIMATE: \$819**

**TRAINER DESCRIPTION**

- A. TRAINER NUMBER AND TITLE:**  
C35 – RSS Receive, Slide Trainer Package.
- B. PURPOSE OF TRAINER:**  
This trainer will be used by the instructor to illustrate the principle of the receiving circuits in the RSS.
- C. DESCRIPTION OF TRAINER:**  
A series of twelve 35 MM slides will be used to illustrate these principles. This trainer will introduce the trainee to the basic concepts of RSS receiving techniques before he is required to analyze circuit prints in detail.
- D. TRAINER UTILIZED IN:**  
Course numbers 1004, 1104, 1204.
- E. BUDGETING ESTIMATE: \$819**

**TRAINER DESCRIPTION**

**A. TRAINER NUMBER AND TITLE:**

C36-RSS Divider, Slide Trainer Package

**B. PURPOSE OF TRAINER:**

This trainer will be used by the instructor to illustrate the principle of the various dividing circuits in the RSS.

**C. DESCRIPTION OF TRAINER:**

A series of twenty 35 MM slides will be used to illustrate the techniques involved in the RSS's special type divider circuits. This trainer will include detail logic circuits and will portray actual divider operation using animated slides.

**D. TRAINER UTILIZED IN:**

Course numbers 1004, 1104, 1204.

**E. BUDGETING ESTIMATE: \$915**



**TRAINER DESCRIPTION**

**A. TRAINER NUMBER AND TITLE:**

**C37 – RSS Antenna Mock-Up**

**B. PURPOSE OF TRAINER:**

This trainer will be used to give the trainee a three-dimensional concept of the RSS antenna.

**C. DESCRIPTION OF TRAINER:**

The trainer will reproduce to scale the actual RSS's hardened antenna used at an LCF. The antenna mock-up will be constructed to duplicate the RSS antenna physically but not electrically. Available GES - GITP equipment will not include the RSS's hardened antenna. Trainer C37 will provide the student with an appreciation of the component parts of the hardened antenna.

**D. TRAINER UTILIZED IN:**

Course numbers 1004, 1104, 1204.

**E. BUDGETING ESTIMATE: \$869**

## TRAINER DESCRIPTION

## A. TRAINER NUMBER AND TITLE:

C38 - Transparencies

## B. PURPOSE OF TRAINER:

This trainer includes transparencies for all courses listed in the training plan section of this document. Transparencies are to be used by the instructor to present the detailed technical analysis of each subsystem.

## C. DESCRIPTION OF TRAINER:

Transparencies will be 7-1/2" x 11" in size and will contain logic/package schematics, simplified block diagrams, timing diagrams, detailed schematic tables, photographs, charts, and instructor handout material. The following breakdown lists the number of transparencies required per course.

COURSE NO.	NO. OF TRANSPARENCIES
1100, 1200	24
1001, 1101, 1201	302
1002, 1102, 1202	35
1003, 1103, 1203	182
1004, 1104, 1204	78
1005, 1105, 1205	<u>55</u>
Total	676

## D. TRAINER UTILIZED IN:

Course numbers 1001- 1004, 1100-1105, 1200-1205.

E. BUDGETING ESTIMATE: \$15,369.

TRAINER DESCRIPTION

A. TRAINER NUMBER AND TITLE:

C39—Utility Handbook Reproduction

B. PURPOSE OF TRAINER:

Utility handbooks are to be used as student text material in the courses included below. The costs involved include only those necessary for reproduction.

C. DESCRIPTION OF TRAINER:

This trainer will be used by the student to supplement classroom lectures. Included in these handbooks are: equipment description, operating instructions, maintenance instructions, theory of operation, and individual circuit analysis. A large portion of the GES diagrams and schematics necessary for student use will be included in these handbooks.

D. TRAINER UTILIZED IN:

Courses 1001-1004, 1101-1105.

E. BUDGETING ESTIMATE: \$6,060.

TRAINER DESCRIPTION

A. TRAINER NUMBER AND TITLE:

C40-GES Diagrams and Schematics for Student Use

B. PURPOSE OF TRAINER:

This trainer includes the diagrams and schematic not included in the Utility Handbooks, but necessary for classroom lectures.

C. DESCRIPTION OF TRAINER:

All diagrams and schematics developed by either the instruction staff or engineering departments which are not included in the Utility Handbook but considered necessary for instruction purposes will be included in this trainer. Included are: schematics, timing diagrams, block diagrams, and miscellaneous training aids developed by instructors for classroom use.

D. TRAINER UTILIZED IN:

Courses 1001-1004, 1101-1105.

E. BUDGETING ESTIMATE: \$5,749.

TRAINER DESCRIPTION

A. TRAINER NUMBER AND TITLE:

C41—Development of GES Orientation Handbook

B. PURPOSE OF TRAINER:

Trainer C41 will provide the student attending course 1100 and 1200 with written material to supplement classroom lectures.

C. DESCRIPTION OF TRAINER:

Existing publication plans do not include development of GES Orientation Handbooks or any other handbook material acceptable for use in course 1100, and 1200. Present training philosophy makes such a document a desirable part of any training program. Trainer C41 will provide students attending course 1100 and 1200 Minuteman GES General Familiarization, with the desired written material to supplement classroom lectures. This Handbook will include a functional description of the overall GES, a functional description of each GES subsystem, and a description of GES interface with other Minuteman systems.

D. TRAINER UTILIZED IN:

Courses 1100, and 1200.

E. BUDGETING ESTIMATE: \$4,567.

TRAINER DESCRIPTION

A. TRAINER NUMBER AND TITLE:

C42 – Development of Order Mechanizations

B. PURPOSE OF TRAINER:

Trainer C42 provides for the development of Order Mechanizations for use by instructor and students in MPCS and SAS courses.

C. DESCRIPTION OF TRAINER:

An integral portion of MPCS and SAS courses will include the use of Order Mechanizations (also called Logical Mechanizations). Order mechanizations are composed of a list of symbolic expressions which explain the sequential, step-by-step operation of a digital device. Order mechanizations have always been an accepted method of training students, in the classroom on the principles of digital devices.

D. TRAINER UTILIZED IN:

Courses 1001, 1002, 1101, 1102, 1201, 1202.

E. BUDGETING ESTIMATE: \$3,732

TRAINER DESCRIPTION

A. TRAINER NUMBER AND TITLE:

C43-Development of Flow Charts

B. PURPOSE OF TRAINER:

Trainer C43 provides for the development of Flow Charts for use by instructor and students in MPCS and SAS courses.

C. DESCRIPTION OF TRAINER:

Complex digital devices do not necessarily follow a linear sequence of operation. In many cases more than one operation is occurring at any given time interval and its sequence may vary depending on certain prescribed functions in other parallel operations. The functions and interrelationship of parallel operations are difficult to comprehend when limited to the use of timing charts and logic schematics. Flow Chart Techniques pictorially explain the sequencing of digital devices through which parallel and serial relationships can readily be observed and understood. Flow Charts recommended in this trainer will illustrate circuit flow to the logic circuit level in respect to MPCS timing and will also include logic print references to aid in location of logic components.

D. TRAINER UTILIZED IN:

Courses 1001,1101, 1201.

E. BUDGETING ESTIMATE: \$10,492.

## SYLVANIA GES R &amp; D AND GFE EQUIPMENT AVAILABILITY

Pages 2-54, 2-55, 2-56, and 2-57 specified by Figure "A" number the GFE and Sylvania GES equipment resulting from the Sylvania R & D program that will be available to support training provided for personnel selected to participate in Associate Contractor training programs conducted by Sylvania after 1 April 1964. This recently prepared listing will be modified and updated to constantly reflect changes which develop during the formulation of the overall GITP program.

In line with current BSD recommendations, individuals involved with the development of the Associate Contractor training equipment package purposely avoided suggesting sophisticated and complex hardware items which would involve long delivery time and large financial expenditures.

Existing schedules indicate that GES hardware as configured for the GITP site I and site II activities will be completely integrated and available to accommodate scheduled "Machine Time" practical exercises after 1 April 1964. It is anticipated that the planned utilization of this hardware will be more than adequate to support the equipment time allocations specified on the individual subsystem "Course Description" sheets contained in the training section of this document.

The map on page 2-51 geographically locates the physical placement of the site I and II buildings. The site II installation will be contained in a brick structure adjacent to the existing Product Support Organization (PSO) training



facility in West Roxbury, Massachusetts. The site I installation will be located approximately 15 miles northwest of the site II facility and is adjacent to the Minuteman Program Office in Waltham, Massachusetts. The two locations are connected by a six lane modern highway. The drawings on pages 2-52 and 2-53 define the internal location of GES GITP hardware and other support equipment required to implement this program.

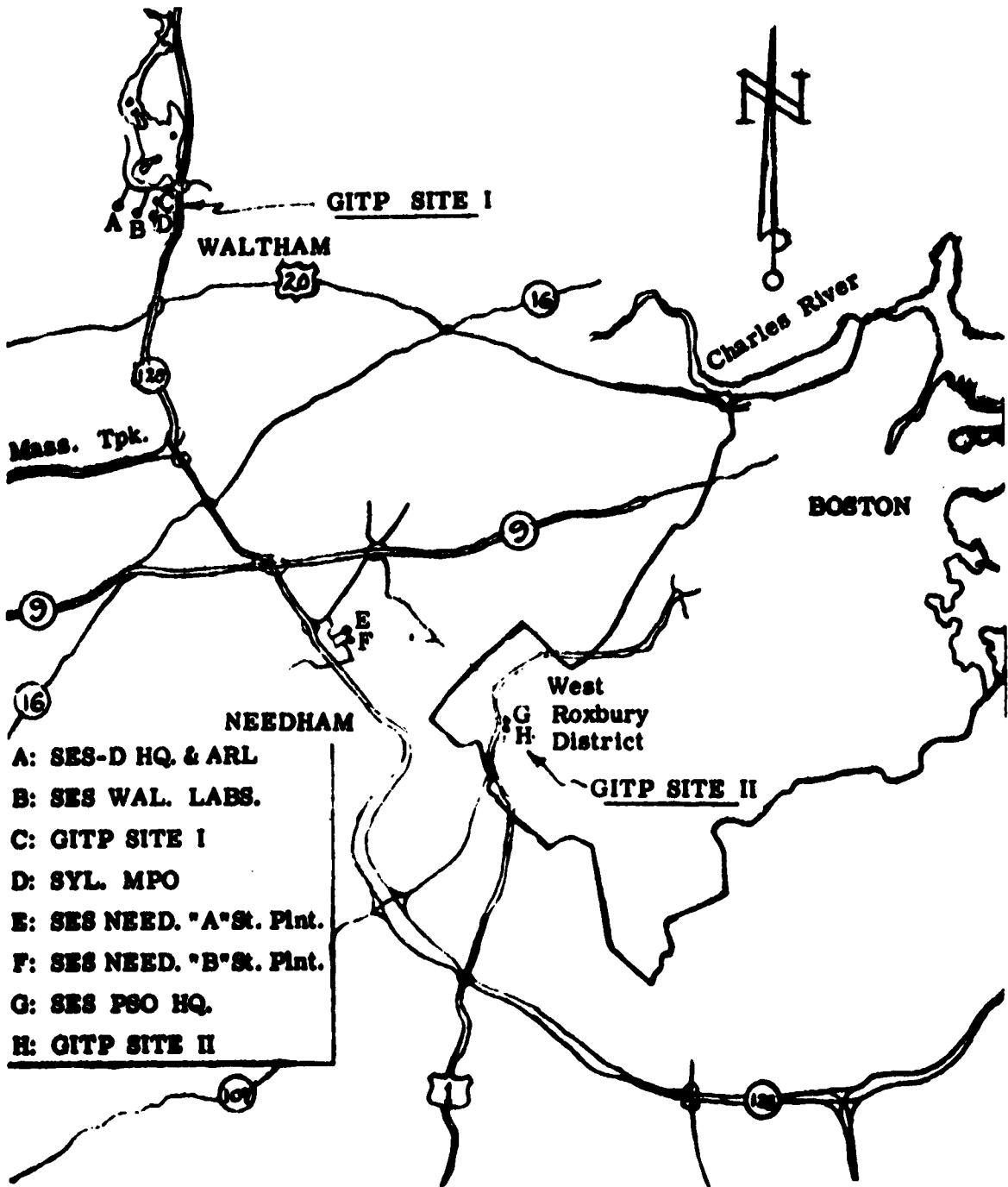


Figure 2-1. Test Facilities Location



- LEGEND
- DEI - DEVELOPMENT ENGINEERING INSPECTION (MOCK-UP)
  - GITP - GROUND INTEGRATION TEST PLAN
  - LCC - LAUNCH CONTROL CENTER
  - LCEB - LAUNCH CONTROL EQUIPMENT BUILDING
  - LCSB - LAUNCH CONTROL SUPPORT BUILDING
  - LEB - LAUNCHER EQUIPMENT BUILDING
  - LER - LAUNCHER EQUIPMENT ROOM

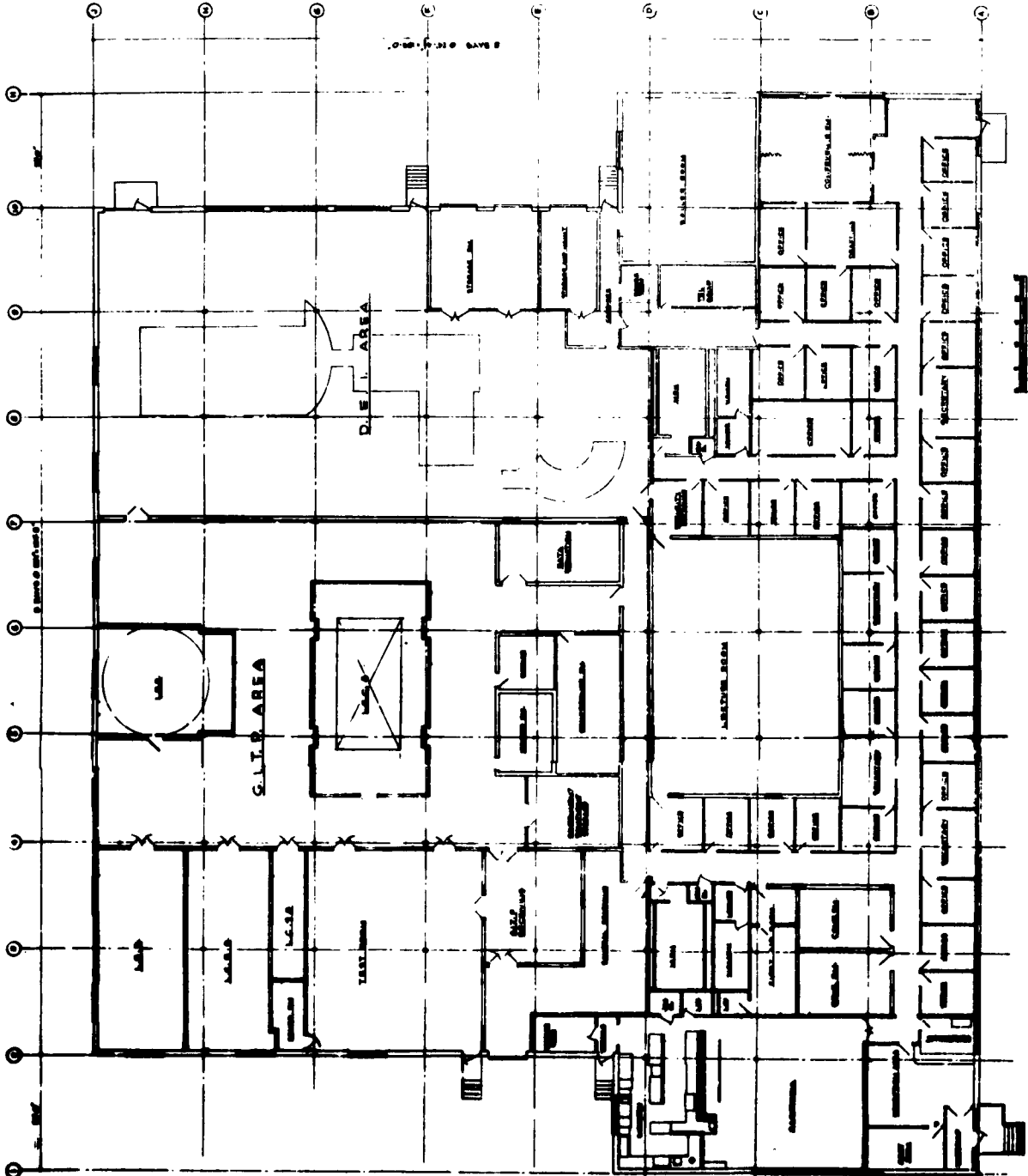


Figure 2-2. Floor Plan GITP Site No. 1, LCF and LF

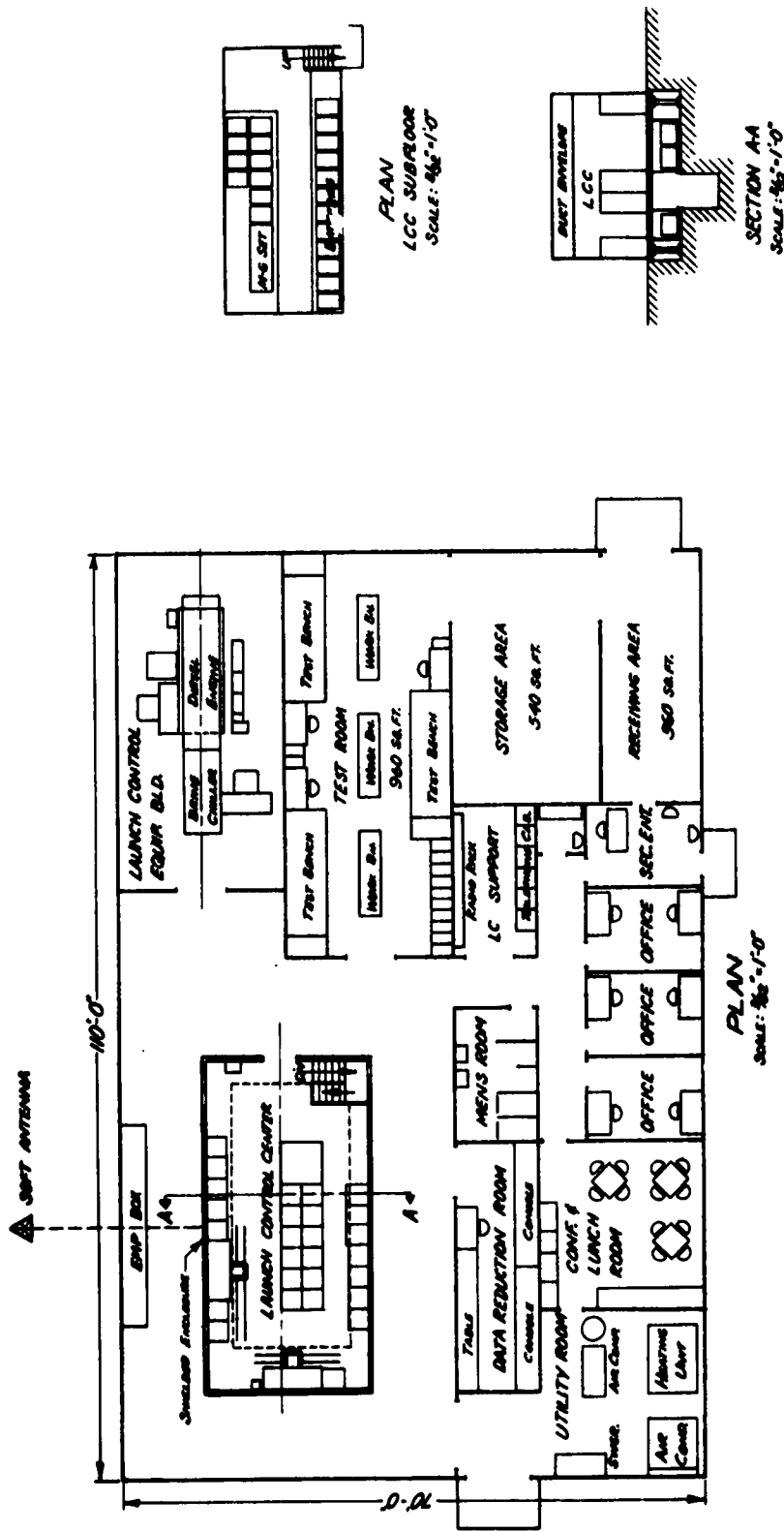


Figure 2-3. Floor Plan, GITP Site No. 2, LCF

**PRELIMINARY LISTING OF GTP AND GFE EQUIPMENT  
AVAILABLE FOR TRAINING**

<u>USED IN</u>	<u>FIG "A"</u>	<u>DESCRIPTION</u>	<u>QTY</u>	<u>SOURCE</u>	<u>O/D GTP</u>
LCF	14013	SAC HF Rack & Equipment SC-901X	2	GFE/GD	10-1-63
LCF	14014	SAC UHF Rack & Equipment 04-2649/TRC-68	2	GFE/ COLLINS	10-1-63
LCF	14038	SAC HF Feed Cables & Control Lines	2	GFE	10-1-63
LCF	14039	SAC UHF Feed Cables & Control Lines	2	GFE	10-1-63
LCF	14040	465L SUB-C Rack (2 each)	1	GFE/ AT&T	10-1-63
LCF	14041	465L SRCC Rack (6 each)	1	GFE/ AT&T	10-1-63
LCF	14044	PAS Rack	1	GFE	10-1-63
LCF		PAS Recorder S-124 (HF Rack)	4	GFE	10-1-63
LCF		PASS Monitor & Control Panel SCC/ACP	1	GFE/ AT&T	10-1-63
LCF		Amplifier & Speaker 106B	6	GFE/WE	10-1-63
LCF		Environmental Control Unit	2	GFE	1-1-64
LF		Environmental Control Unit	1	GFE	1-1-64
LF		LF Security Subsystem	1	GFE/ SES-W	1-1-64
LF		LF Ordnance Simulator	1	GFE	1-1-64
LCF	14101	32 Volt Battery Charger Set	2	GFE	8-15-63
LCF	14102	MG Battery Charger Set	2	GFE	8-15-63
LCF	14103	Protection and Distribution Set	2	GFE	8-15-63
LCF	14104	32 Volt Battery Set	2	GFE	8-15-63
LCF	14107	Survival Lighting Set	2	GFE	8-15-63
LCF		Transfer Switches & Auxiliary Equipment	2	GFE	8-15-63
LF		Transfer Switches & Auxiliary Equipment	1	GFE	8-15-63
LCF		Standby Primary Power Equipment	2	GFE	8-15-63
LF		Standby Primary Power Equipment	1	GFE	8-15-63
LF		Batteries 32 Volts	1	GFE	12-1-63
LF		Power Distribution Rack and Cables	1	GFE/ BOE	12-1-63

**PRELIMINARY LISTING OF GITP AND GFE EQUIPMENT  
AVAILABLE FOR TRAINING (Cont.)**

<u>USED IN</u>	<u>FIG "A"</u>	<u>DESCRIPTION</u>	<u>QTY</u>	<u>SOURCE</u>	<u>O/DGITP</u>
LF		Intersite Cabling and "J" Box Set	1	GFE/ BOE	12-1-63
LF		AC to DC Power Converter	1	GFE/ BOE	12-1-63
LF		Handling Fixtures (G & C Equipment)	1	GFE/ AUTO	1-7-64
LF	13002	C225A Power Conversion Set	1	GFE/ AUTO	1-7-64
LF	13000	C163A Signal Converter	1	GFE/ AUTO	1-7-64
LF	13201	C166A Control Monitor	1	GFE/ AUTO	1-7-64
LF		D-37 Computer & Program Tapes	1	GFE/ AUTO	1-7-64
LF	13200	C-164A Signal Data Converter	1	GFE/ AUTO	1-7-64
LF		Equipment Maintenance Tapes	1	GFE/ AUTO	1-7-64
LF	602	Collimator Set	1	GFE/ AUTO	1-7-64
LF		C XXX Collimator Test Set	1	GFE/ AUTO	1-7-64
LF		C-89, C-90, C-91 Test Set	1	GFE/ AUTO	1-7-64
LF	6275	NP-17, G&C System	1	GFE/ AUTO	4-30-64
LF		G&C Liquid Cooling System	1	GFE/ BOE	1-7-64
LF		G&C "J" Box	1	GFE/ BOE	1-7-64
LF		Re-entry Vehicle Simulator	1	GFE/ AVCO	1-7-64
LCF		Power Panel LCDB	1	GFE/ RPIE	8-15-63

**PRELIMINARY LISTING OF GITP AND GFE EQUIPMENT  
AVAILABLE FOR TRAINING (Cont.)**

<u>USED IN</u>	<u>FIG "A"</u>	<u>DESCRIPTION</u>	<u>QTY.</u>	<u>SOURCE</u>	<u>O/D GITP</u>
LCF	14000	CLCF Voice & Data Terminal Equipment	2	SYL	10-1-63
LCF	14002	Communication Control Panel (CCC-SCC)	4	SYL	10-1-63
LF/LCF	14003	ESA Mounting Assembly		SYL	10-1-63
LF/LCF	14004	Audio ESA		SYL	10-1-63
LCF	14005	HF ESA	2	SYL	10-1-63
LCF	14008	Site Cabling For SCP With Sub-C	1	SYL	12-15-63
LCF	14009	Site Cabling for ACP	1	SYL	10-1-63
LCF	14011	SAC CTE For ACP	1	SYL	10-1-63
LCF	14012	PAS Monitor Panel	3	SYL	10-1-63
LF	14016	LF Connector and Cable Stub	1	SYL	1-1-64
LF	14017	Site Cabling For LF	1	SYL	1-1-64
LCF	14018	Pressurization Alarm Equipment	2	SYL	10-1-63
LCF	14019	External Communication Control Panel (SCC)	2	SYL	10-1-63
LCF	14020	FLCF Connector and Cable Stub	2	SYL	10-1-63
LCF/LF	14021	DC ESA		SYL	10-1-63
LCF	14022	Pressurization System ESA	2	SYL	10-1-63
LCF	14023	SAS CTE for SCP	1	SYL	12-15-63
LF	14024	Weatherproof Alarm and Jack Boy	1	SYL	1-1-64
LCF&LF	14027	Access Valve and Pressure Contractors	3	SYL	9-1-63
LCF&LF	14028	Air Compressor and Drier	2	SYL	9-1-63
LCF&LF	14029	Splice Case	3	SYL	9-1-63
LCF	14030	Hands Off Phone (LCSB)	2	SYL	10-1-63
LCF	14031	FLCF Junction Box	2	SYL	10-1-63
LF	14032	LF Junction Box	1	SYL	1-1-64
LF	14033	LF Work Cage Jack Box	1	SYL	1-1-64

PRELIMINARY LISTING OF GITP AND GFE EQUIPMENT  
AVAILABLE FOR TRAINING (Cont.)

<u>USED IN</u>	<u>FIG "A"</u>	<u>DESCRIPTION</u>	<u>QTY.</u>	<u>SOURCE</u>	<u>O/D GITP</u>
LCF/LF	14034	FLCF & LF Jack Box	9	SYL	10-1-63
LCF	14035	Head Set	2	SYL	10-1-63
LCF	14036	VHF ESA	2	SYL	10-1-63
LCF/LF	14037	Hand Set	5	SYL	10-1-63
LCF	14045	Monitor & Fault Alarm Rack	2	SYL	10-1-63
LF	14049	LF Wall Phone	1	SYL	1-1-64
LCF	14050	Desk Phone	2	SYL	10-1-63
LCF		PAS Monitor Panel	3	SYL	10-1-63
LCF	14100	LCC Power Cable Set	2	SYL	8-15-63
LCF	14105	Motor-Generator Battery Set	2	SYL	8-15-63
LCF	14106	Motor-Generator Set	2	SYL	8-15-63
LCF	14125	Radio Set, Command & Status	2	SYL	1-1-64
LF	14126	Radio Set, Command & Status	1	SYL	1-1-64
LCF/LF	14129	Arrestor Set, Electrical Surge	3	SYL	1-1-64
LF	14130	Antenna Tuner Set, MF (LF)	1	SYL	1-1-64
LCF	14131	Antenna Tuner Set, MF (LCF)	2	SYL	1-1-64
LCF	14150	Message Processing and Control Subsystem	2	SYL	1-1-64
LF	14152	LF Processing, Control & Termination Rqm.	1	SYL	1-1-64
LCF	14180	Status Authentication Subsystem	2	SYL	1-1-64
LF	14181	Status Authentication Subsystem	1	SYL	1-1-64
LCF		Maintenance Ground Equipment		SYL	12-15-63
LF		Maintenance Ground Equipment		SYL	12-15-64



**APPENDIX A**

**SLIDE TRAINER PACKAGE TECHNIQUE**

## SLIDE TRAINER PACKAGE TECHNIQUE

A major and important segment of any training program is the understanding and acceptance of a system's and/or subsystem's operational philosophy. If the trainee is able to understand operational philosophy, he will be equipped to appreciate and comprehend efficiently the techniques involved when analyzing circuit details. Classroom presentations involving systems and/or subsystem operational philosophy are difficult to deliver to trainees due to the complexity and large amount of equipment involved.

Previous training programs conducted at Sylvania have utilized a Slide Trainer Package Technique which has proven to be an effective training device. This technique involves a series of 35 MM slides and is similar in some respects to Functional Flow Board Trainers. Slide Trainer Packages consist of a series of 35 MM slides of different geometry and color to progressively animate the flow of information within a particular system and/or subsystem in relation to time. Each slide package is derived from one or two basic diagrams with a series of overlays which are photographed in sequence to achieve the animated flow of information. The slides can be advanced automatically by the instructor using automatic remote control devices attached to 35 MM projection equipment. This technique, although applicable to mechanical devices, is more effective when applied to demonstrate electronic philosophy and circuits. Advantages of this Slide Trainer Package Technique include:

1. Inexpensive cost of development as compared to costs involving Functional Flow Board Trainers.
2. Simplicity and economy of updating slide trainer packages as changes in the system take place.
3. Flexibility of slide producing techniques allows a large variety of animation and color to be implemented in the generation of Slide Trainer Packages.
4. Use of automatic 35 MM projection equipment allows variability in speed and direction under remote control.
5. Automatic 35 MM projection equipment is available as standard training equipment at most training facilities.
6. The compactness of Slide Trainer Packages allows ease of transporting, storage, and inventory.

The Slide Trainer Package Technique as applied to the Minuteman Contractor Training Program will include overall Minuteman philosophy, overall GES philosophy, basic subsystem philosophy, a more detailed block philosophy on several of the larger subsystems, and digital logic techniques. A total of 35 Slide Trainer Packages have been recommended for Minuteman Associate Contractor training. These trainers will provide instructors with the necessary training equipment to efficiently and effectively present material involved in system and/or subsystem operational philosophy.

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