TECHNICAL MANUAL

OPERATOR'S MANUAL

FOR

AERIAL RESUPPLY AND ACCOMPANYING BUNDLE SYSTEM

(ARABS)

NSN 1670-01-351-8587

DISTRIBUTION STATEMENT A:
Approved for public release; distribution is unlimited

HEADQUARTERS, DEPARTMENT OF THE ARMY
15 SEPTEMBER 1993



SAFETY STEPS TO FOLLOW IF THE ARABS SYSTEM IS SUBJECTED TO CONTACT MITH ELECTRICAL WIRES.

Do not try to pull or grasp the ARABS system.

If possible, turn off the electrical power.

If you cannot turn off the electrical power, pull, push, or lift the ARABS to safety using a dry wooden pole or dry rope or some other insulating material.

WARNING

Two deployment system uses cutters which are pyrotechnic devices. Be very careful when handling these cutters. Detonated pyrotechnic devices can be very hot and may cause serious injury to personnel.

HEADQUARTERS
DEPARTMENTOF THE ARMY
WASHINGTON D. C., 15 September 1993

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REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can improve this manual. If you find any mistakes, or if you know of a way to improve the procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms) direct to Commander, U.S. Army Aviation and Troop Command Attn: AMSAT-I-MTS, 4300 Goodfellow Blvd., St. Louis, MO 63120-179R. A reply will be forwarded to you.

TABLE OF CONTENTS

TABLE OF CONTENTS - Continued

HOW TO USE THIS MANUAL

This manual has been written to give you the information necessary to operate the Aerial Resupply and Accompanying Bundle Systems (ARABS), and do all the preventive maintenance checks and services and maintenance that the operator is authorized to do.

A chapter index located at the beginning of each chapter makes it easy for beginning and experienced operators to use.

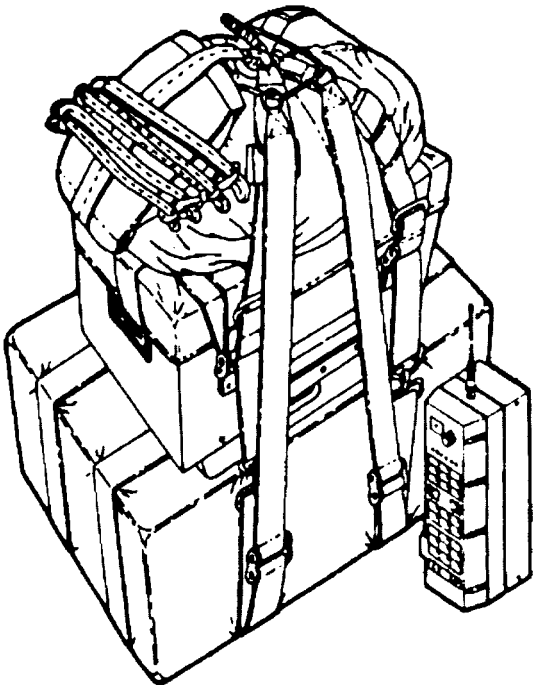

Figure 1-1. Aerial Resupply and Accompanying Bundle System (ARABS)

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CHAPTER 1
INTRODUCTION

Section I. GENERAL INFORMATION

1-1 Scope. This manual provides operating instructions for the Aerial Resupply and Accompanying Bundle Systems (ARABS). The ARABS is a radio guided aerial cargo delivery system which uses ram air parachutes to provide an offset of up to 35 miles. Once deployed from any cargo carrying aircraft, the ARABS can be guided to a preselected landing point using the automatic homing feature or manually guided by the operator. The radio unit has frequency hopping and multi-channel capabilities and operates in the frequency range of 339 to 372 MH,.

1-2 Maintenance Forms and Procedures
Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750, The Army Maintenance Management System (TAMMS).

1-3 Destruction of Army Materiel to Prevent Enemy Use Refer to TM 750-244-2, Destruction of Army Materiel to Prevent Enemy Use, for proper procedures for destruction of this equipment to prevent enemy use.

1-4 Reporting Equipment Improvement Recommendations If your ARABS needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design. Put it on an SF368 (Quality Deficiency Record). Mail it to: Commander, U.S. Army Aviation and Troop Command, Attn: AMSAT-I- MOC, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798. We will send you a reply.

1-5 Warranty Information. The ARABS is warranted for 12 months. The warranty starts on the in-service date found on the inside cover of the Army Parachute Log Record, DA Form 3912, for parachute components, and from date of manufacture for all other components, as indicated in block 23 of DA Form 2408-9, Equipment Control Record.

1-6 Nomenclature Cross Reference List Not applicable.

1-7 List of Abbreviations.

A	Automatic	FH	Frequency Hopping
AGU	Airborne Guidance Unit	kHz	kilohertz
		KIAS	knots indicated air speed
ARABS	Aerial Resupply-and Accompanying-Bundle Systems	L	Left
		Lbs	Pounds
		M	Manual
		MHz	Mega*hertz*
Batt	Battery	MV	Millivolts
C	Centigrade	PREV	Previous
CHAN	Channel	PRGM	Program
dB	Decibel	R	Right
DSBL	Disable	RF	Radio Frequency
ENBL	Enable		
EXT	External	TMR	Timer
ID	Identification	T/C	Transmitter Controller

Section II. EQUIPMENT DESCRIPTION

1-8 Equipment Characteristics. Capabilities and Features

a. Characteristics.

(I) Modular construction provides ease of maintenance.

(2) Multi-frequency capability.

b. Capabilities and Features.

(1) The ARABS can carry a payload with a range from 200 to 500 pounds.

(2) Up to six ARABS can be deployed and manually controlled by a single ground- based Transmitter/Controller (T/C). Any number of ARABS can automatically home to a single T/C.

(3) Maximum operating slant range of approximately 35 miles.

1-8 Equipment Characteristics, Capabilities and Features- Continued

b. Capabilities and Features - Continued

(4) ARABS can be deployed from altitudes of 2,000 feet Above Ground Level (AGL) to 25,000 feet Mean Sea Level (MSL) at airspeeds ranging from 0 to 1R0 Knots Indicated Air Speed (KIAS).

(5) ARABS provides steerable gliding descent with a lift-to-drag (L/D) ratio of approximately 3 to 1.

1-9 Location and Description of Major Component.

a. Parachute Assembly. (See Figure 1-2.)

(1) GI3A Cargo Clevis. Connects the drogue static line to the anchor line cable in the aircraft.

(2) Static Line. Connects the deployment bag to the G13A cargo clevis.

1-9 Location and description or Major Components- Continued

a. Parachute Assembly - Continued

(3) Drogue Deployment Bag. Stows the drogue parachute until deployed. Protects the drogue parachute.

(4) Drogue Parachute. The drogue parachute is used to decelerate and orient the ARABS so that the payload is oils suspended below the AGU.

(5) Drogue Bridle. Connects the drogue parachute to the main deployment bag and to the master tie cutter assembly during descent under the drogue, prior to main parachute deployment.

(6) Main Deployment Bar. Stows the main parachute until deployed. Protects the main parachute nylon canopy.

(7) Main Parachute. The ARABS uses a 370 square f(x)t main parachute. Prior to deployment, the main parachute is stowed in the main parachute deployment bag, mounted in a container on top of the AGU.

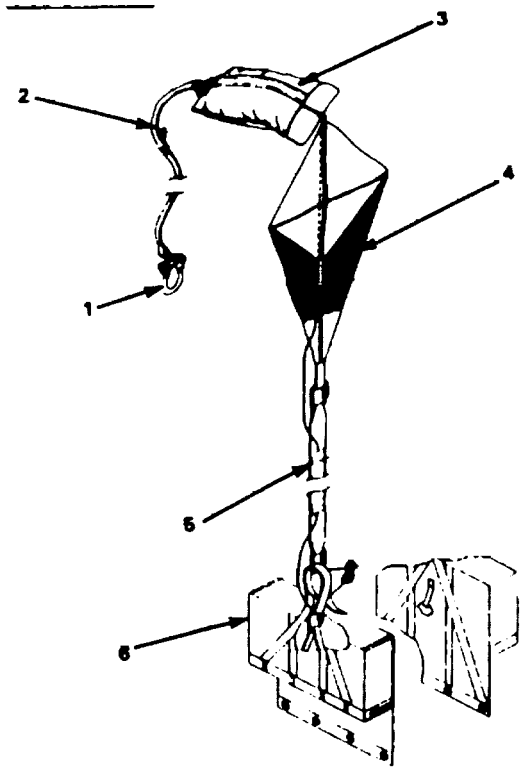

Figure 1-2. Parachute Assembly (Sheet I of 3)

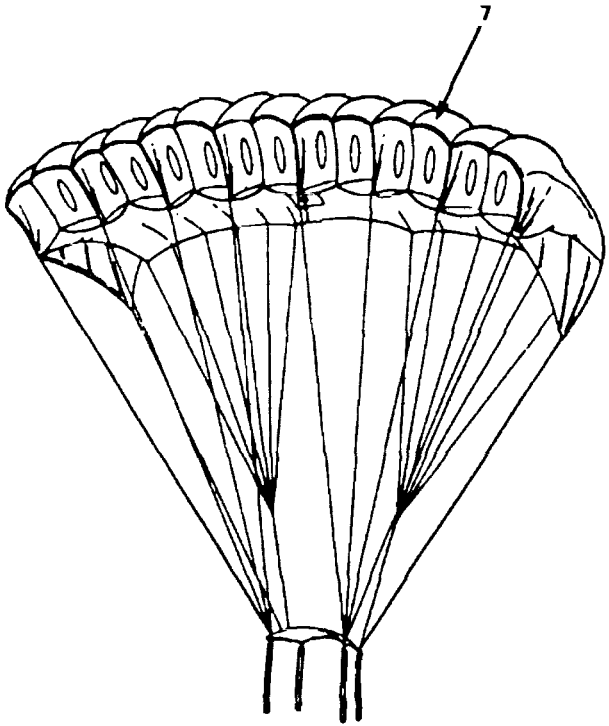

Figure 1-2. Parachute Assembly (Sheet 2 of 3)

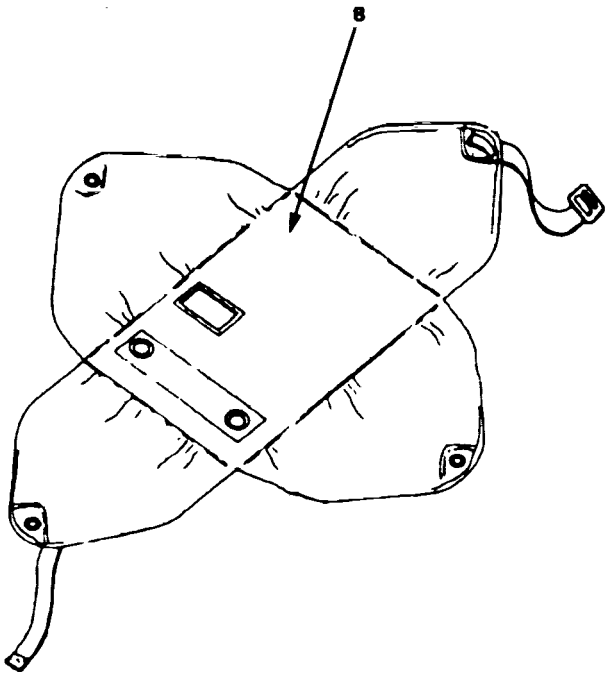

Figure 1-2. Parachute Assembly (Sheet 3 of 3)

1-9 Location and Description of Major Components - Continued

a. Parachute Assembly - Continued

(8) Container. Stows the main deployment bag prior to deployment. The flaps of the container are held closed by the master tie cutter for 6 seconds after the system leaves the aircraft. A clear plastic pocket (not shown on illustration) on the side of the container provides storage for the log record box,)k (not shown on illustration), AGU power switch, tab, and arming pins for the cutters.

b. Airborne Guidance Unit (AGU). (See Figure 1-3.)

(1) Protector Skirt. Fits over the top of the AGU cradle. Protects the parachute webbing from the AGU cradle sharp edges.

(2) AGU. The AGU mechanically manipulates parachute steering lines in response to RF signals received from the T/C. The AGU is housed in a metal case mounted in the protective AGUL cradle. Two flexible antennae extend from the bottom surface of AGU in flight.

1-9 Location and Description of Major Component- Continued

b. Airborne Guidance Unit (AGU) - Continued

(2) AGU - Continued

The AGU is powered by two rechargeable 12-volt batteries. The AGIT power switch is automatically turned on by deployment of the parachute.

(3) AGU Cradle. Mounts the AGU. Has an opening to allow access to the AGU controls and indicators.

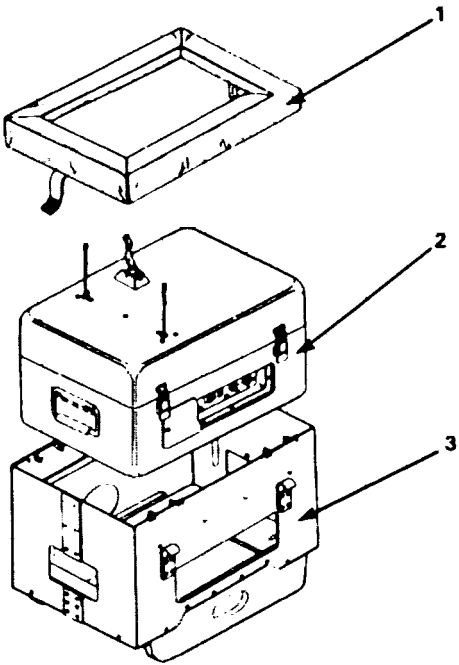

Figure 1-3. Airborne Guidance Unit

1-9 Location and Description of Major Component- Continued

c. Free Fall Kit. (See Figure I 4.) The free fall kit consists of FF-2 mounting panel (1) and cutter adapter (2). The free fall kit components allow the ARABS to the employed in a delayed opening mode.

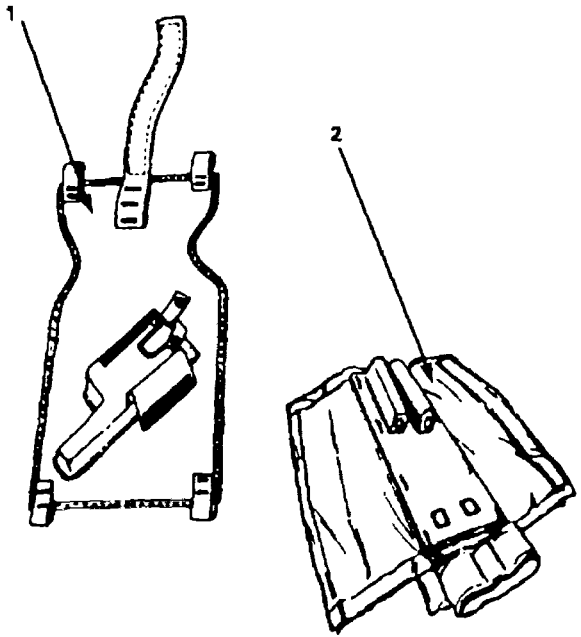

Figure 1-4. Free Fall Kit Components

1-9 Location and Description of Major Components- Continued

d. Transmitter/Controller (TIC). (See Figure 1-5.) The T/C (1) is a portable, battery- powered radio which transmits RF energy in the 339 to 372 MHz UHF band. The T/C can he fitted(with an optional remote control switch assembly (2) to allow a parachutist carrying the T/C to control the parachute via the AGU. The T/C is supplied with a removable dipole antenna (3).

CAUTION

Never turn on the T/C without the antenna connected, or when operating within 25 meters of another T/C. Damage to one or both T/Cs could result.

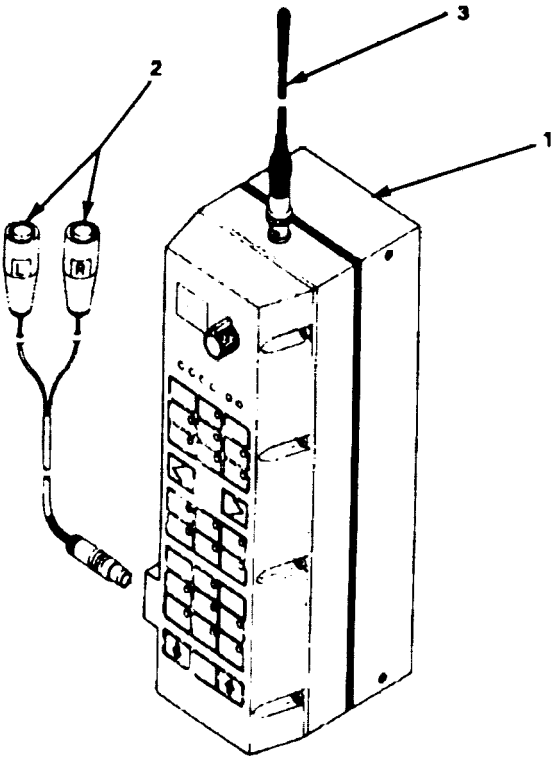

Figure 1-5. Transmitter/Controller

1-10 Differences Between Models. There is only one model of ARABS.

1-11 Equipment Data.

a. Weights and Dimensions (approximate).

(1) Main Parachute:

Span	28.5 ft (8.7 m)
Chord	13.0 ft (4.0 m)
Area	370 sq ft approx. (34.8 m)

(2) AGU:

Weight	85 lbs (32 kg)
Length	20.75 In. (53 cm)
Width	14.25 in. (36 cm)
Height	17.25 in. (44 cm)

(3) T/C:

Weight	7 lbs (2.6 kg)
Length	9.75 in. (25 cm)
Width	3.375 in. (8.5 cm)
Height	4.375 in. (11 cm)

1-11 Equipment Data - Continued

b. Performance.

(I) Main Parachute

Lift Drag	3 1 approx
Suspended Weight	500 Ib maximum (237 kg)
Forward Speed	20 to 45 mph (32.2 to 72.4 kph)
Rate of Descent	10 to 26 fps (3 to 8 mp,)
Fully Flared Landing	10 to 16 fps (3 to 4.9 mps)
Canopy Fabric	Ripstop nylon 1.5 oz/yard
Suspension Lines	Dacron 600 lb test (296kg)
Altitude Range	2000 ft AGL to 25,000 ft MSL (610 m to 9144 m)
Deployment Velocity	0 to 180 KIAS

(2) AGU

Guidance	Radial homing on a modulated source of RF energy transmitted in the 339 to 372 MHz frequency range at even 0.5 MHI increments

1-11 Equipment Data - Continued

b. Performance - Continued

(3) T/C

Output power	2 walls minimum
Range	Up to 15 miles (24 km) minimum, 35 mile, (4R.3 km) maximum

Section III. PRINCIPLES OF OPERATION

1-12 Deployment System Overview. The following paragraphs give a general overview of the deployment system.

a. The deployment system is used to stage deployment of the main parachute. It consists basically of a drogue parachute attached to a deployment bag. The deployment sequence is controlled by three pyrotechnic cutters (4 seconds, 6 seconds, and 12 seconds), each activated by portions of the deploying parachute. In the case of the system that is rigged for delayed opening drops, the first or master tie-cutter is fired by the FF-2 automatic ripcord release, initiating the deployment sequence.

1-12 Deployment System Overview. - Continued

b. When the system is pushed from the rear of the aircraft, the static line unstows and pulls the drogue deployment bag from the load as it falls away. The pack opening l(x)p on the static line breaks the payload retention tie that holds the AGU to the payload. This allows the payload to separate from the AGU, and also releases the drogue parachute from inside the drogue deployment bag. At this time, the drogue inflates to (decelerate and orient the system so that the payload is suspended below the AGU. The droque is connected to the AGU via a bridle. When the drogue is released(, it becomes a pilot chute and lifts to the parachute in its deployment bag off the AGU. The sequence then is line stretch, canopy deployment, full inflation, slider disreefing, deployment brakes released(, and droque deflation.

1-13 Equipment Functioning. (See Figure 1-6.)

a. Main Parachute (1). The parachute system includes a 370 square f(x)l ram air parachute which carry payloads tip to 500 p)units. The ram air main parachute has an airfoil shape that is maintained by air being "rammed" into the nose of the canopy in flight.

b. Drogue (2). The parachute system includes a drogue to decelerate and orient the system after deployment so that the payload is suspended below the AGU. The drogue is activated by line stretch upon deployment from the aircraft.

c. Airborne Guidance Unit (AGU) (3). The AGU is the airborne steering unit of the cargo-carrying parachute system. It receives RF signals transmitted by a T/C located on the ground in the drop area, or by a T/C carried by a parachutist. The RF signal is decoded into signals which mechanically manipulate the parachute steering lines. This allows the parachute to automatically "home" on the source of RF energy it' it is transmitting on the correct frequency and(with the correct code.

1-13 Equipment Functioning (See figure 1-6.)

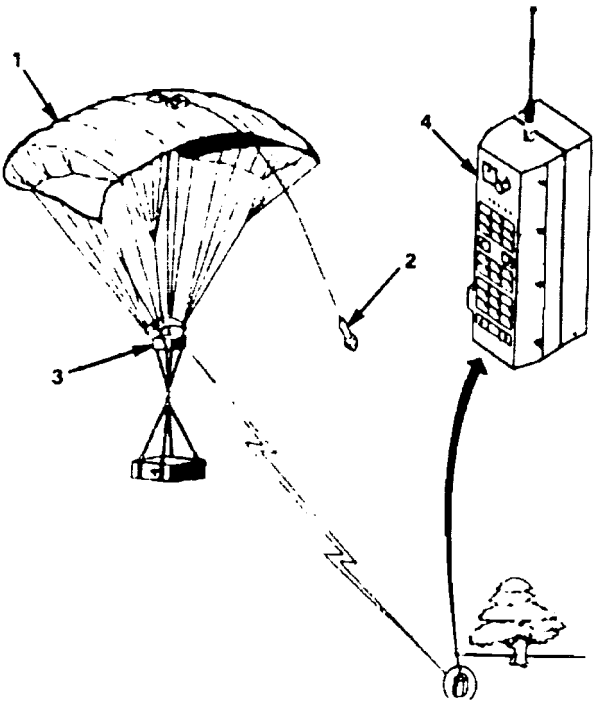

Figure 1-6. Components of ARABS (Sheet 1of 2)

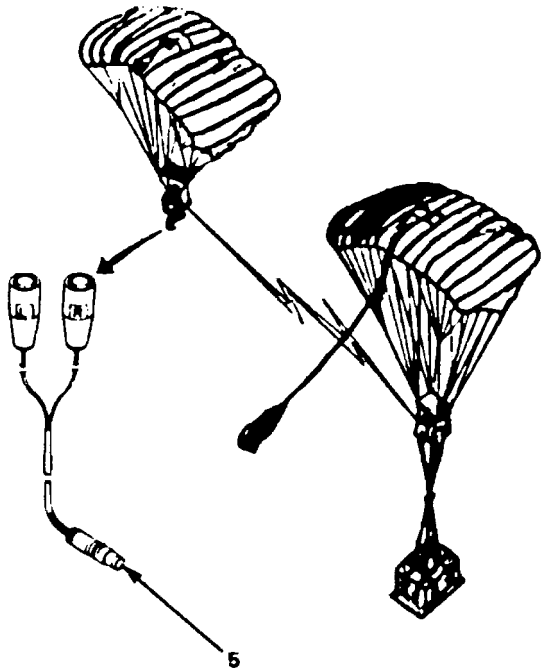

Figure 1-6. Components of ARABS (Sheet 2 of 2)

1-13 Equipment Functioning - Continued

d. Transmitter/Controller (T/C) (4). While T/C is used at the landing site (or carried by a parachutist) to provide the homing and control signals for the AGU. When operate(l in the vertical position, the T/C antenna radiates a horizontal "doughnut" pattern. Very little energy is radiated along the axis of the antenna. When operating, the T/C continuously transmits a code on the RF carrier of the programmed channel. The transmitted digital data contains the control information to:

(I) Select a particular AGU from I to 6 for manual control.

(2) Manually steer the selected parachute.

(3) Manually brake the parachute.

(4) Initiate accessory function. on a selected AGU, if so equipped.

(5) Initiate landing "flare" on a selected AGU.

1-13 Equipment Functioning - Continued

d. Transmitter/Controller (T/C)(4)-Continued The T/C can be carried by a parachutist while descending under a parachute and has the option of a remote control switch assembly (5) which plugs into the T/C. The remote control switch assembly terminates in two thumb operated switches which allow the parachutist to control an AGU in flight manually with a thumb switch in each hand such that he/she does not have to remove his/her hands from the parachute control handles to command with AGU. The T/C can be operated either in the manual mode or automatic mode while on the ground or in the air while being carried by a parachutist. In the auto mode, the AGU and T/C work together to fly the parachute to the target without any operator intervention. In the manual mode, the operator uses controls on the T/C for precise steering of the parachute during descent. The T/C may be switched between manual and automatic modes at any time. This allows automatic homing during the first part of the descent and manual operation once the parachute is within visual range.

1-14 Deployment Sequence. (See Figure 1-7.)

a. The bundle is initially droqued for 6 seconds to stabilize the load and reduce the airspeed (I).

b. Main canopy deployment starts after 6 seconds (2).

c. Canopy inflation starts on line stretch. Cutters for the slider reefing system and the deployment brakes are activated (3).

d. Canopy inflates and the slider is disreefed during the next 4 seconds. The canopy is left in brakes. The drogue deflates automatically (4).

e. Canopy remains in brakes for another 4 seconds until the last cutter fires, releasing the deployment brakes. The AGU is activated when the deployment bag leaves the pack tray (5).

1-14 Deployment Sequence - Continued

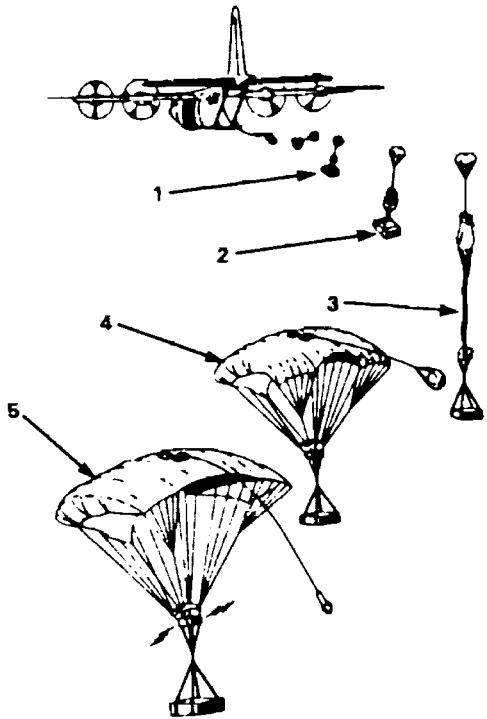

Figure 1-7. Deployment Sequence

1-27/(1-28 blank)

CHAPTER 2
OPERATING INSTRUCTIONS

Section I. DESCRIPTION OF OPERATOR'S CONTROLS AND INDICATORS

2-1. Airborne Guidance Unit (AGU).

a. AGU Activation Switch. (See Figure 2-1.) The AGU activation switch is a spring-loaded switch which is tied to the rigging in such a manner that it is automatically turned on by deployment of the parachute. Unless the parachute has been deployed, this switch is kept off by inserting a tab into the switch assembly. When the parachute is deployed, the tab is extracted from the switch assembly by a lanyard attached to the deployment bag and the switch is turned on. This conserves battery life since the AGU is turned on only during parachute deployment.

2-1. Airborne Guidance Unit (AGCU) - Continued

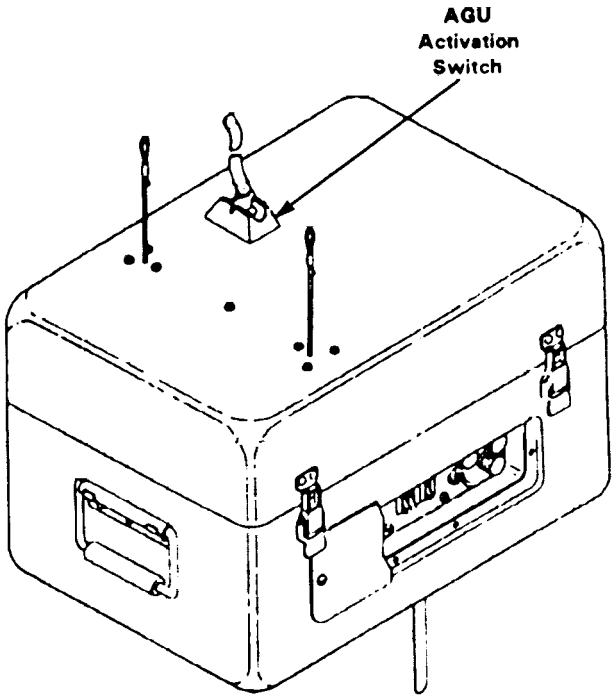

Figure 2-1. AGU Activation Switch

2-1. Airborne Guidance Unit (AGU) - Continued

b. AGU Control Switches. (See Figure 2-2.)

(I) CHAN (Channel) In**di**cator. Displays the channel number selected by the CHAN selector switch.

(2) AGU Indicator. Displays the AGU identification number ,,selected by the AGU ID switch.

(3) CHAN (Channel) Selector Switch. Select, the AGU frequency channel. The left channel switch is the decade select the right channel switch is the units select. To select channel number 19, for example, set the decade switch t) I and the unit switch to 9.

2-1. Airborne Guidance Unit (AGU) - Continued

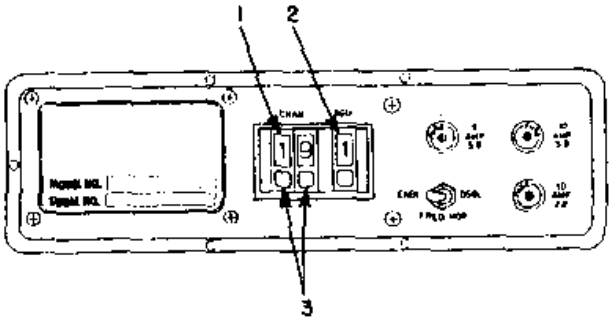

Figure 2-2. AGU Control Switches (Sheet 1 of 2)

b. AGU Control Switches - Continued

(4) AGU ID (Identification) Switch. Selects the AGU identification code from I to 6.

NOTE

An AGU can only he operated with a T/C that is programmed to the same frequency channel and the same ID code.

(5) FREQENCY HOPPING Switch Enables and disables the frequency hopping mode of the AGU. With the switch able Enable(ENBL) the AGU may be commanded to follow a programmed frequency hopping scheme by the T/C, provided the T/C is so programmed, on channels 1-10.

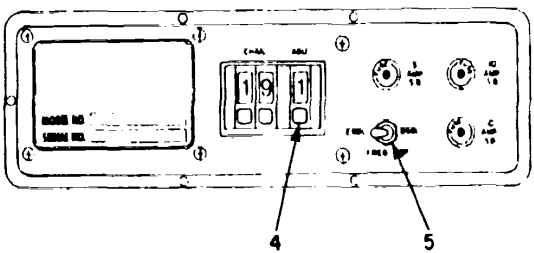

Figure 2-2. AGU Control Switches (Sheet 2 of 2)

2-2. Transmitter/Controller (T/)C).

a. Rotary Switch. (See Figure 2-3.)

(1) OFF Position. Turns off the T/C and allows the T/C battery to be charged.

(2) ON Position. Normal position for most airborne operations. In this mode, the T/ transmitter transmits after self-test.

(3) EXT (External) Position Enables extern turn control switches for airborne operations. If both external switches are de- pressed, the parachute will be command to 100% brakes.

(4) TMR (Timer) Position. Disables transmission by the T/C transmitter until the pre- programmed timer times out. Turn on delays may be preprogrammed from I minute to 99 hours, provided that there is sufficient battery capacity.

(5) PROG (Program) Position. In this mode, the T/C may be preprogrammed.

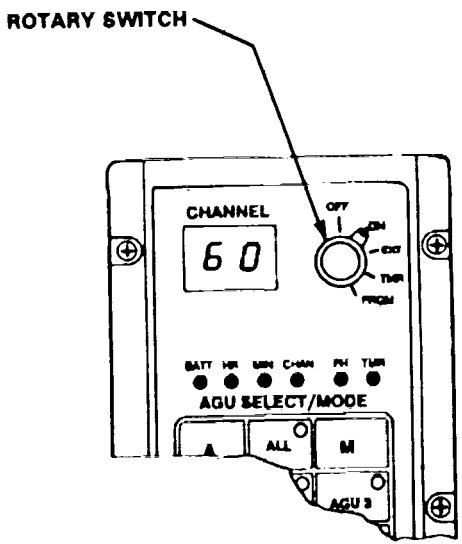

Figure 2-3. T/C Rotary Switch

2-2. Transmitter/Controller (T/C) - Continued

b. .AGU Select/MODE Switches. (See Figure 2-4.)

(I) A (Automatic) Switch. Selects auto homing. Auto homing will he selected for all AGUs on the same channel by pressing the ALL switch. Alternately, any number of AGUs up to six may be individually commanded to auto home. The selected AGUs will be continuously illuminated green, indicating auto homing. Only AGU numbers that have been preprogrammed will accept command(,s.

(2) ALL. Switch. Used in combination with the A switch or M switch to sele*ct* auto homing or manual homing for all AGUs on the same channel.

(3) M (Manual) Switches. Switches the transmission from auto mode to manual model. Manual may be combined with the ALL switch, in which case all AGUs will follow the same manual commands. In this mode, the ALL switch light will be red and flashing. The most common methods, however, is to commands one specific AGU for manual control. This is accomplished by pressing the specific AGLI switch, followed by the M switch. The flashing red light will confirm that die particular AGU is in the manual mode.

2-2. Transmitter/Controller(T/C). Continued

b. AGU Select /Mode Switches - Continued

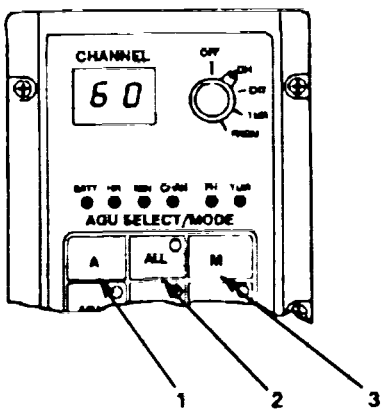

Figure 2-4. T/C AGU Select/Mode Switches

2-2. Transmitter/Controller (T/C).-Continued

c. Steering Switches. (See Figure 2-5.)

(l) L (Left) STEERING Switch. Commands a left turn. When switch released, the servos return to neutral. The left steering commands are only accepted by AGUs which have been commanded to the manual mode and have been identified by a flashing red light of their respective AGU ID switches.

(2) R(Right) STEERING Switch. Commands a right turn. When switch released, the servos return to neutral. The right steering commands are only accepted by AGUs which have been commanded to the manual mode and have been identified by a flashing red light of their respective AGU ID switches.

2-2. Transmitter/Controller (T/C).-Continued

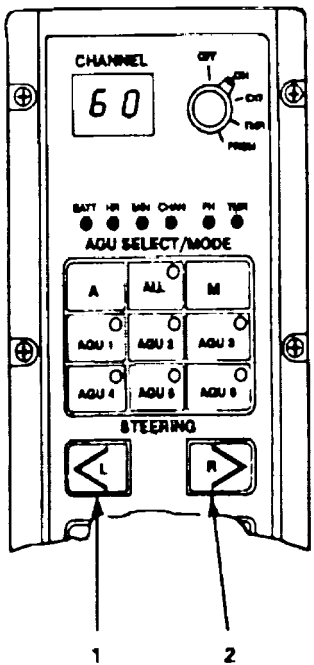

Figure 2-5. T/C Steering Switches

2-2. Transmitter/Controller (T/C).-Continued

d. **Braking Switches**. (See Figure 2-6.)

CAUTION

Activation of FLARE switch sequence will command and lock the system in 100% braking. The switch is unable to be disengaged without turning off the T/C, possibly causing system damage upon impact.

(1) FLARE ENB (Enable) Switch. Enables the FLARE switch, allowing it to function. Not used in this configuration.

(2) FLARE Switch. Indicates a "flare" landing. A "flare" procedures the slowest for- ward speed and slowest rate of descent possible. Not used in this configuration.

(3) 0% 25%, 50%, and 100% Brakes Selector Switches. Selects the amount of braking during descent of the parachute. In normal operations, the brakes will be 0% and the red light will be on. The 25%, *50%,* and 100% brakes position may be selected for any one AGU which has a red flashing light.

2-2. Transmitter/Controller (T/C).-Continued

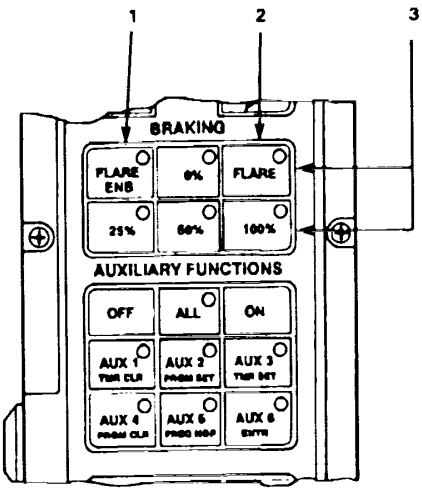

Figure 2-6. T/C Braking Switches

2-2 Transmitter/Controller (T/C).-Continued

c. Auxiliary Functions. (See Figure 2-7.)

(I) OFF Switch. Disables the auxiliary functions selected by ALL or AUX 1 through AUX 6 switches.

(2) ALL Switch. Selects all auxiliary functions simultaneously when the ON switch is depressed.

(3) ON Switch. Enables the auxiliary functions selected by ALL or AUX 1 through AUX 6 switches.

2-2. Transmitter/Controller (T/C).-Continued

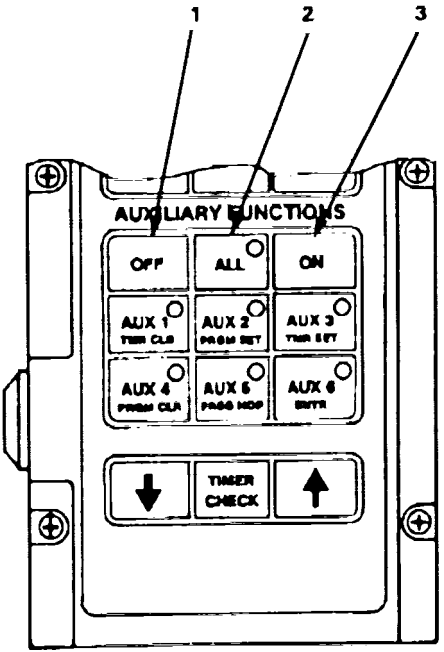

Figure 2-7. T/C Auxiliary Function Switches (Sheet 1of 2)

2-2. Transmitter/Controller (T/C).-Continued

c. Auxiliary Functions - Continued

(4) AUX 1 through AUX 6 Switches. Function as programming switches when the rotary switch is in the PROGRAM position. The ALL switch enables all auxiliary functions simultaneously when the ON switch is depressed. The individual AUX switches, once selected, may he turned on and off with the ON and OFF switches. A flashing red light indicates that the particular auxiliary function has been selected. A solid red light indicates that the function has been activated. To turn a function off; selector switch must be depressed again Auxiliary functions selected by the switches is as follows:

Switch	Function
AUX 1	Timer
AUX 2	Program set
AUX 3	Timer set
AUX 4	Program clear
AUX 5	Frequency hop
AUX 6	Enter

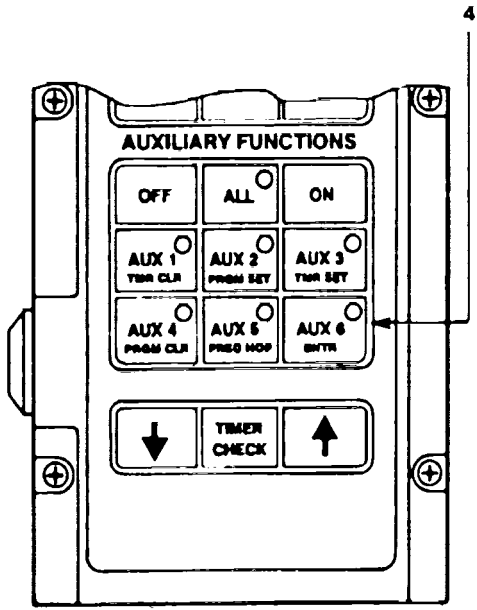

Figure 2-7. T/C Auxiliary Function Switches (Sheet 2 of 2)

2-2. Transmitter/Controller (T/C).-Continued

f. Channel Increase, Decrease, and Timer Check Switches. (See Figure 2-8.)

(I) Channel Decrease Switch. During T/C programming, pressing the down arrow switch decrements transmitter channel.

(2) TIMER CHECK Switch. Used to check the time remaining before turn on in the timer mode.

(3) Channel Increase Switch. During T/C programming, pressing the up arrow switch increments transmitter channel.

2-2. Transmitter/Controller (T/C).-Continued

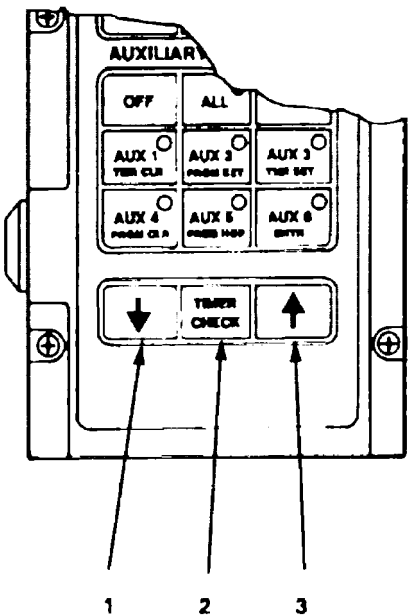

Figure 2-8. T/C Channel Increase, Decrease, and Timer Check Switches

g. Channel Display and Status LEDs (Light Emitting Diodes). (See Figure 2-9).

(I) CHANNEL Display. Displays programmed frequency channel whenever T/C power is turned on. With the rotary switch in TMR position, the CHANNEL display will display programmed time-out in hours and minutes.

(2) BATT LED. Indicates battery condition. Flashes to indicate a battery low condition.

(3) HR LED. Lights to indicate that the CHANNEL display is displaying hours. Rotary switch must he in TMR position.

(4) MIN LED. Lights to indicate that the CHANNEL display is displaying minutes. Display switch must be in TMR position.

2-2. Transmitter/Controller (T/C).-Continued

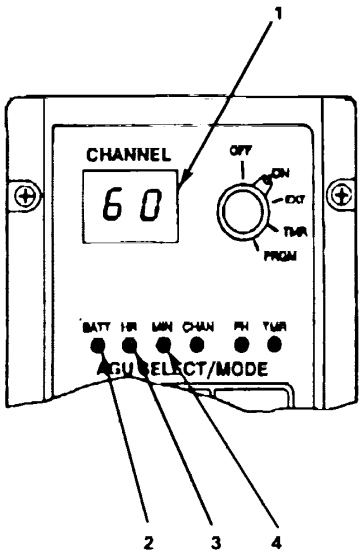

Figure 2-9. T/C Channel Display and Status LED s (Sheet 1 of 2)

2-2. Transmitter/Controller (T/C).-Continued

g. Channel Display and Status LED, - Continued

(5) CHAN LED. Lights continuously when the PRGM CLR (AUX 4) switch is de- pressed during T/C programming. Dc- pressing the PRGM SET (AUX 2) switch during T/C programming will cause the CHAN LED to blink. The CHAN LED stops blinking when the ENTER switch is pressed to enter the selected frequency channel.

(6) FH LED. Lights to indicate that the frequency hopping mode has been selected.

(7) TMR LED. Lights to indicate that the T/C is in the timer mode.

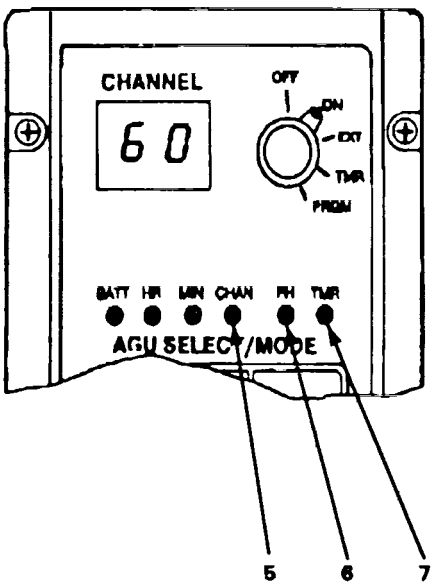

Figure 2-9. T/C Channel Display and Status LEDs (Sheet 2 of 2)

Section II. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

2-3. General. To be sure that equipment is always ready for your mission, you must perform the scheduled preventive maintenance checks, and services (PMCS). Figure 2-10 illustrates the major components[of the ARABS.

2-4.. **Explanation of Operator's PMCS Table Columns**-Your preventive maintenance checks and services table 2-1) is divided into five columns. Each column is described in the following paragraphs.

a. The "Item No." column of your PMCS table indicates the sequence in which the inspections should be performed.

b. The "Interval" column of your PMCS table tells you when to do a check or service.

(1) Before Operation. Perform your Before PMCS to be sure your ARABS equipment is ready for use. Always keep in mind the CAUTIONS and WARNINGS that appear in the manual.

(2) After Operation. Perform your After PMCS after each operation. This should help you keep your ARABS equipment in top operating condition.

2-4. **Explanation of Operator's PMCS Table Columns**-Continued

c. The "Location" of your PMCS table gives the name of the item(s) to be checked or serviced.

d. The "Procedure" column of your PMCS table tells you how to do the required checks and services. Carefully follow the instructions.

c. The "Not Fully Mission Capable if"'column of your PMCS table tells you when and why your equipment cannot be used.

Table 2-1. Preventive Maintenance Checks and Services for the ARABS

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
1	Before	AGU/TC batteries	Check condition of AGU and T/c batteries. See Battery Check Procedure (paragraph 2-5)	Batteries not fully charged
2	Before	T/C	Perform T/C Self-test (paragraph 2-5).	T/C Self-test failed

Table 2-1. Preventive Maintenance Checks and Services for the ARABS-Continued

Item No	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
3	Before	Rigging	Ensure that the has been rigged in accordance with TM 10-1670-302--23&P	System not properly rigged
4	Before	Load sling assy	Inspect that load sling is firmly secured to D-rings on payload	Load sling assy not properly attached
5	Before	AGU/payload	Ensure that AGU/payload connector straps adjusted as required	AGU/payload connector straps not tight
6	Before	Master tie cutter	Ensure that safety pin and flag is not removed from master toe cutter or cutter fired	Master tie cutter fired, or safety pin removed

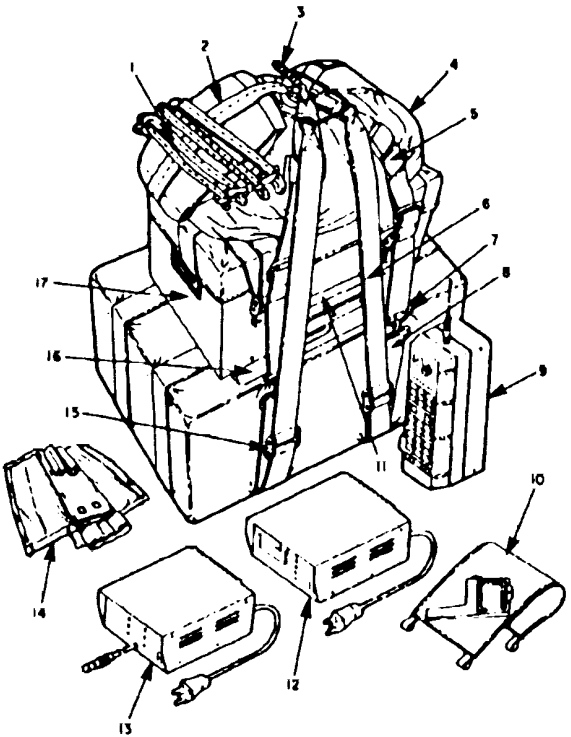

Figure 2-10. Major ARABS Components (Sheet 1of 2)

1 Static Line
2 Drogue Bag
3 Master-Tic Cutter
4 Main Parachute Container
5 Master-Tie Strap
6 Payload Connector Strap
7 Payload Attachment Ring on Main Parachute Risers
8 Payload Sling
9 T/C
10 FF-2 Mounting Panel (Free Fall Kit)
11 Channel Select Access Panel
12 T/C Battery Charger
13 AGU Battery Charger
14 Master-Tie Cutter Adapter (Free Fall Kit)
15 Payload Connector Strap Adjuster
16 Skid
17 AGU Cradle

Figure 2-10. Major ARABS Components (Sheet 2 of 2)

Table 2-1. Preventive Maintenance Checks and Services for the ARABS-Continued

Item No.	Interval	Location Item to Checks/ Service	Procedure	Not Fully Mission Capable if:
7	Before	Internal cutters	Ensure that safety pins and flag are removed from inter nal curlew. Inspect that safety pins and flags are stowed in log record book pocket en the outside of Ruin parachute container.	Safety pin and flag not removed from internal cutter
8	Before	AGU and T/C antenna	Inspect that AGL and TIC antennae are not broken or cracked and are tight. Make sure AGU antenna are not snagged in parachute webbing	Antennae missing, not tight or damaged
9	After	System	Inspect all equipment for damage	

Section III. OPERATION UNDER USUAL CONDITIONS

2-5. Initial Programming. Checks, and Self Tests

a. T/C Programming. (See Figure 2-11.)

(1) Set rotary switch (I) to PRGM. Auxiliary switches AUX I through AUX 6 (2) become programming switches as indicated by the red print on them.

(2) Press AUX 4 (PRGM CLR) switch (3). Observe that the CHANNEL display (4) displays 01 and the red CHAN LED (S) lights.

(3) Press AUX 2 (PRGM SET) switch (6). Observe that the CHANNEL display (4) displays 01, indicating that channel I has been selected, and that the red CHAN LED (5) blinks.

(4) Select the channel that the system is in- tended to operate by pressing the down arrow (7) or up arrow (8) switches. Refer to table 2-2.

WARNING

The channel programmed into the T/C must match the channel selected for the AGU it is intended to operate. Unmatched channels will result in loss of system control, possible injury to personnel, or equipment damage could result.

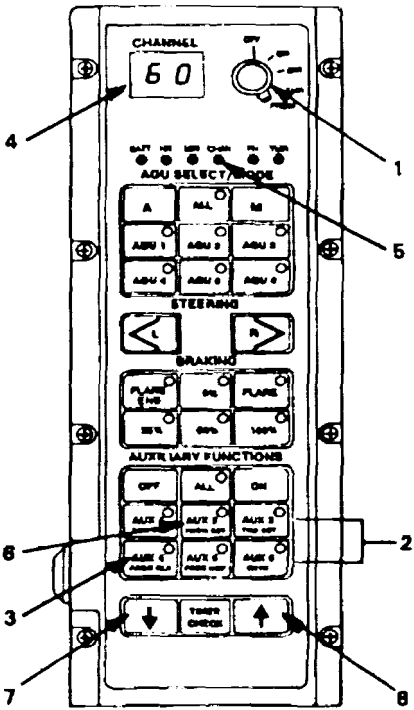

Figure 2-11. T/C and Timer Programming (Sheet 1of 3)

Tablet 2-2. Channel Selection/Frequency Cross Reference

Channel	UHF Frequency (MHz)
01	339.00
02	339.50
03	340.50
04	341.00
05	341 50
06	342.00
07	342.50
08	343.00
09	343.50
10	344.00
11I	344.50
12	345.50
13	346.00
14	346.50
15	347.00
16	347.50
17	348.00
18	348.50
19	34900
20	349.50
21	350.50
22	351 00
23	351.50
24	352.00
25	352.50
26	353.00
27	353.50
28	354.00
29	354.50
30	355.00

Tablet 2-2. Channel Selection/Frequency Cross Reference

Channel	UHF Frequency (MHz)
31	355.50
32	356.00
33	356.50
34	357.00
35	357.50
36	358.00
37	359.00
38	359.50
39	360.50
40	361.00
41	36t.50
42	362.00
43	362.50
44	363.00
45	363.50
46	364.00
47	364.50
48	365.00
49	365.50
50	366.00
51	367.00
52	367.50
53	368.00
54	368.50
55	369.00
56	369.50
57	370.50
58	371.00
59	371.50
60	372.00

2-6. Initial Programming. Checks, and Self Tests Continued

a. TIC programming - Continued

(5) Select the AGU identity code by pressing AGU ID switches AGU 1 through AGU 6 (9), as applicable. Any number of these switches may be selected, depending on the number of AGUs you intend to operate with the same TIC and on the same frequency. If all six AGU codes are to be used, they can be selected by pressing the ALL switch (10) or by pressing all six of them one at a time. Those AGUs which have been selected will blink. If the LED does not blink, press the appropriate switch until the LED blinks. If the LED is red, press the A (Auto) switch (11), then press the appropriate AGU switch until a blinking LED is observed for all AGUs you desired to operate with this TIC. The green blinking LED will allow the TIC to transmit the auto homing code when it is turned on.

(6) Press the AUX 5 (FREQ HOP) switch (12) if you wish to program In the frequency hop mode. Frequency hopping will only work with those AGUs that have all had their frequency hop switches turned on. Frequency Hopping mode can only be used with channels 1-10.

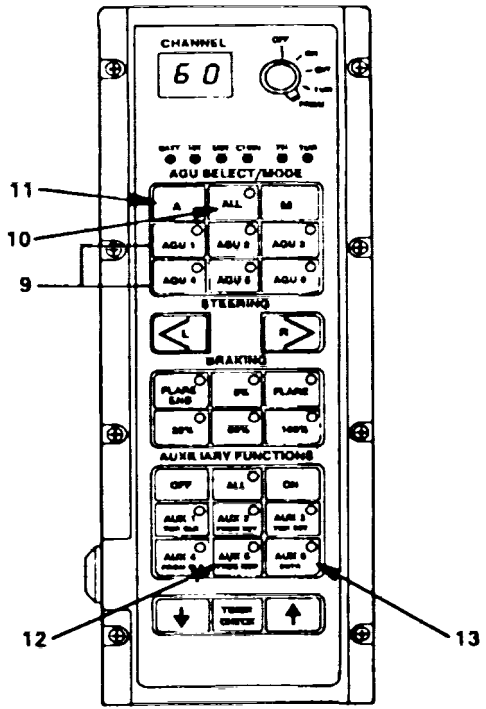

Figure 2-11 T/C and Timer Programming (Sheet 2 of 3)

a. T/C Programming - Continued

(7) Press the AUX 6 (ENTR) switch (13). This enters the frequency (channel) and AGU ID codes into the T/C's memory. Thus, when the T/C is turned on, the programmed in channel will appear in the display (4) and the selected AGU's will have their indicator LED's on. Once the AUX 6 (ENTR) switch is pressed, the blinking AGU LED's will light continuously and the CHAN LED (5) will also stop blinking.

NOTE

The T/C has now been programmed.

(8) Set the rotary switch (1) to OFF, then turn it to ON and verify that the CHANNEL display (4) indicates the correct channel number and that all of the AGU ID switches previously programmed come on solid red or solid green - as appropriate.

2-5. Initial Programming, Checks, and Self Test- Continued

a. T/C Programming - Continued

NOTE

With all AGU LED's (9) .solid green, all the AGU's in flight at the time will automatically home on the T/C, unless individually commanded manually.

(9) When the T/C is switched to the ON position, the system illuminates all the LED's on the front panel and runs a self test diagnostic program**.** The unit has passed the self test if the correct Channel and AGU numbers illuminate following the illumination of all LED's.

(10) To select an AGU for manual operation, press the appropriate AGU ID switch (9)**.** A blinking green LED on a specific AGU ID switch indicates that it has been designated to accept other commands.

2-5. Initial Programming, Checks, and Self Test - Continued

a. T/C Programming - Continued

(11) Press the M (Manual) switch (14). The selected AGU ID switch (9) will be identified by a blinking red LED.

NOTE

Only AGU's corresponding to AGU ID switches identified by a blinking red LED will accept manual commands.

b. Timer Programming.

(1) Set the rotary switch (1) to PRGM.

(2) Press AUX 1 (TMR CLR) (15) followed by AUX 3 (TMR SET) (16). The CHANNEL display (4) displays 01 and the MIN LED (17) illuminates. This indicates that the display is indicating minutes. The TMR LED (18) will also be illuminated and blinking.

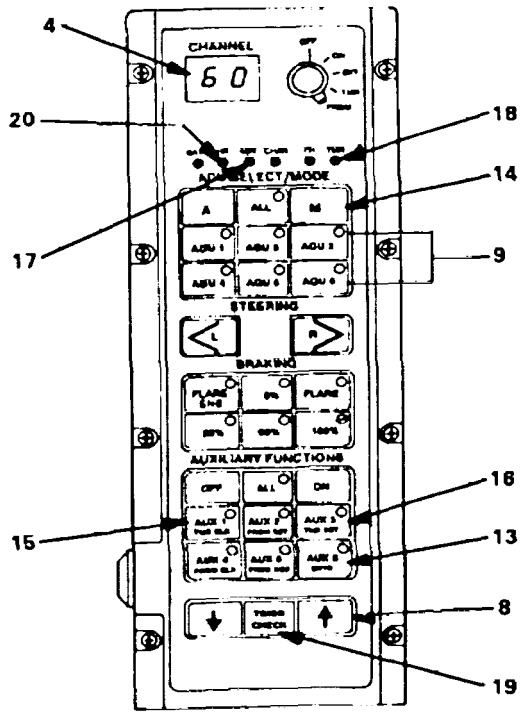

Figure 2-11. T/C and Timer Programming
(Sheet 3 of 3)

2-5. Initial Programming, Checks, and Self Test- Continued

b. Timer Programming. - Continued

(3) The Minutes display (4) may he increased up to 99 by pressing the up arrow switch (8), after which the display returns to 1 and the MIN LED (17) will go out and the HR LED (20) will light, indicating that the display is now displaying hours**.** The number of hours can he programmed from 1 through 99.

(4) After the display (4) indicates the correct minutes or hours**,** press the AUX 6 (ENTR) switch (13)**.** This locks in the timer setting into the T/C's memory.

(5) Set the rotary switch (1) to TMR**.** The T/C will stay off until the selected time elapses, after which the T/C turns on automatically with the programmed in frequency and AGU selections as described earlier. Normal operation in Timer mode would he the Automatic homing mode.

NOTE

While the T/C is in the timer mode, the remaining time can he checked by pressing the TIMER CHECK switch.

2-6. Operation Procedures.

a. Drop Zone Preliminary Operation.

CAUTION

Never turn the T/C on without the antenna connected. The T/C could be damaged if turned on without tile antenna connected.

(1) Attach the antenna to the T/C.

(2) If there is an option on selecting the drop zone, select the largest possible open unobstructed area. Obstructions such as buildings may slightly affect die Auto homing mode due to the reflection of the RF signal. This would cause the control system to seek an offset landing area.

NOTE

Select the Manual steering mode as soon as possible since RF reflections cannot prevent the operator from flying the payload to the desired location in this mode. In the Manual steering mode, it does not matter where the commanding signal is coming from.

2-6. Operating Procedures - Continued

a. Drop Zone Preliminary Operation - Continued

(3) Set the T/C on the ground in the approximate middle of the open area. If the area is obstructed with buildings, for example, on one or more sides, locate the T/C as far as possible from the obstructions even if it has to be located near the edge of the drop zone.

(4) Verify that the T/C has been correctly programmed. See T/C Programming procedures (see paragraph 2-5).

(5) Remove all objects, vehicles, and personnel from the immediate vicinity of the T/C.

NOTE

The ARABS operates in the UHF band. Therefore, it is a line of sight system; i.e., objects physically between the T/C and the ARABS may often weaken or blank the homing signal.

2-6. Operation Procedures - Continued

b. Jumpmaster Duties. The following is a guide to jumpmaster duties for ARABS.

(1) Duties in the unit area and departure airfield.

(a) Mission Planning and Release Point Calculation. The release point (RP) may be calculated to an approximate position by using the standard Distance - Constant x Altitude x Velocity (D-KAV) formula. Always use the ARABS High Altitude Release Point (HARP) when in the accompanying mode. Refer to FM 31-19, Military Free Fall Parachuting, for explanation of the D-KAV formula. K constants for ARABS are contained in table 2-3.

Table 2-3. ARABS K Constants

Total Payload Weight: (excluding ARABS)	
200 - 250 lbs	K = 75
251 - 300 lbs	K = 76
301 - 350 lbs	K = 77
351 - 400 lbs	K = 78
401 - 450 lbs	K = 79
451 - 500 lbs	K = 80

2-6. Operating Procedures - Continued

b. Jumpmaster Duties - Continued

CAUTION

Extreme care should be taken not to handle the rigged ARABS by any of the rigging components nor the exposed deployment system components. Specifically, the ARABS should not be moved or steadied by grasping the payload connector straps, nor the master tie components, as this may interfere with proper deployment of the system. At no time should any tie down straps be routed between the AGU skids and the payload, where they may interfere with or damage the antennae. Master tie cutter lanyards should not be attached to the master tie cutter firing pin ring. Cutter safety pins should not be removed at this time. This will prevent inadvertent firing of the master tie cutters.

2-6. Operating Procedures - Continued

b. Jumpmaster Duties - Continued

(b) Loading of Combined ARABS and Payload into Aircraft.

1. Arrange the equipment so that it can be loaded into the aircraft in the opposite order of exit, with static lines and drogue deployment bags facing toward the front of the aircraft.

2. Brief all personnel involved in loading operations (to include the Air Force crew) in the proper handling of rigged ARABS payloads.

3. Perform a final inspection of the rigging, insuring that all payload connector straps are secure, antennae are free and clear under the AGU, and that the appropriate number of safety pins and flags are present in their slots in the Log Record Book pocket. Ensure that all channel and AGU numbers recorded on the channel select access panels are correct according to the load plan.

2-6. **Operating Procedures** - Continued

b. Jumpmaster Duties - Continued

(2) Duties in Flight and Drop Operations.

(a) At the ten minute time warning, hook up static lines of ARABS units to be released on this pass. Attach master tie cutter arming lanyards, and remove the cutter safety pin and flag. Place the safety pin and flag into the appropriate place in the Log Record Book Pocket, double checking that the correct number of safety pin flags are displayed. There should be three for standard static line operations and four for free fall operations. Remove all but one tiedown device from the load.

(b) At the one minute time warning, remove the remaining tiedown device from the load and assist the loadmasters in moving the ARABS to the ramp and stabilizing the loads. Double check the correct routing of static lines. If possible, visually verify release point, and stand by for release.

2-6. **Operating Procedures** - Continued

b. Jumpmaster Duties - Continued

(c) Upon illumination of the Aircraft's Green Jump Caution Light if you are using a navigator release point again attempt to visually verify the release point, and if correct release the ARABS and payloads for that pass as vigorously as possible to minimize rolling of the system off of the ramp. Attempt to keep the loads in sight to verify correct functioning of the parachutes. Retrieve static lines and drogue deployment bags.

2-6. Operating Procedures - Continued

c. Flying/Controlling Drop From Ground-Based T/C. (See Figure 2-12.)

(1) Just prior to the drop, request the operator in the landing zone to set the T/C rotary switch (I) to ON. This is the normal position for most airborne operations.

(2) Press The A (Auto) switch (2) to select the Auto mode. In this mode, the ARABS will "home" to the T/C.

(3) Position the T/C so that the antenna (3) is vertical for maximum effectiveness.

(4) The operator in the drop zone should make visual contact with the system as soon as possible. When visual contact is made and the direction of flight established, press the M (Manual) switch (4) to select the Manual steering mode.

(5) Use the L (Left) switch (5) and R (Right) switch (6) to maneuver the system toward the desired landing 7one. When the system is approximately 200 feet (60 m) above the ground and its trajectory is to the T/C, press the 0% BRAKING switch (7) if not already pressed.

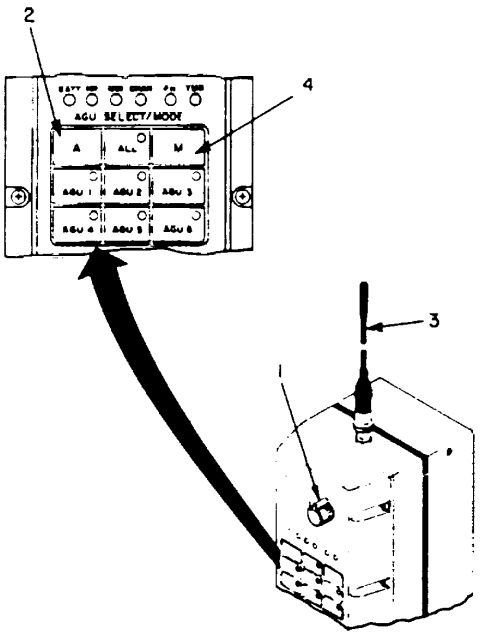

Figure 2-12. Flying/Controlling Drop From Ground-Based T/C (Sheet 1 of 2)

2-6. **Operating Procedures** - Continued

c. Flying/Controlling Drop from Ground-Based T/C - Continued

NOTE

ALL LANDINGS SHOULD BE INTO THE WIND.

(6) When the system is approximately 50 feet (15 m) from the ground, press the 50% or 100% BRAKING switch (8) to initiate a "flared" landing. A "flare" produces the slowest forward speed and slowest rate of descent possible.

NOTE

Manual control from the ground can also be accomplished using the external control switch assembly if the T/C rotary switch (1) is placed in the EXT position.

CAUTION

With some loads, the 100% braking configuration stalls and possibly imitates reverse flight. Use caution and be ready to transition to a lesser braking configuration if stalls are encountered, as rate of descent would be excessive.

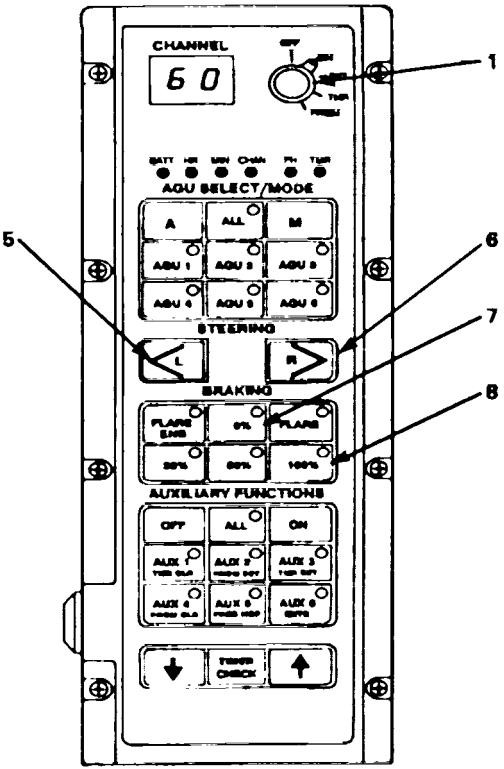

Figure 2-12. Flying/Controlling Drop From Ground-Based T/C (Sheet 2 of 2)

2-6. Operating Procedures - Continued

d. Air-to-Air Control of System.

(1) Payload Weight Restrictions. To enable the jumper to fly his own parachute relative to the ARABS, the rigged weight of the ARABS and payload must be matched to the weight of the jumper and his equipment, to within plus 100 and minus 50 pounds. The lightest payload to he rigged to the ARABS should be 200 pounds. For planning purposes, the packed ARABS system weight is approximately 115 pounds. The MC4/MC5 or MTI-XX parachute assemblies weigh slightly less than 50 pounds. If the jumper weighs 210 pounds dressed, he should rig the ARABS payload weight from 200 to 245 pounds. Jumping with additional combat equipment will increase the amount of weight that can be added to the ARABS payload proportionately. With ARABS and payload weight combinations heavier than the all-up weight of the jumper plus equipment, increased brake setting modes may need to be flown on the ARABS to minimize forward speed and rate of descent.

2-6. Operating Procedures - Continued

d. Air-to-Air Control of System - Continued

(2) Transmitter/Controller Setup and Programming For Air Control.

CAUTION

Never turn the T/C on without the antenna connected. Never operate the T/C in any proximity closer than 25 meters to another T/C. Damage to one or both T/Cs may result.

(a) Operational Checks.

The individual T/C that is to he used for the operation should be used for the function/operational test performed on the AGIJ, using the External control switch assemblies, if possible. At a minimum, the T/C should he tested using the external control switch assemblies, to insure that they are functional, using an operating AGU to observe the function of the T/C. It would also be a good practice, to make the function/operational test on the same

d. Air-to-Air Control of System - Continued

Channel, AGU number, and Frequency Hopping mode that will be actually used for the operation. The operational test should include checks of all Manual flight modes.

(b) Preflight Preparation.

1 Carefully route the wires of the external control switch assembly through the sleeves of your jumpsuit, leaving only a few inches of the cable protruding from the cuffs of the jumpsuit. Excess cable should be stored inside the suit.

2 Don your parachute and route the 90 degree connector to the inside of the main lift web. After correctly routing bailout oxygen system components and attaching weapons carrying devices and other equipment to the parachute, attach the T/C in its container to the main equipment carrying rings.

2-6. **Operating Procedures** - Continued

d. Air-to-Air Control of System - Continued

3 Remove the cover from the external control switch jack located to the left bottom of the T/C, and insert the 90 degree connector of the external control switch assembly into the jack.

4 Turn the T/C rotary switch to EXT to verify that the Channel, AGU Number, and Flight Mode are correct.

5 Press the AGU Number switch corresponding to the AGU number you are to be operating to obtain a blinking red light indication. Test the external control switches by depressing both switches simultaneously. The 100% braking light should illuminate. The absence of this condition indicates that there may be a broken connection in one or both of the remote switches, and the remote switch assembly should be replaced, and rechecked.

2-6. Operating Procedures - Continued

d. Air-to-Air Control of System - Continued

6 Press the 100% braking command button on the face of the T/C. The LED should illuminate. Depress both external Control switches simultaneously, then release them. The Manual Braking Mode LED should return to the 0O indication.

7 Turn off the T/C. Preflight testing of the T/C should be done as quickly as possible to preserve battery power.

(3) Airborne Operations.

(a) Three Minutes Prior to Drop.

1 Turn on T/C and press the appropriate AGU number button on the face of the T/C.

2 Depress both external Control switches to check that the 100% braking mode LED illuminates, indicating that the switches are operating properly.

2-6. **Operating Procedures** - Continued

d. Air-to-Air Control of System - Continued

3 Set the Manual Braking mode to the 50% position. This setting will slow the ARABS system's flight while you get oriented under your own parachute after exit.

4 Secure the cover of the T/C container.

(b) 1 Minute Time Warning.

1 Recheck the indicators on the front panel of the T/C.

2 Move toward the ramp close to the load you are to follow.

(c) Green Light. As soon as the load is released, exit the aircraft, and maintain visual contact with the system. The load will descend for six seconds under the drogue, then when the main parachute deploys, the slider is restrained for an additional four seconds, causing the system to have a relatively fast fall rate for the first ten

d. Air-to-Air Control of System - Continued

seconds after release from the aircraft. Therefore, a count of approximately seven to eight seconds after load release should be the best delay for deployment of your own main parachute, to open as close as possible to the load, while not descending below it. It may be easier to count one to two seconds after ARABS Main Parachute deployment.

(d) Under Canopy.

1 18 seconds after release from the aircraft, the ARABS system should be ready to accept navigational commands.

2 Release the deployment brakes of your own canopy and immediately direct your attention to the ARABS system.

3 Command the ARABS system to take up the predetermined compass heading that you computed during

d. Air-to-Air Control of System - Continued

mission planning.

4 Begin to adjust the rate of descent and forward speed of the ARABS system to your own, so that you can stay in formation on the load, with little adjustment as possible with your own canopy. The best place to fly is a little high and to one side of the load, where it is easiest to watch. If the load is floating too much, decrease the brake setting to 25% or 0%, but be ready for the forward speed to increase proportionately. Excess forward speed can be neutralized with "S" turns or "Sachet" maneuvers left and right, however use caution not to depress the turn switches too long so as to prevent the ARABS system from spiraling. If the load again starts to descend significantly faster than your canopy, transition to an increased brake setting, to allow you to catch up. The desirable method to use is to make the ARABS system do most of the work of flying relative to you.

2-6. **Operating Procedures** - Continued

d. Air-to-Air Control of System - Continued

5 Be constantly aware of altitude and heading, and as soon as possible, attempt to acquire and maintain visual contact with the Drop Zone.

6 To prevent the use of too deep a Braking Mode on final approach; perform a check of flight performance in all braking modes, including 100%.

(e) Drop Zone Approach.

1 Search for smoke or natural indicators of wind direction and velocity in the drop zone.

2 As soon as you have visual contact with the drop zone, and are aware of wind direction and velocity, begin to plan a route into the landing area, if one has not already been assigned to you in mission planning. Search the area between your present

2-6. Operating Procedures - Continued

d. Air-to-Air Control of System - Continued

location and the drop zone for alternate landing areas in the event that your primary landing point is unreachable, or congested with other traffic upon your arrival at a reasonable decision height

3 Attempt to plan for a standard landing track of downwind leg, base, and final approach into the wind.

4 Your proximity to the load is critical in the prepare to land phase. Too much distance, especially altitude separation, between)tour canopy and the load, can cause you to misjudge the proper initiation**,** point of the landing flare.

5 As you near the drop zone, the 50% braking mode is especially useful to minimize turn radius and pendulum effect of the load.

2-6. **Operating Procedures** - Continued

d. Air-to-Air Control of System - Continued

6 When the ARABS system is at approximately 300 feet AGL, depress the 0% Braking Mode switch, to allow it to increase its airspeed. Insure that the system stays facing into the wind. At 50-75 feet AGL, initiate a flared landing by either depressing both external control switches, or by pressing either the 10095 Braking Mode switch or the 'Flare Enable" then the "Flare" switch on the T/C front panel. The External Control Switches are a better choice if you have plenty of altitude left yourself, to observe the ARABS system's final approach, and release the switches in case the canopy begins to flare too high. The100% braking mode switch or the flare switch are the best choices if you are at a lower altitude. And must divert your attention to landing your own canopy. The major disadvantage to using the "Flare

d. Air-to-Air Control of System - Continued

Enable", and the "Flare" switch combination, is that the controls will latch in the "Flare" mode and the T/C must be cycled to OFF and then ON to return the ARABS system to full flight.

(f) After Landing. Attempt to land as close as safely possible to the load, and follow the recovery procedures as outlined in paragraph 2-9 of this manual.

WARNING

Do not allow your canopy to fly in front of the ARABS system or behind it any closer than 50 meters. Turbulence behind the ARABS parachute at about a 45° angle can cause your canopy to partially collapse.

2-6. Operating Procedures - Continued

e. Operation of ARABS in Delayed Opening Mode. The FF-2 free fall kit can he installed on either a packed or unpacked parachute. The ARABS with the free fall kit installed is hooked up in the aircraft the same as if for standard static line operations, except that the master-tie arming lanyard is removed, as the FF-2s will activate the master-tie cutters at the preselected altitude. Tile need for a dual FF-2 system is to provide redundancy for extra insurance against loss of mission equipment due to FF-2 failure. The free fill kit facilitate, placement of the FF-2s on opposite sides and at different heights on the AGU/parachute assembly, which provides the needed differential for correct functioning of at least one FF 2. The load is released from the aircraft in an identical manner to that of static line operations. Release point computation should take into account the drift in free fall of the system. Free fall drift is relatively close to that of a parachutist. Altitude setting of the FF-2 should be approximately 1000 feet higher than the desired pack opening altitude, to account for the various delays of the deployment system. The FF-2 should never be set lower than 5000 feet AGL. It is recommended that hl>th FF-2s be set to the same altitude.

e. Operation of ARABS in Delayed Opening Mode - Continued

WARNING

It is highly recommended that free fall bundles he ground controlled. A parachutist descending below an ARABS in free fall could possibly risk collision upon deployment of his main parachute.

Free fall rate of descent is directly related to the size and weight of the payload. A heavier payload with the same drag area will have a proportionately higher rate of descent. As an example, a 500 pound payload with a drag area (bottom surface) of approximately 1.4 square feet (10 x 20 inches) will descend under the drogue at approximately the same speed as a free fall parachutist, while a load with the same area and only 200 pounds in weight or a 500 pound payload with a standard size of 30 x 40 inches (8.33 ft^2), will descend at roughly half of that rate. With larger sized payloads, the rate of descent would be proportionately less. This is an important consideration if the load is to be accompanied in free fall by a parachutist, for air control of the load. It would be ultimately impossible for a jumper to follow a bundle that is only descending at 60 mph.

2-6. Operating Procedures - Continued

f. Auxiliary Function Use. (See Figure 2-13.)

NOTE

The six auxiliary (AUX) switches (1) on the T/C are used as on/off switch for various accessories on a selected AGU if the selected AGU has an AUX channel. The following procedures will allow tile operator to turn that function on and off from the T/C.

(1) Program the AGU ID codes and channel frequency. (Refer to paragraph 2-5.)

(2) With T/C on programmed frequency, select the AGU on which the auxiliary function is to be operated by pressing the appropriate AGU Switch (2). The AGU switch selected will blink on and off and be green if the system is in the Auto mode or red if the system is in the Manual mode.

(3) Select the desired auxiliary function by pressing the specific auxiliary (AUX) switch (1). When an AUX switch is pressed, it will show a red blinking LED. With a red blinking LED, the AUX on/off switches become operable for the first particular AUX channel.

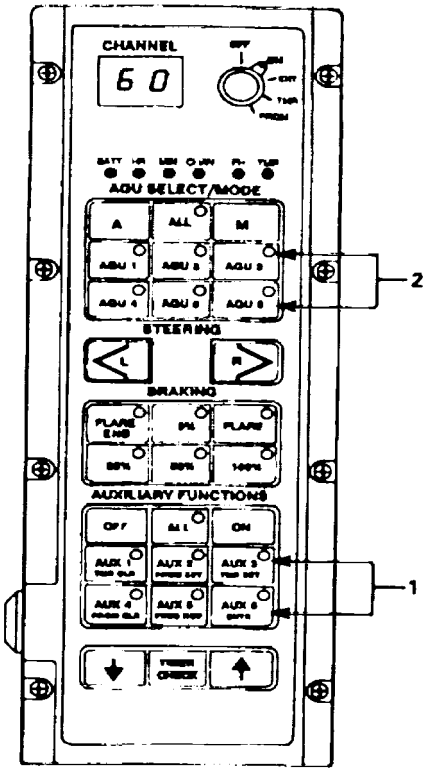

Figure 2-13. Auxiliary Function Use

2-6. Operating Procedures - Continued

f. Auxiliary Function Use - Continued

(4) Press the AUX ON switch to turn on the AUX function and the AUX OFF switch to turn off the AUX function. Once either of the switches is pressed, the blinking red LED will stop blinking and become solid red to indicate that the AUX ON switch has been pressed for that function or the LED will go out completely to indicate that the function has been turned off.

(5) If an AUX function has been turned on and is confirmed by a solid red LED, press the AUX switch. When the LED blinks on and off, press the AUX OFF switch to turn it off.

g. Fully Automatic Landings.

(1) Under certain circumstances, it may he necessary to allow the system to land totally on its own. Since the system doesn't know which way the wind is blowing, it is not predictable which direction it will be facing at the time of

g. Fully Automatic Landings - Continued

landing. Furthermore, it is likely that it will be maneuvering in an attempt to fly toward the T/C. Therefore, the impact of the payload can be expected to be much greater than with manual operations.

(2) Because of the greater impact velocity due to the system maneuvering and possibly landing with the wind without the benefit of an operator commanded landing flare, it is not advisable to use the fully automatic landing mode unless the situation requires it.

WARNING

In the automatic landing mode, maintain a minimum distance of 150 meters between the T/C and the nearest personnel. The system's behavior during the final few seconds is difrtcull to predict. Because of the tremendous kinetic energy of approximately 500 pounds when traveling at speeds of greater than 30 mph, it may endanger personnel in the vicinity of the T/C.

2-7. Decals and Instruction Plates

Not applicable.

2-8. Operating Auxiliary Equipment

Not applicable.

2-9. Recovery.

a. Immediately reinsert the tab of the red AGU arming assembly, located in the Log Record book pocket, into the power switch assembly to turn the AGU off.

b. Fieldpack the parachute and the suspension sling assembly into the container on the AGU.

CAUTION

Leave the AGU steering lines loose so that an accidentally turned on AGU is free to reel the line in. Otherwise, damage to the equipment may occur.

Section IV. OPERATION UNDER UNUSUAL CONDITIONS

2-10. Operation in Inclement Weather. The ARABS is designed and manufactured to operate in an outdoor environment, thus subjecting the equipment to extreme temperatures plus unusual weather conditions during operation. When operating the ARABS in normal or usual conditions, no protection from the elements is required; however, under extreme conditions, the following precautions are necessary.

a. Cold Climates. Extreme cold causes the remote control switch assembly to become hard, brittle, and difficult to handle.

(1) Be careful when handling the remote control switch assembly and connecting it to the equipment so that kinks and unnecessary loops will not result in permanent damage.

(2) Make sure connectors, controls, and terminals are free of frost, snow, and ice. Keep them protected from the elements when not in use.

(3) Be careful when cables are connected to the ARABS. Never drag or place the cables in the snow or water.

2-10. Operation In Inclement Weather - Continued

h. Hot Climates. In hot, dry climates (i.e., desert and dusty areas) equipment is subject to damage from dust and sand.

(1) Never place your equipment directly on the ground (sand or dusty area). First lay a protective cover on the ground on which to place the equipment.

(2) Protect connectors, controls, and terminals from blowing sand and dust.

(3) Increase cleaning interval, as necessary, to keep equipment free of dust and dirt.

c. Warm, Damp Climates. In warm, damp climates, the equipment is subject to damage from moisture and fungus. Wipe all moisture and fungus from equipment with a soft, lint-free cloth.

CHAPTER 3
OPERATOR'S MAINTENANCE

Section I. LUBRICATION INSTRUCTIONS

Not applicable

Section II. TROUBLESHOOTING PROCEDURES

3-1. Operator's Troubleshooting Procedures.
(See Table 3-1.)

Table 3-1. Operator Troubleshooting Procedures

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
1. T/C BATTERY CHECK FAILED
Fully charge T/C battery and repeat T/C Battery Check.
Replace T/C battery.
2. AGU BATTERY CHECK FAILED
Fully charge AGU batteries and repeat AGU Battery Check.
Notify direct support to replace AGU batteries.

Table 3-1. Operator Troubleshooting Procedures - Continued

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
3. AFTER DEPLOYMENT, RATHER THAN HOMING (i.e., FACING THE T/C), THE SYSTEM CONTINUES TO FLY IN A CIRCLE. Recheck designated channel and AGU number on T/C. Set the correct operating channel and AGU number for the ARABS you are controlling. If correct, switch the T/C from auto to manual. Switch the T/C from Auto to Manual mode. If the circling slops, the system can be flown manually under full control. If switching to the Manual mode doesn't stop the canopy from flying in circles, it is most likely a rigging problem. Under these circumstances, applying manual turn in the opposite direction should at least reduce the rate of the turn, if not completely stopping it.

Section III. MAINTENANCE PROCEDURES

3-2. Introduction. The following paragraphs give an overview of the batteries used with the ARABS.

a. AGU Batteries. The AGU is powered by maintenance-free lead acid batteries. These batteries use a unique gelled electrolyte which allows them to be used while oriented in any position. With proper care, the batteries will provide two years of useful life under the light to moderate load requirements imposed by this homing guidance system. The AGU uses two 12-volt, 6 ampere-hour batteries for primary power. Fully charged batteries at a temperature of -40°F will power the AGU for 30 minutes of normal flight time. At battery temperatures of +60°F, approximately 2 hours of operation can be expected before recharging is required. The actual battery life prior to recharging will be a function of the number of steering maneuvers required during an individual flight. Automatic radial homing at the longer ranges where steering requirements are moderate will extend useful battery life. Excessive manual steering will reduce the time required before the batteries must he recharged. Using brakes in either Manual or Auto mode drains the batteries twice as fast as manual steering.

3-2. Introduction - Continued

a. AGU Batteries - Continued

The batteries selected for this application have adequate capacity to power the AGU for two or more successive flights without recharging, depending on altitudes and loads. However, to ensure successful completion of an airdrop or a series of airdrops, the batteries should be recharged overnight prior to the first drop. The batteries should then be recharged if 30 minutes of flight time has been accumulated.

b. T/C Battery Pack. The T/C is powered with a 4 ampere-hour NiCd battery pack. When properly charged, these batteries will provide adequate power for I hour at -40°F and 2 hours of operation at +68°F. Although the operating time of these batteries, before recharging, exceeds that of the AGU batteries, successful airdrops are best assured if these batteries are recharged at the same time when the AGU batteries are recharged. The T/C battery pack is easily detachable so that a fully charged battery pack can be installed in seconds.

3-3. Battery Care. Never allow a battery to be stored for more than a few hours in a discharged condition. Prior to storage, each battery should be fully charged. These batteries will self-discharge at the rate of 2-3% per month if stored at +68°F and 10-15% per month if stored at +104°F. Batteries in storage should be recharged at 2-3 month intervals then returned to storage. If this procedure is followed, the batteries should be ready for immediate use if time is not available for recharging prior to the airdrop. Battery life is halved for each 20°F increase in temperature above normal room temperature. Avoid storing batteries in an excessively warm area. Protect the batteries from rough handling or blows which may crack the case. Even minor case cracks will allow the gelled electrolyte within the battery to dry out, thus rendering the battery useless.

3-4. Battery Check Procedures.

a. T/C Battery. (Sec Figure 3-1.) Check the T/C battery as follows:

(1) Set the T/C rotary switch (1) to ON.

(2) Observe BATT LED (2). If the LED is not illuminated, it is an indication that the battery condition is good. A flashing BATT LED indicates a battery low condition.

3-4. Battery Check Procedures - Continued

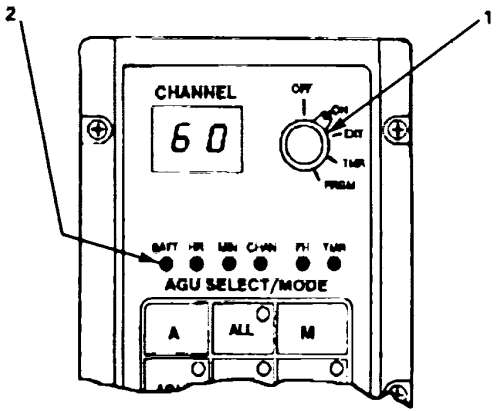

Figure 3-1. T/C Battery Check and Charging

3-4. Battery Check Procedures - Continued

b. AGU Battery. Check the AGU battery as follows:

(1) Unscrew the charger receptacle cover on the side of the AGU.

(2) Insert the charger plug into the receptacle, making sure the keyed positions of tile plug are aligned properly.

(3) Set tile voltage selector to 115 or 230, depending upon available line voltage.

(4) Plug the charger plug into electrical outlet.

(5) Set the charger ON/OFF switch to ON.

(6) Observe that the BATTERY A and BATTERY B CHARGE COMPLETE LEDs are lit.

(7) Observe that the BATTERY A and BATTERY B BATTERY FAILURE LEDs are extinguished.

3-5. Battery Charging, Procedure. The AGU and T/C battery chargers are used to charge the batteries in their respective units. The chargers are equipped with, and incorporate, automatic circuits to switch them from the "fast charge" mode to the "float" mode.

a. Charging T/C Batteries. (See Figure 3-2.) Charge the T/C batteries as follows:

(1) Insert the battery pack (1) into the charger (2).

(2) Set the voltage selector to 115 or 230, depending upon available line voltage.

(3) Plug the power cord (3) into electrical outlet.

(4) Set the charger ON/OFF switch (4) to ON.

(5) Charge the batteries for at least 6-R hours. Overcharging is prevented automatically by the charger circuit.

(6) When battery charging is complete, remove the battery from the charger.

3-5. Battery Charging Procedures - Continued

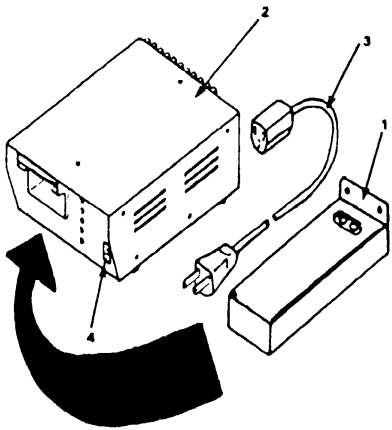

Figure 3-2. Charging T/C Battery

3-5. Battery Charging Procedure - Continued

b. Charging AGU Batteries. (See Figure 3-3.) Charge the AGU batteries as follows:

(1) Unscrew the charger receptacle cover on the side of the AGU.

(2) Insert the charger plug (1) of the AGU Battery Charger (2) into the AGU receptacle, making sure the keyed positions of the plug are aligned properly.

(3) Set the voltage selector to 115 or 230, depending upon available line voltage.

(4) Plug the power cord (3) into electrical outlet.

(5) Set the charger ON/OFF switch (4) to ON.

(6) Charge the batteries for at least 6-8 hours. Overcharging is protected automatically by the charger circuit.

(7) When battery charging is complete, remove the battery from the charger.

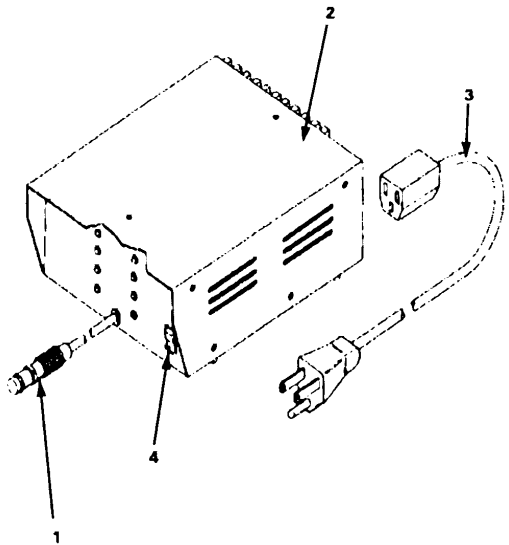

Figure 3-3. AGU Battery Charger

CHAPTER 4
MAINTENANCE OF AUXILIARY EQUIPMENT

Not Applicable.

APPENDIX A

REFERENCES

A-1. Scope. This appendix lists all forms, field manuals, regulations, and technical manuals referenced in this technical manual.

A-2. Forms.

Quality Deficiency Report ..... SF 368

Recommended Changes to
Publications and Blank Forms ..... DA Form 2028

Report of Item and Packaging
Discrepancies ..... SF 364

Equipment Inspection and
Maintenance Worksheet ..... DA Form 2404

Army Parachute Log Record Book ..... DA Form 3912

Equipment Control Record ..... DA Form 2408-9

A-3. Technical Manuals.

Unit and Direct Support Maintenance Manual Including Repair Parts and Special Tool List for Aerial Resupply and Accompanying Bundle System .... TM10-1670-302-23&P

Destruction of Army Materiel to Prevent Enemy Use ..... TM 750-244-2

A-4. Pamphlets.

The Army Maintenance Management System ... . DA PAM 738-750

A-5. Field Manuals.

Military Free Fall Parachuting ..... FM 31-19

APPENDIX B

COMPONENTS OF END ITEM LIST (COEI)

Section I. INTRODUCTION

B-1. Scope.

This appendix lists Components of End Item and Basic Issue Items for the Aerial Resupply and Accompanying Bundle System (ARABS) to help you inventory items required for safe and efficient operation.

B-2. General.

The Components of End Item list is divided into the following sections:

a. Section II, INTEGRAL COMPONENTS OF THE END ITEM.

These items, when assembled, comprise the ARABS and must accompany it whenever it is transferred or turned in. The illustration following this section (Figure B-1) will help you identify these items.

b. Section III, BASIC ISSUE ITEMS.

Not applicable.

B-3. Explanation of Columns.

a. Column (1) - Illustration Number (ILLUS Number). This column indicates the number on the illustration in which the item is shown.

b. Column (2) - Description. Indicates the Federal item name and, if required, a minimum description to identify and locate the item. The last line for each item indicates the FSCM (in parenthesis) followed by the part number.

c. Column (3) - Unit of Measure (U/M). Indicates the measure used in performing the actual operational/maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g. EA, IN, PR).

d. Column (4) - Quantity Required (QTY RQR). Indicates the quantity of the item authorized to be used with/on the equipment.

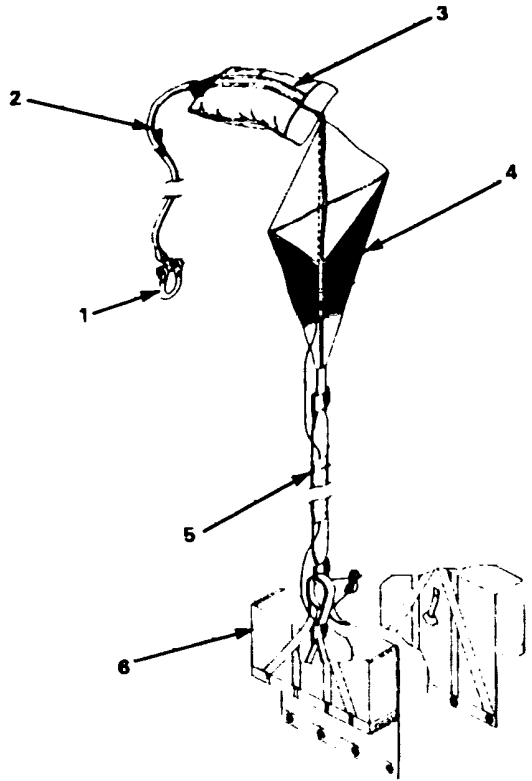

Figure B-1. Components of End Item
(Sheet 1 of 9)

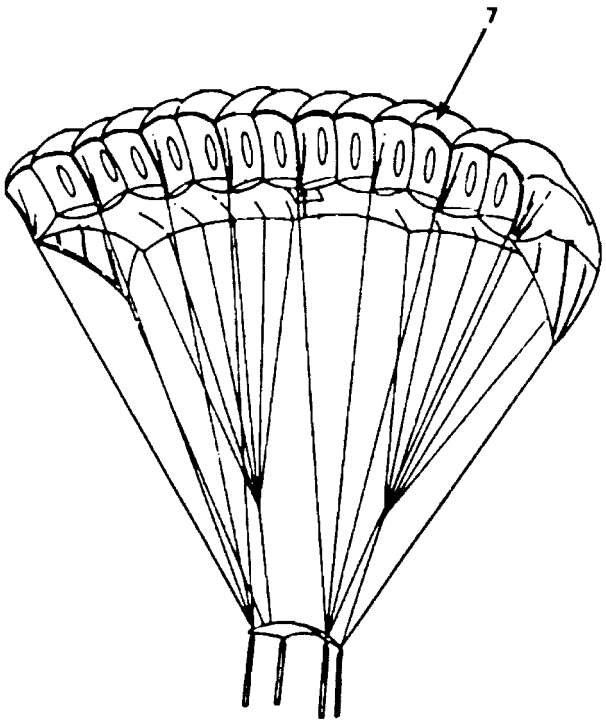

Figure B-1. Components of End Item
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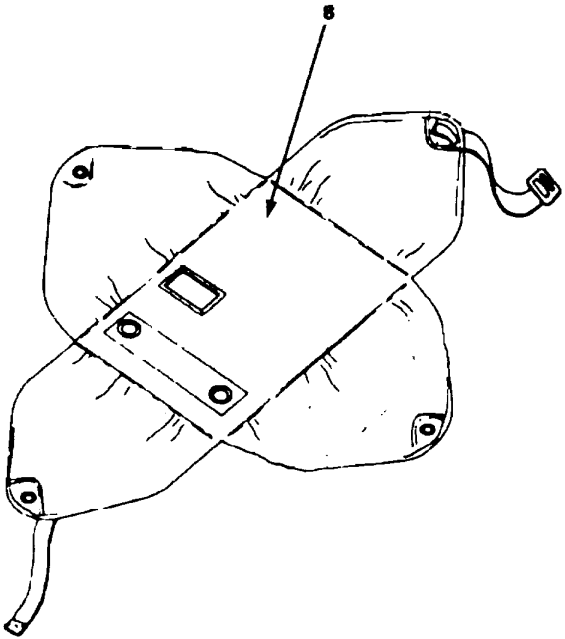

Figure B-1. Components of End Item
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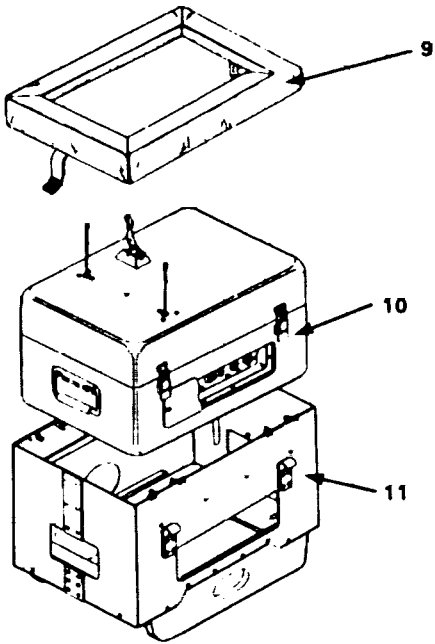

Figure B-1. Components of End Item
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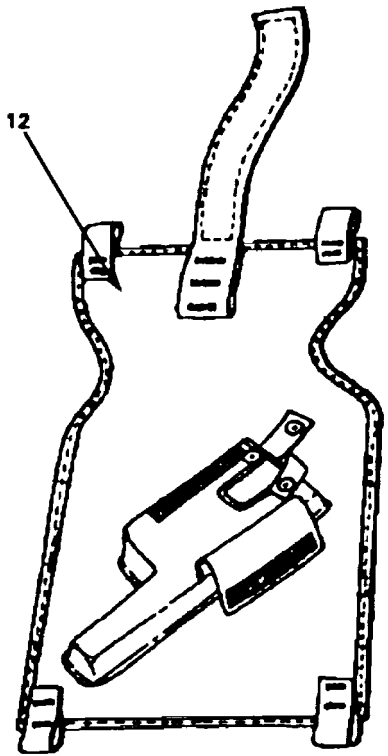

Figure B-1. Components of End Item
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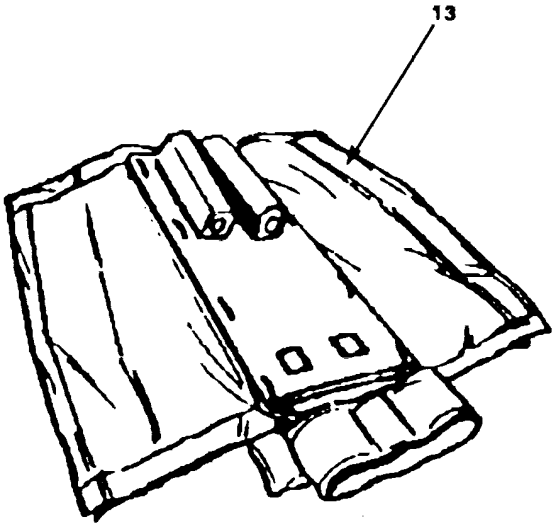

Figure B-1. Components of End Item ·
(Sheet 6 of 9)

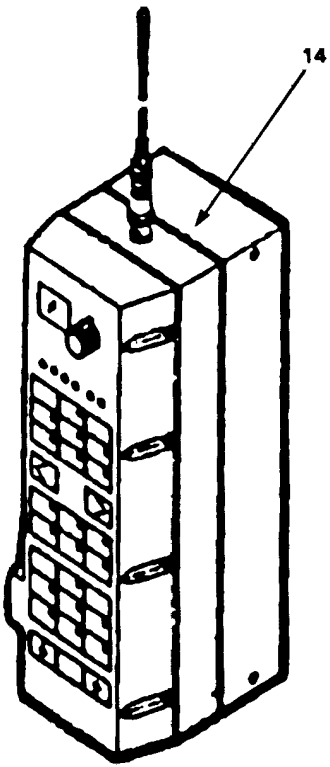

Figure B-1. Components of End Item
(Sheet 7 of 9)

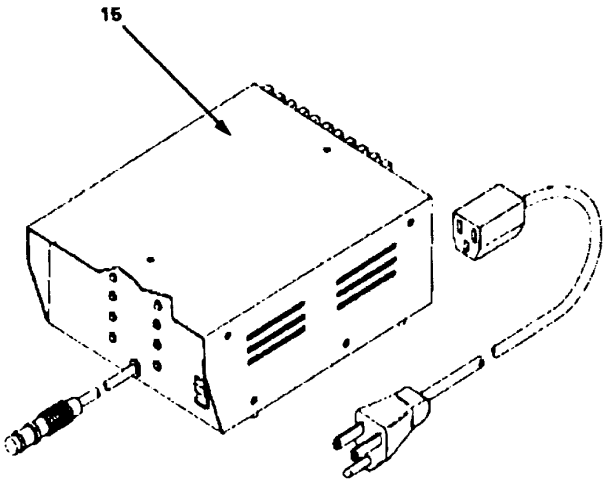

Figure B-1. Components of End Item
(Sheet 8 of 9)

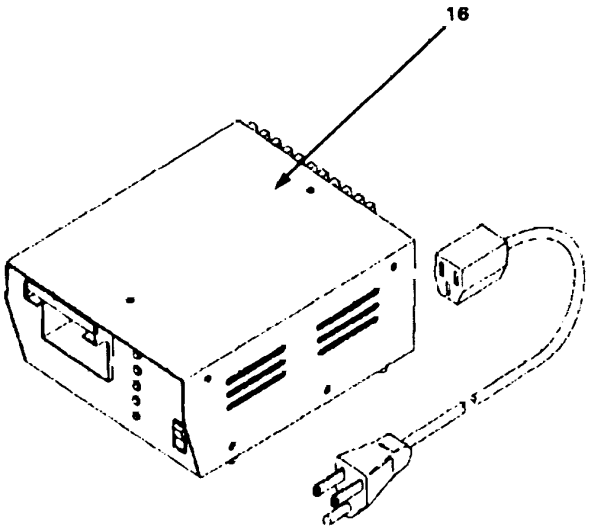

Figure B-1. Components of End Item
(Sheet 9 of 9)

Section II. COMPONENTS OF END ITEM

(1) ILLUS Number	(2) NSN	(3) Description/FSCM	(4) U/M	**(5)** QTY RQR
1		G13A Cargo Clevis/57172	EA	1
2		Static Line/57172	EA	1
3		Drogue Deployment Bag/57172	EA	1
4		Drogue Parachue/57172	EA	1

Section II. COMPONENTS OF END ITEM - Continued

(1) ILLUS Number	(2) NSN	(3) Description/FSCM	(4) U/M	**(5)** QTY RQR
5		Drogue Bride/57172	EA	1
6		Main Deployment Bag/57172	EA	1
7		Main Parachute/57172	EA	1
8		Container/57172	EA	1
9		Protector Skirt/57172	EA	1

Section II. COMPONENTS OF END ITEM - Continued

(1) ILLUS Number	(2) NSN	(3) Description/FSCM	(4) U/M	**(5)** QTY RQR
10		Airborne Guidance Unit/57172	EA	1
11		AGU Cradle/57172	EA	1
12		FF-2 Mounting Panel/57172	EA	1
13		Cutter Adapter/57172	EA	1
14		TransmitterlController/57172	EA	1

Section II. COMPONENTS OF END ITEM - Continued

(1) ILLUS Number	(2) NSN	(3) Description/FSCM	(4) U/M	**(5)** QTY RQR
15		AGU Charger/5S7172	EA	1
16		T/C Charger/57172	EA	1

ALPHABETICAL INDEX

D

E

H

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M

N

O

P

R

S

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THE METRIC SYSTEM AND EQUIVALENTS

'NEAR MEASURE

. Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches
1 Kilometer = 1000 Meters = 0.621 Miles

'VEIGHTS

Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces
1 Kilogram = 1000 Grams = 2.2 lb.
1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

SQUARE MEASURE

1 Sq. Centimeter = 100 Sq. Millimeters = 0.155 Sq. Inches
1 Sq. Meter = 10,000 Sq. Centimeters = 10.76 Sq. Feet
1 Sq. Kilometer = 1,000,000 Sq. Meters = 0.386 Sq. Miles

CUBIC MEASURE

1 Cu. Centimeter = 1000 Cu. Millimeters = 0.06 Cu. Inches
1 Cu. Meter = 1,000,000 Cu. Centimeters = 35.31 Cu. Feet

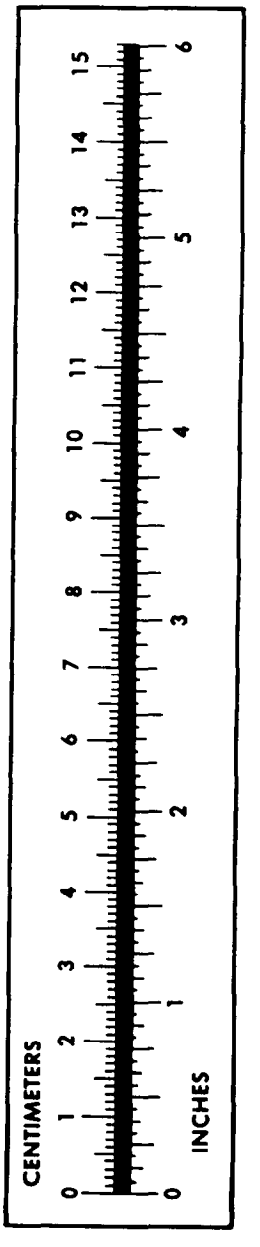
TEMPERATURE

5/9(°F - 32) = °C
212° Fahrenheit is evuivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius
9/5C° + 32 =°F

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
ıts	Liters	0.473
arts	Liters	0.946
allons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Square Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
'ers	Gallons	0.264
.ms	Ounces	0.035
.ograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pounds-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
lometers per Liter	Miles per Gallon	2.354
›meters per Hour	Miles per Hour	0.621



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