Space Flight Operations Contract

Location Coding Workbook
Loc Code 21002

Advanced Training Series

**For Training Purposes Only
Systems Division
EVA & Crew Systems Operations Branch**

June 17, 2004

USA®

United Space Alliance

Location Coding Workbook
Loc Code 21002

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Contract NAS9-20000

REVISION LOG

Rev. letter	Change no.	Description	Date
Basic	A	Revision A	06/1996
	B	Revision B	06/17/2004

LIST OF EFFECTIVE PAGES

The status of all pages in this document is shown below:

Page No.	Change No.
Preface	Rev. B
Foreword	Rev. B
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PREFACE

The Location Coding Workbook Loc Code 21002 was prepared by the United Space Alliance (USA), Flight Operations.

The primary responsibility is with USA, Crew Systems D/43220.

Questions concerning the technical content of this document should be directed to Name, Phone Number, Mailcode, Department Number (example: D/4220).

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FOREWORD

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This training material is part of a series of lectures, handouts, and workbooks for instruction on crew systems.

This training package should be studied before attending any classroom session on this material or taking any lesson for which this is a prerequisite.

The Crew Systems lesson sequence chart shows where this lesson fits in the series, the prerequisites for each lesson, and the optimum presentation order. The lesson sequence charts are located in the Shuttle Training Program catalog.

This material is for training purposes only; it should not be used as a source of operational data.

The last page in this workbook is the Lesson Critique Sheet, which is used to obtain your comments on this workbook. Please fill it out and mail to the instructor when you have completed this workbook. (It need not be placed in an envelope nor be signed.)

HOW TO USE THIS WORKBOOK

This book is organized into sections. You should proceed through the sections in the order they are presented. Within the section, however, you control your own progress. You should begin each section by reading the objective and the learning material. The learning material is set apart in a box. This is the central information to be learned. Supporting data following the learning material is provided as additional information to aid you in learning. If you are already quite familiar with the material presented in the learning material, skip right to the next sections. For other sections, with which you are somewhat familiar, you may want to read the objective, learning material, and some of the supporting data, then go to the exercise. If the material is totally new to you, most of the supporting data should be very helpful.

This workbook is provided for your use. You may make notes or write comments anywhere you like. You may retain the text for later reference.

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FIGURES

LESSON INTRODUCTION

The orbiter location codes enable crewmembers to locate displays and controls, stowage compartments and lockers, access panels, and wall mounted equipment in the orbiter crew compartment. The codes are referenced in various forms of the shuttle documentation, including the procedural checklists, and are used extensively during shuttle preflight activities to define the orbiter equipment locations. The orbiter crew compartment is divided into areas known as the flight deck, middeck, and airlock. A fourth compartment, the SpaceHab, is part of the shuttle configuration when the SpaceHab module is flown. The SpaceHab location coding is shown in the SpaceHab Habitability Workbook (S Hab 2102). Because of compartment functions and geometry, each has a unique location-coding format.
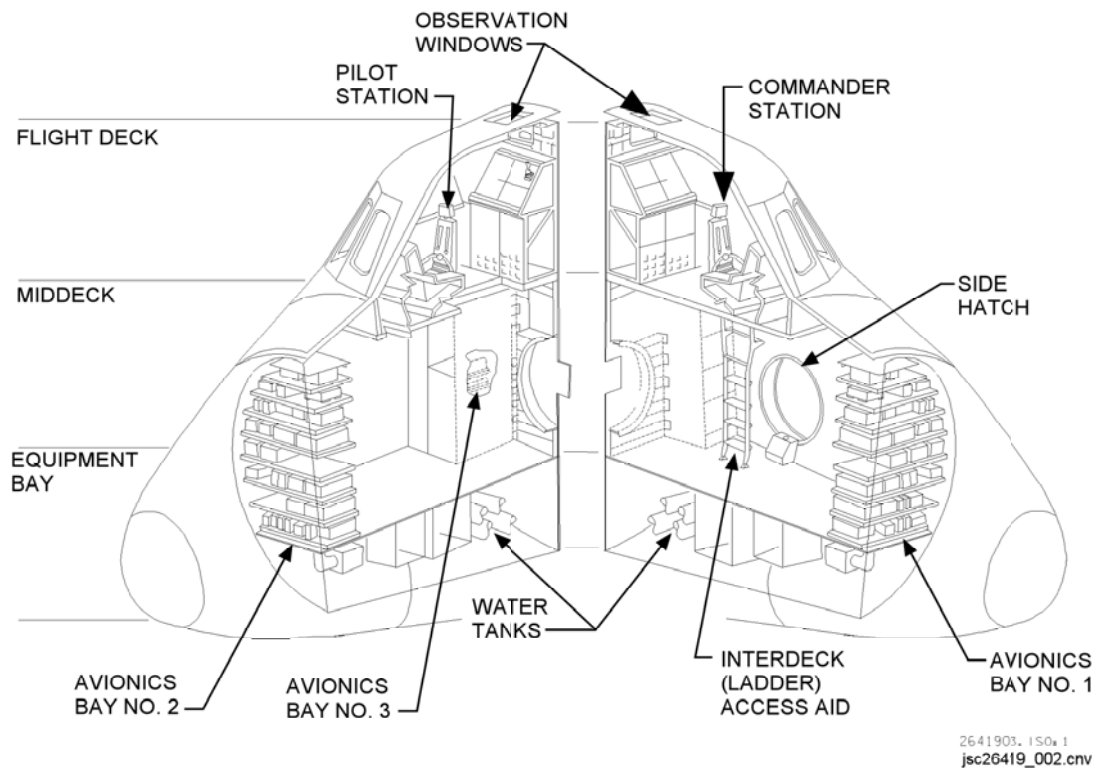

Figure 1. Crew cabin (cutaway view)

1.0 ORBITER CREW COMPARTMENT CODES

1.1 INTRODUCTION

Each area of the crew compartment (flight deck, middeck, and airlock) has a unique location-coding format.

1.2 LOCATION CODE FORMATS

Flight deck	A two- (or three-) character alphanumeric code. The first character is a letter, and the second (and third) character is a number. The code may also be further expanded to call out upper/lower areas of a panel location with the characters U and L attached to the end
Middeck	A five-character alphanumeric code starting with M
Airlock	A four- or five-character alphanumeric code starting with A

1.2.1 Examples of Orbiter Codes

a. Flight deck codes (two or three characters)

S1
L12
F6
A6L
R11U
O5

b. Middeck codes (four or characters)

MF43C
MA16N
ML60J
MO52J
MD73R

c. Airlock codes (four or five characters)

AW82H
AO4F
AD2F

2.0   FLIGHT DECK LOCATION CODES

2.1   INTRODUCTION

A flight deck location code consists of two or three alphanumeric characters (Figure 2-1).

Note: Sometimes an additional U or L is attached to the end of the code to call out the upper or lower halves respectively. This would expand the code out to three or four characters.

The forward flight deck contains the commander and pilot stations with the displays and controls (D&C) necessary to monitor, command, and control the orbiter and orbiter systems during normal and contingency operations (Figure 2-2). The forward flight deck also contains stowage provisions for the flight data file.

The aft flight deck contains D&C required to perform orbiter systems management, on-orbit maneuvers, payload systems management, and payload handling operations (Figure 2-3). The aft flight deck also contains stowage provisions for crew equipment that must be accessed during early on-orbit operations.

2.2   ORBITER FLIGHT DECK LOCATION CODING

The characters in the flight deck codes specify the following:

- First character – The first letter of a flight deck surface; the characters and surfaces are

  L – Left   C – Center console

  R – Right   O – Overhead

  F – Forward   S – Seats

  A – Aft   W – Windows

(The surfaces are addressed while sitting in the Commander/Pilot (CDR/PLT) seats)

- Second/third characters – Numerics identifying the relative location of components on each flight deck surface

Exceptions:

- Third/fourth characters – Letters that further divide the flight deck surface into upper or lower halves: U – Upper; L – Lower

Note: Sometimes the installation codes are used in place of upper/lower; for example, A1 – Upper; A2 – Lower.

The following table contains the <u>general</u> numbering philosophy (<u>second/third characters</u>) for the flight deck surfaces:

| Surfaces	General numbering philosophy
L – Left R – Right C – Center console	• Numbered from top to bottom, forward to aft
O - Overhead	• Numbered from left to right, forward to aft
F – Forward A – Aft	• Numbered from left to right, top to bottom (facing the surface)
W – Windows	• The forward windows are numbered left to right (W1 through W6) facing forward • The overhead windows are numbered left to right (W7 and W8) facing aft • The aft windows are numbered left to right (W9 and W10) facing aft
S – Seats	• The CDR's seat is <u>S1</u> and the PLT's seat is <u>S2</u>
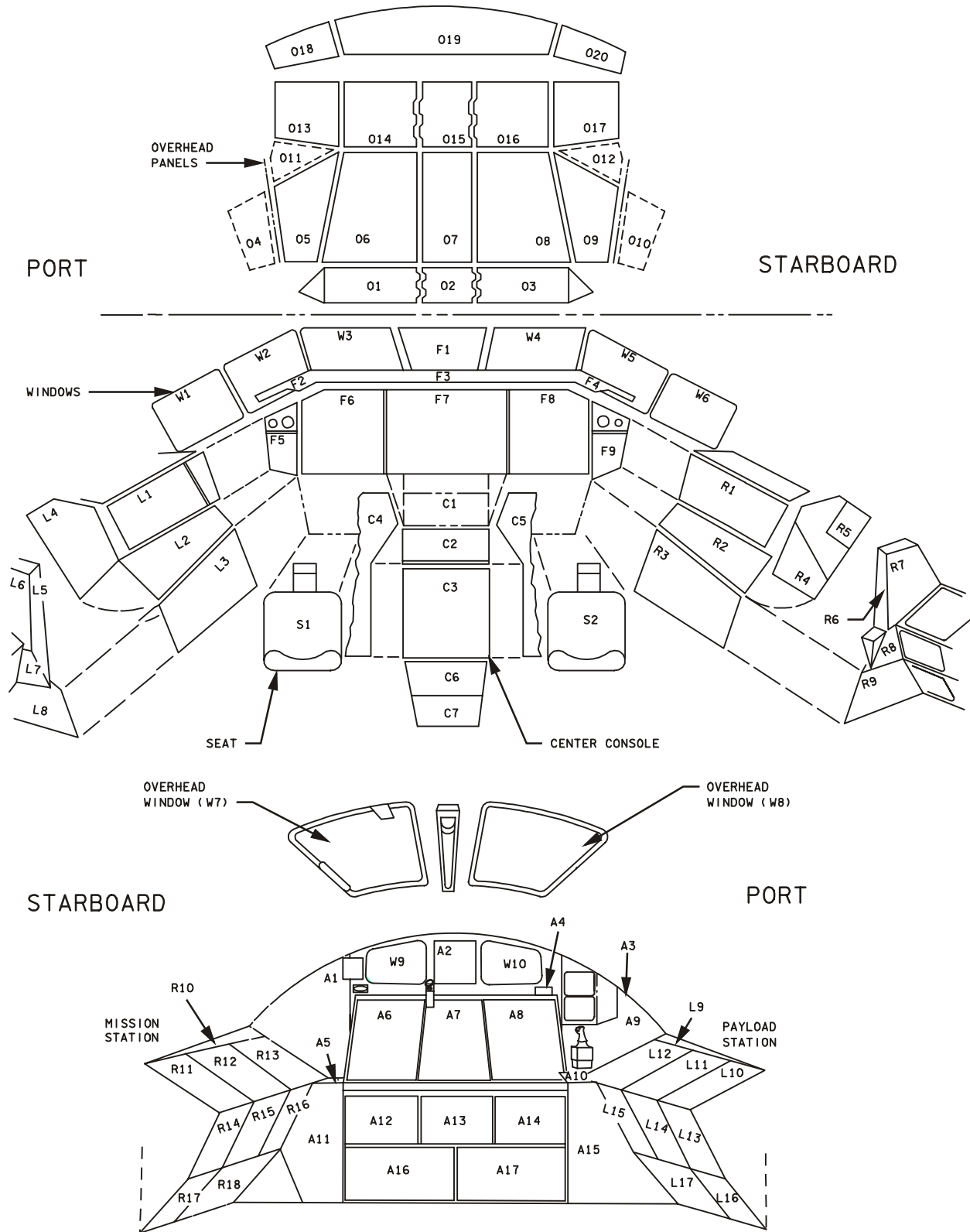
Figure 2-1. Flight deck location codes
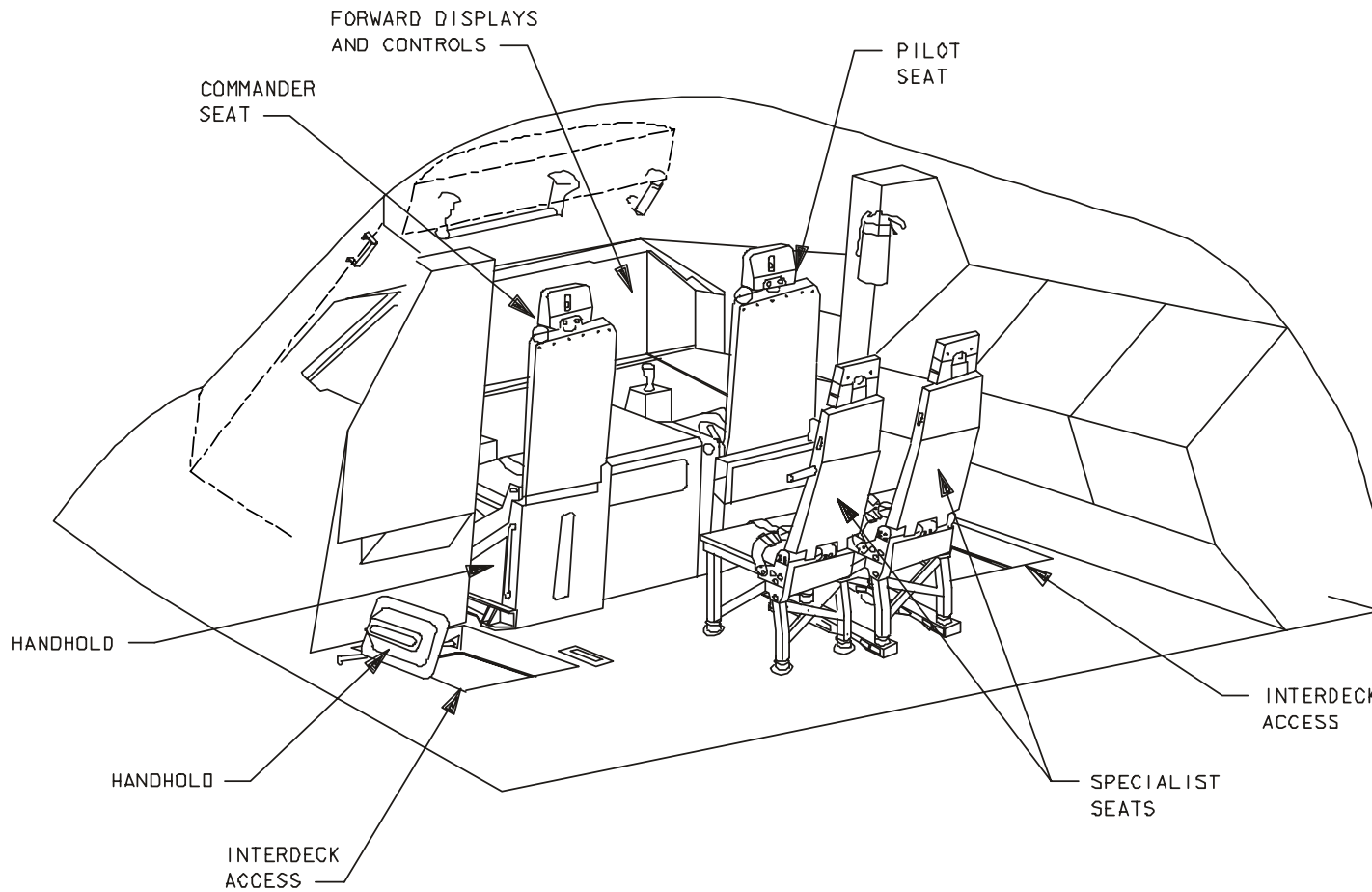
Figure 2-2. Forward flight deck equipment
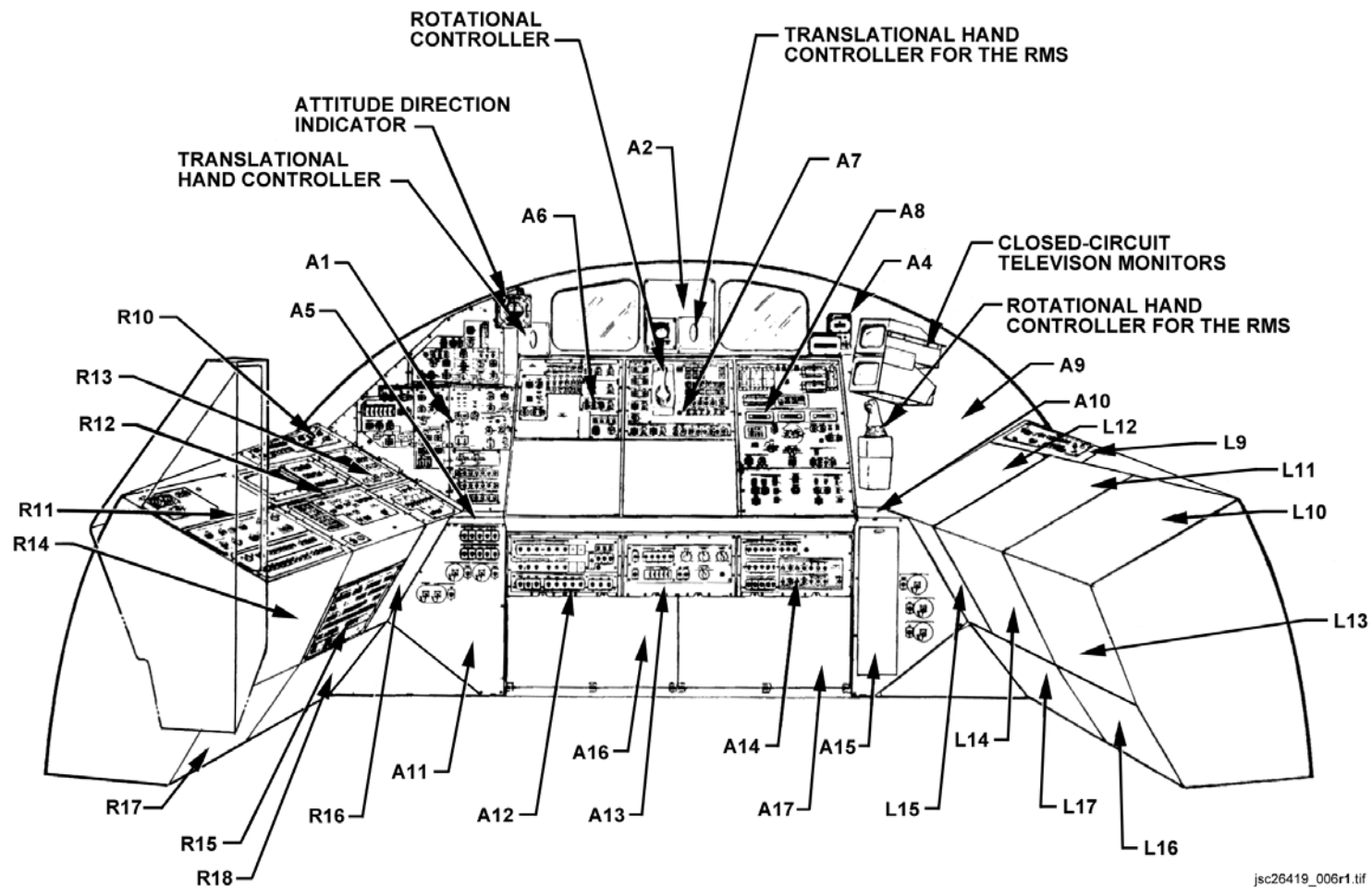
Figure 2-3. Aft flight deck equipment and location codes

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3.0   MIDDECK LOCATION CODES

3.1   INTRODUCTION

The middeck location codes have four or five alphanumeric characters starting with M.

The orbiter middeck contains D&C panels for orbiter systems control, stowage provisions for most of the crew equipment on a flight, a waste management system (WMS) compartment, the airlock, and middeck floor stowage compartments (Figure 3-1, Figure 3-2, and Figure 3-3). Beneath the middeck, the lower equipment bay contains environmental control and life support system (ECLSS) hardware. Access to equipment in the lower equipment bay is through middeck floor panels, which are marked with middeck codes.

Note: The panel numbers listed below are not consistent with the location coding system defined by this document. However, in each case the location coding, as indicated, is in close proximity to the actual location. The panel numbers below were assigned prior to middeck closeout panel design definition. The starting points for location coding were behind the closeout panels, whereas the starting points used in this document are in front of the closeout panels.

ML31C	MA73C	MO30F	MO29J	MO62M
ML86B	MO58F	MO52J	MO39M	MO13Q

3.2   ORBITER MIDDECK LOCATION CODING

The characters in the middeck codes specify the following:

* First character − M for middeck.

* Second character − The first letter of a middeck surface; the characters and surfaces are

   L − Left   A − Aft
   R − Right   D − Deck
   F − Forward   O − Overhead

   The reference position for identifying the surface is <u>standing on the middeck floor (deck) facing forward (+X)</u>.

* Third/fourth/fifth characters − These characters form a location grid on each middeck surface.
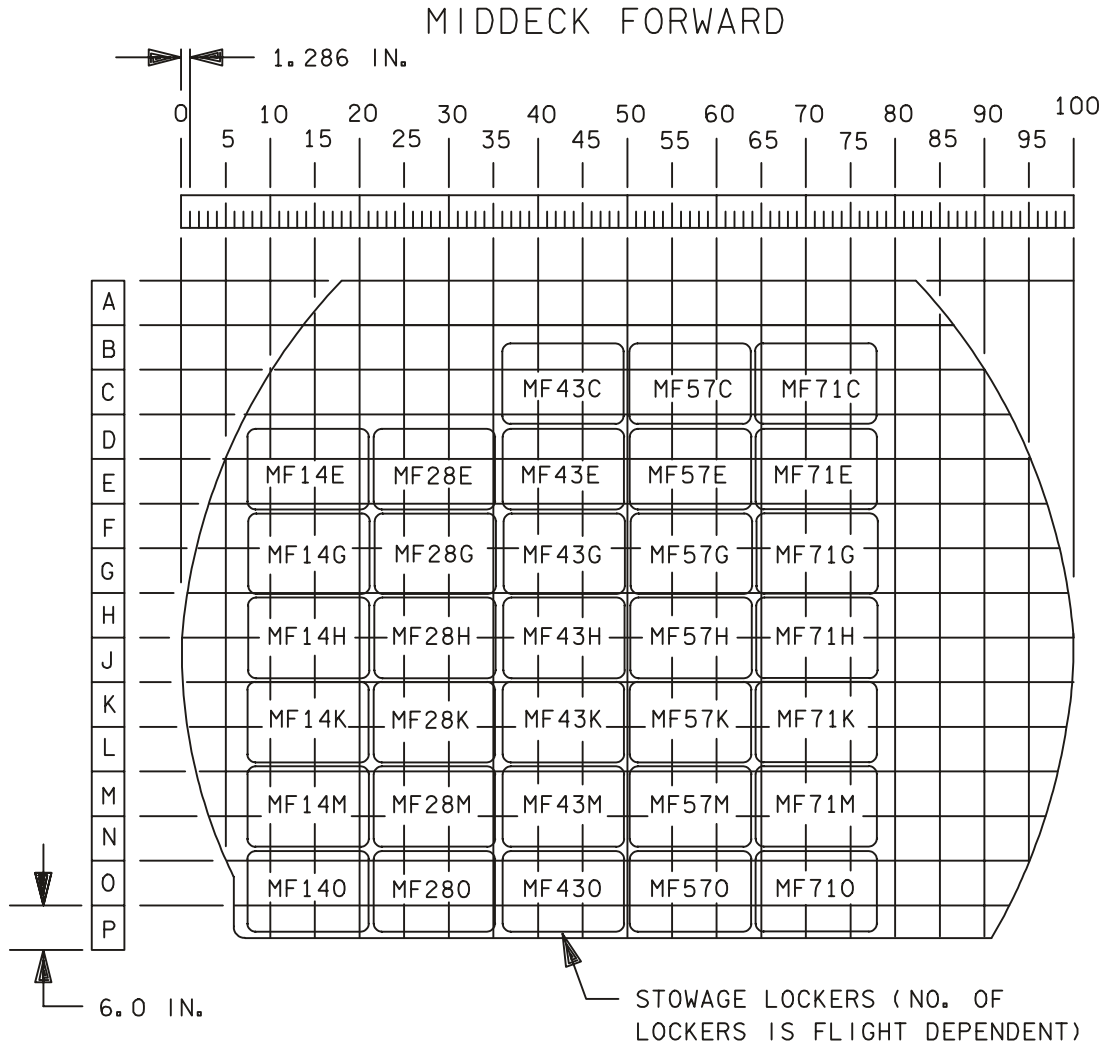
   The <u>third</u> and <u>fourth</u> characters are numerics indicating the distance from the <u>left</u>* side of a surface expressed as a <u>percentage</u> of the total width of the surface (follows the contour of the wall).

The <u>last</u> character is an alpha character indicating the distance from the <u>top</u>* of a surface expressed <u>alphabetically</u> in increments of 6 inches.
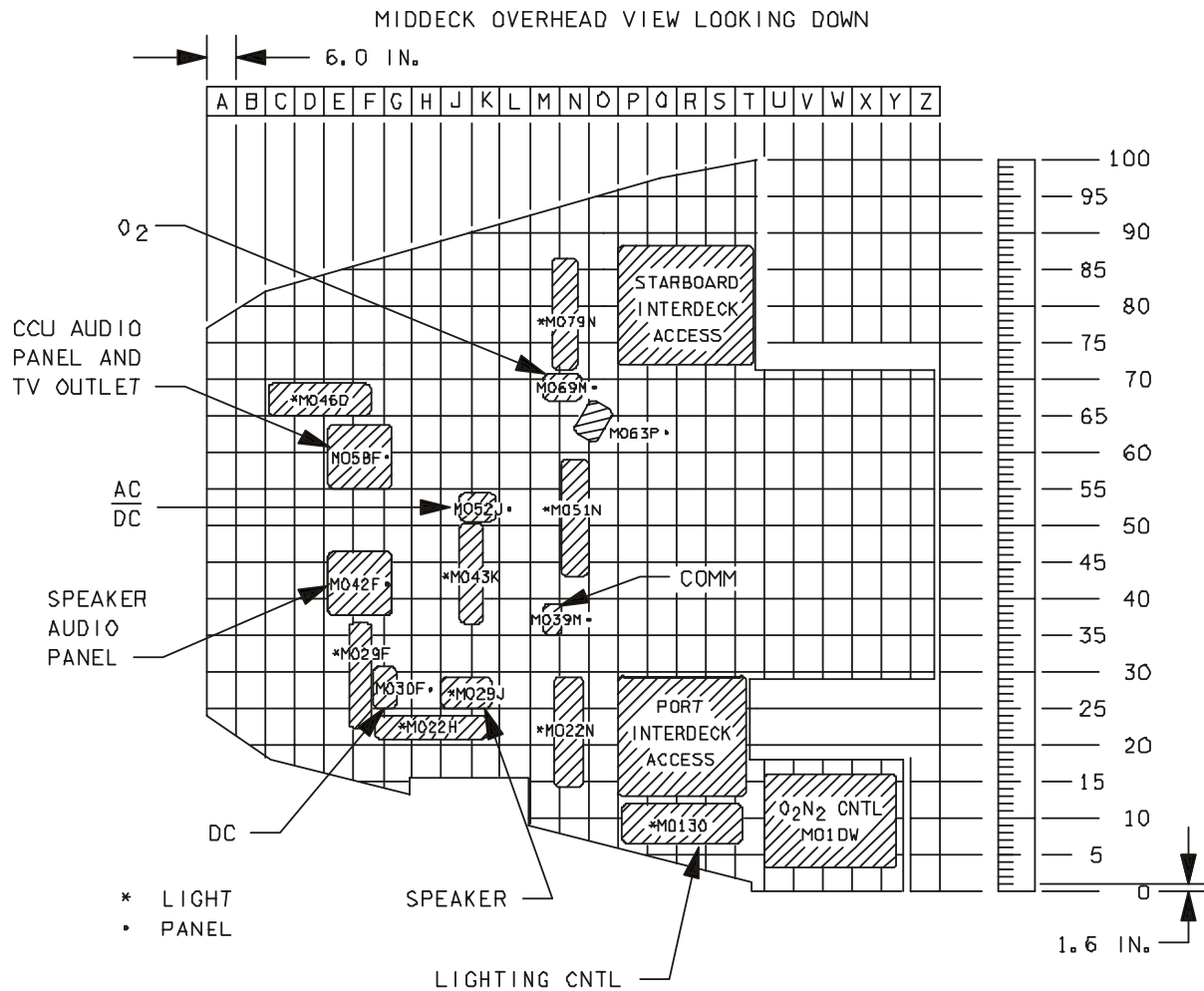
MOD standards do not utilize the letter "i".

*Each surface is addressed as follows to determine the "left" and "top" sides.

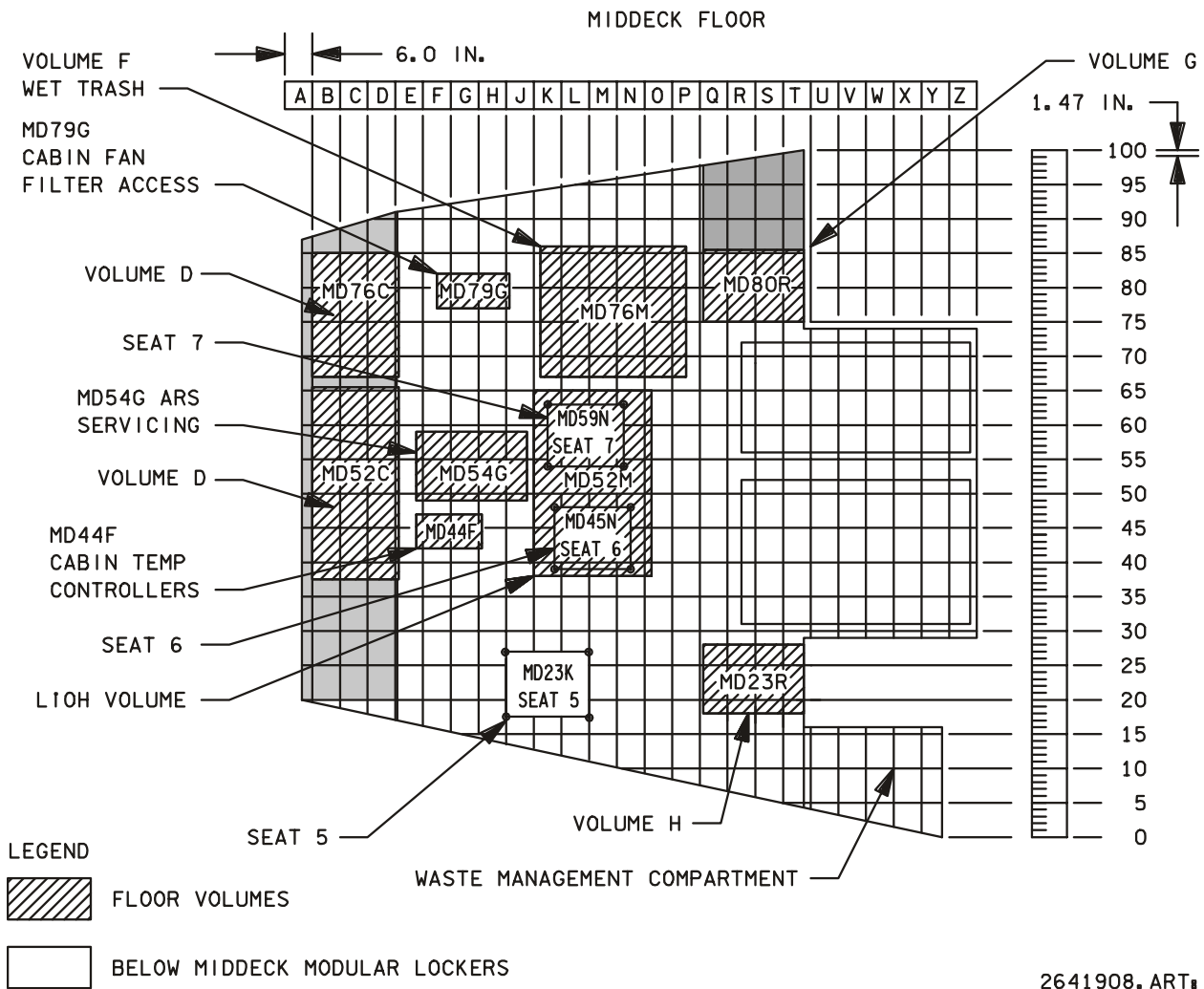| **Surfaces**	**Reference position**
L, R, F, A	Standing on deck facing the surface
D	Standing on deck facing forward (+X) looking down
O	The overhead location grid matches the grid on the deck; i.e., a point on the overhead has the same third, fourth, and fifth characters as a point directly below it on the deck

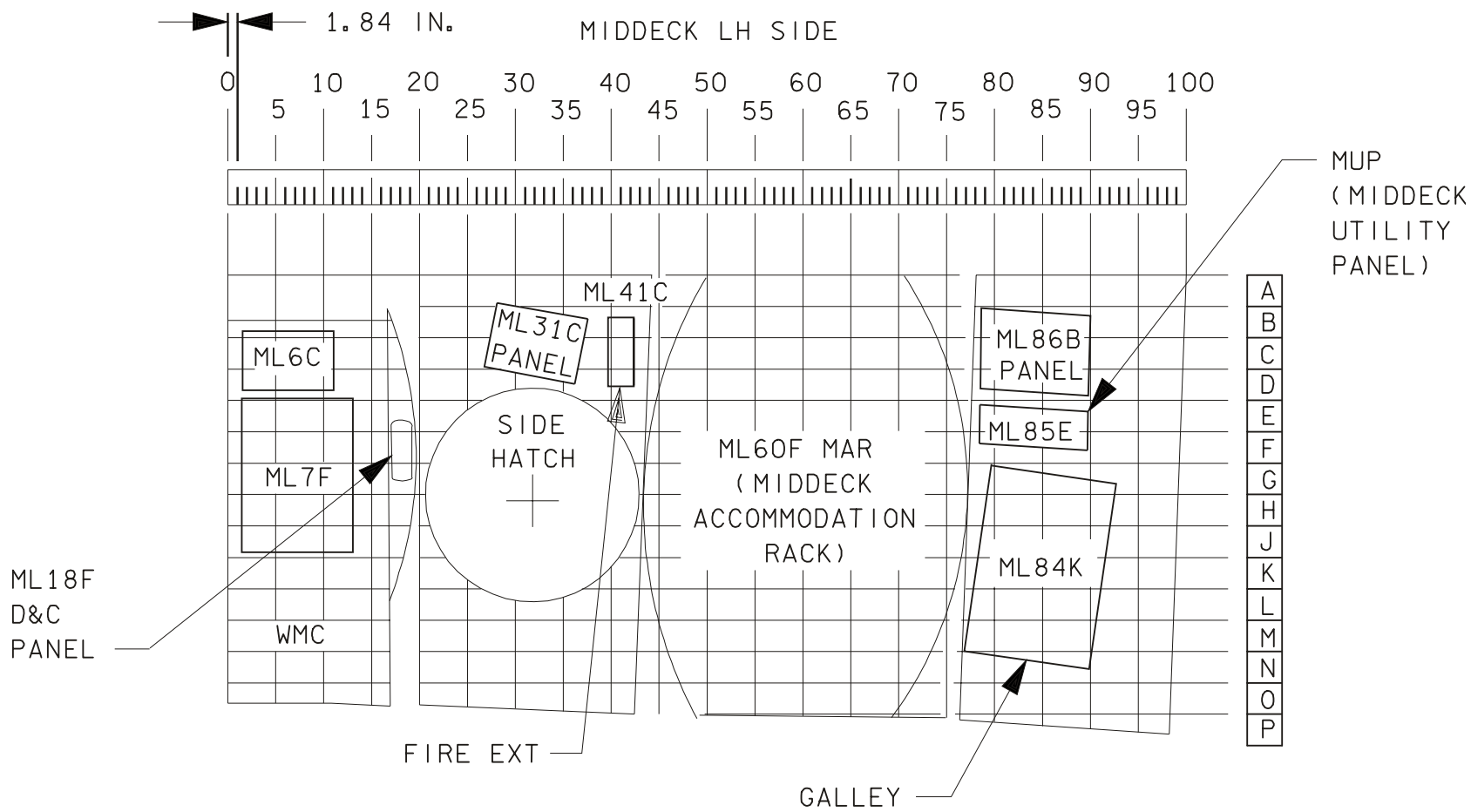MIDDECK FORWARD

Figure 3-1. Middeck location codes (1 of 7)

Figure 3-1. Continued (2 of 7)

Figure 3-1. Continued (3 of 7)

1.84 IN.

MIDDECK LH SIDE

MUP
(MIDDECK
UTILITY
PANEL)

ML41C

ML31C
PANEL

ML6C

ML86B
PANEL

ML7F

SIDE
HATCH

ML85E

ML60F MAR
(MIDDECK
ACCOMMODATION
RACK)

ML18F
D&C
PANEL

ML84K

WMC

FIRE EXT

GALLEY

2641907.ART;1

Figure 3-1. Continued (4 of 7)

MIDDECK RH SIDE

Operational sleeping bags on middeck right wall
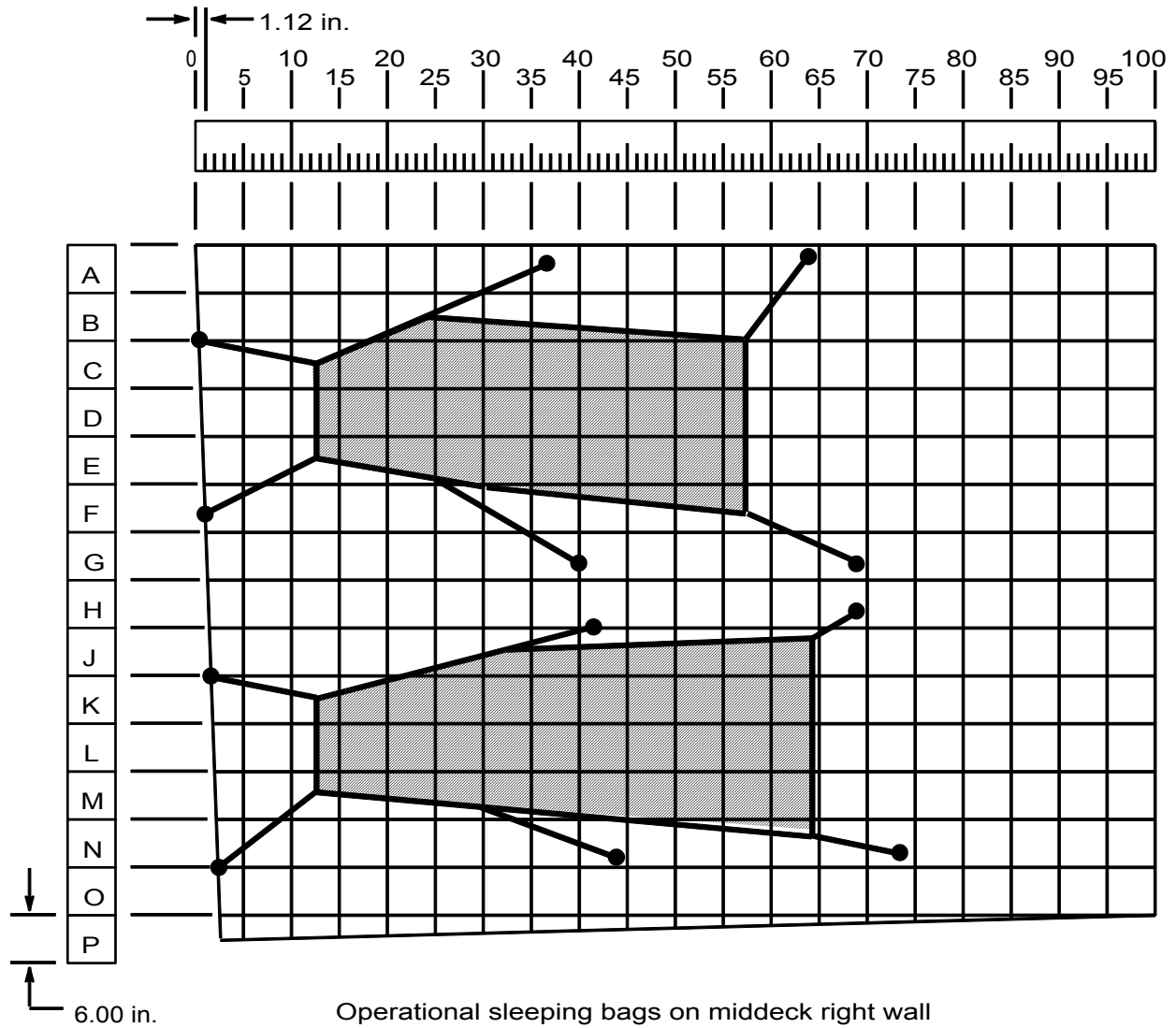
j_26419_002

Figure 3-1. Continued (5 of 7)

MIDDECK RH SIDE
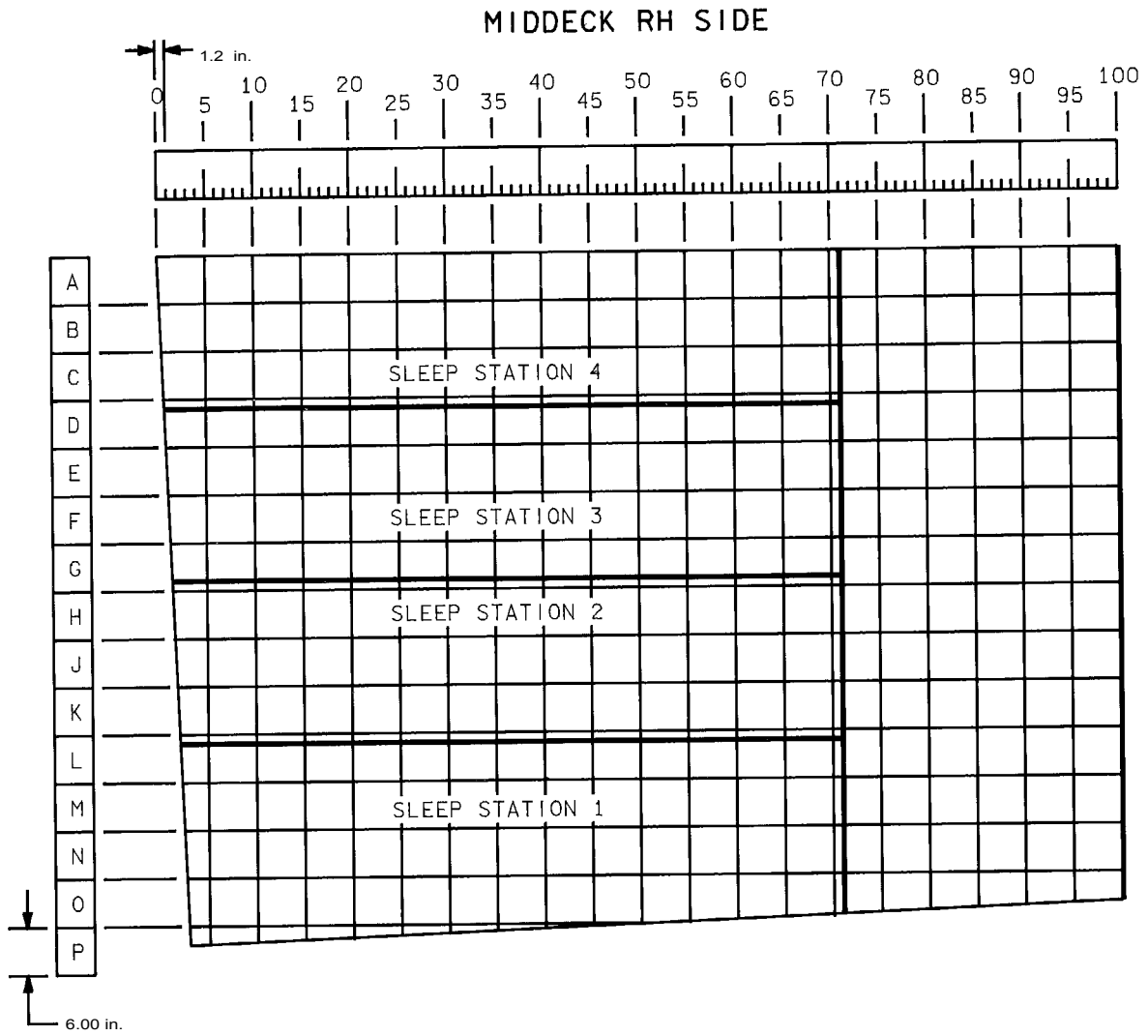
Four-tier sleep station on middeck right wall

j_26419_013

Figure 3-1. Continued (6 of 7)
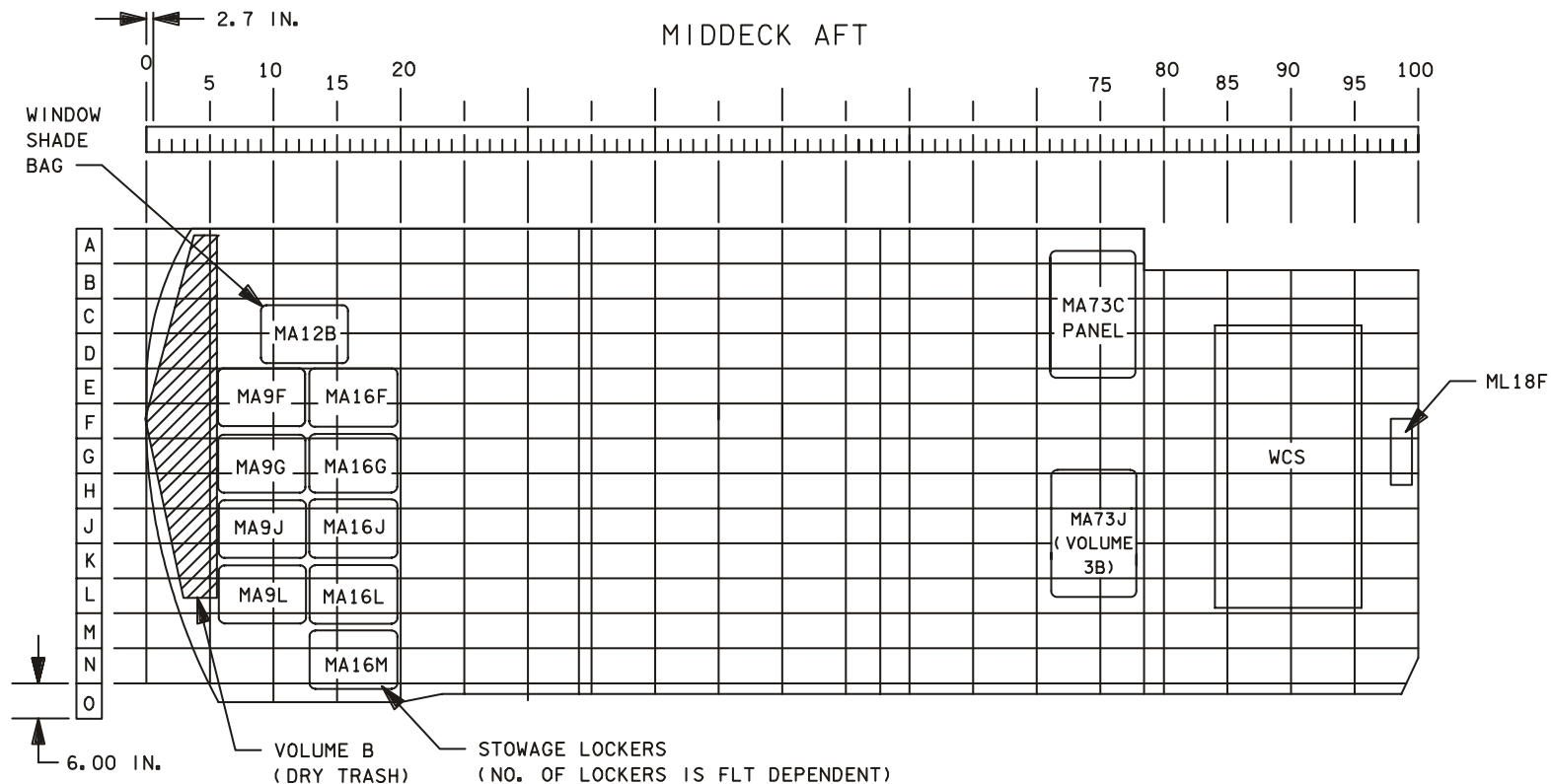
MIDDECK AFT

Figure 3-1. Continued (7 of 7)
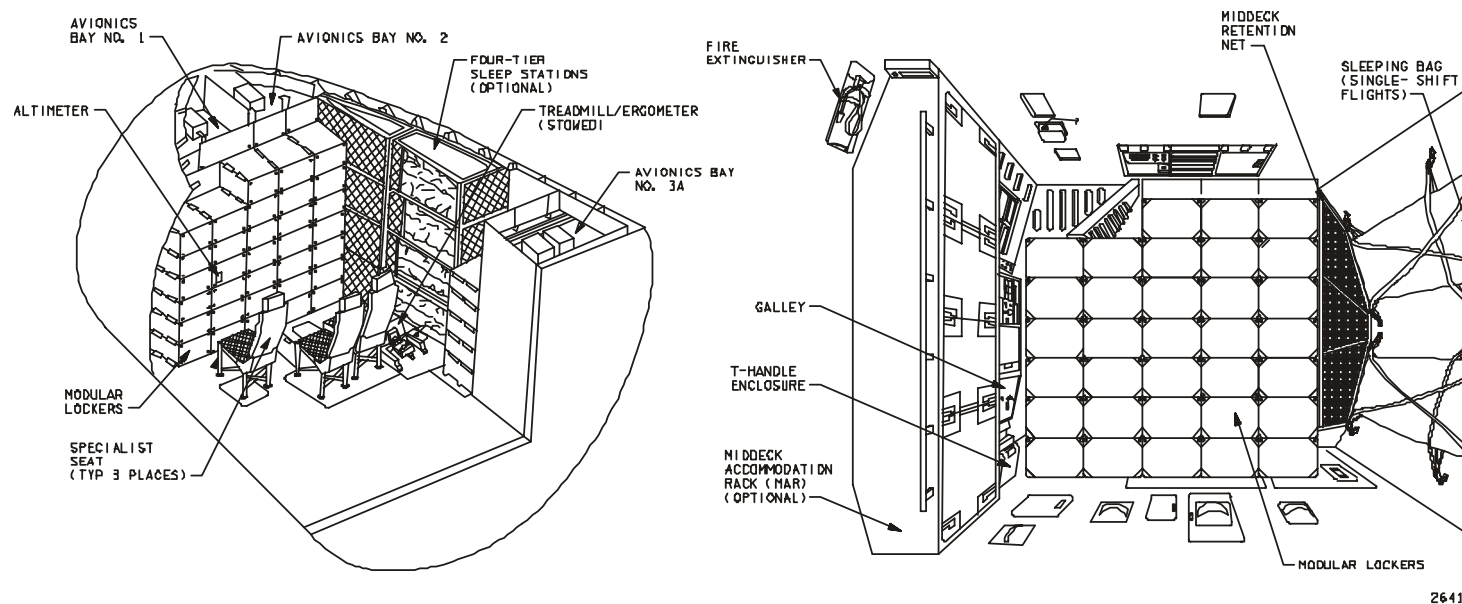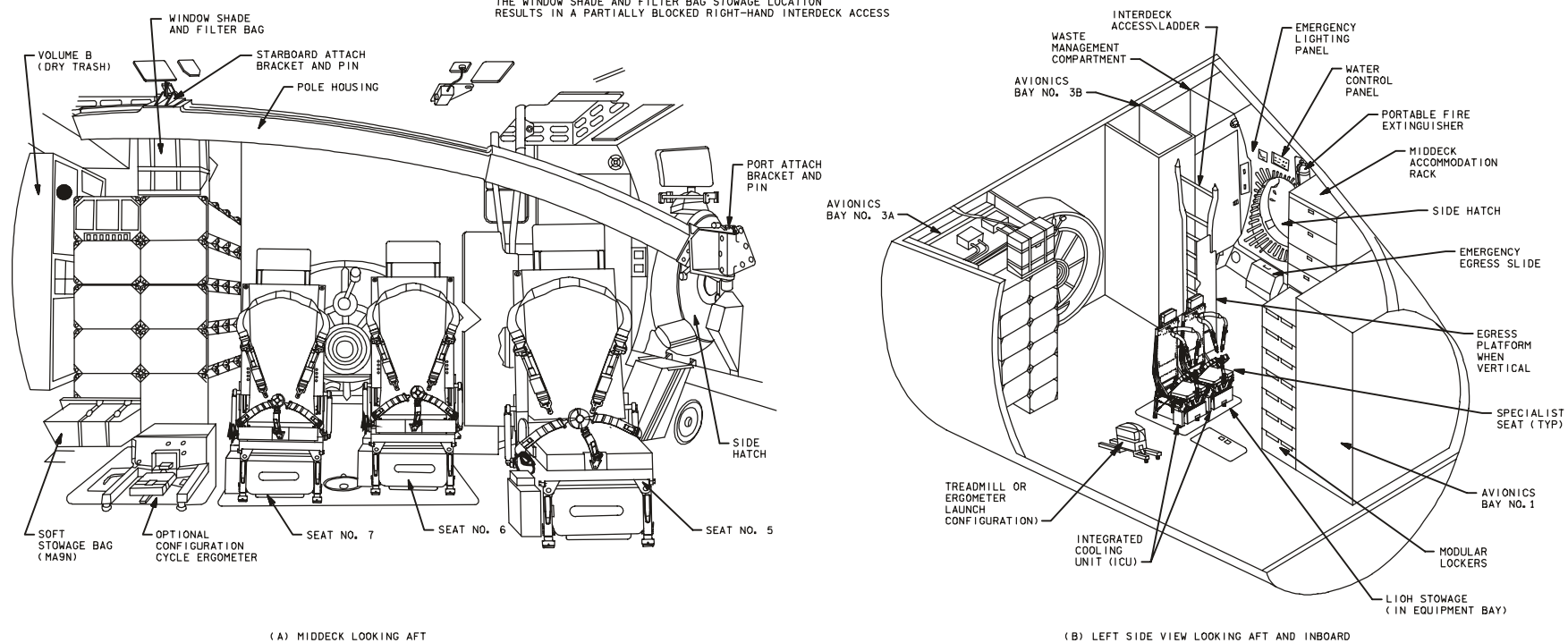
2641911.ART;1

Figure 3-2. Forward middeck cutaway

Figure 3-3. Aft middeck cutaway

4.0   AIRLOCK LOCATION CODES

4.1   INTRODUCTION

An airlock code consists of four or five alphanumeric characters (Figure 4-1 and Figure 4-2).

The airlock provides the capability to transfer from the middeck to the payload bay for extravehicular activity (EVA) without depressurizing the orbiter cabin. The airlock has D&C panels for airlock systems control and stowage provisions for most of the crew equipment necessary to perform an EVA.

4.2   ORBITER AIRLOCK LOCATION CODING

The characters in the airlock codes specify the following:

- First character − A for airlock

- Second character − The first letter of an airlock surface; the characters and surfaces are

  W - Wall
  O - Overhead
  D - Deck

  The "wall" is the inner wall of the cylindrical airlock. The airlock is oriented upside down with respect to the middeck, so that the airlock <u>overhead</u> corresponds to the middeck floor. The "overhead" surface is honeycomb material with the sub floor volume containing Docking System Avionics. The "Deck" surface is the ODS Hatch. The wall location codes have five characters and the overhead/deck codes have four characters.

- Third/fourth/fifth characters (wall only) − These characters form a location grid on the airlock wall.

  The <u>third</u> and <u>fourth</u> characters are numerics indicating the distance (clockwise) from the vertical centerline of the forward hatch expressed as a <u>percentage</u> of the total airlock circumference.

  The <u>fifth</u> character is an alpha character indicating the distance from the overhead surface expressed <u>alphabetically</u> in increments of 6 inches.

- Third/fourth characters (overhead/deck only) − These alpha (A through K) numeric (0 through 10) characters form location grids on the deck and overhead surfaces. Since these surfaces are small, items can be easily located without the aid of the location grids.
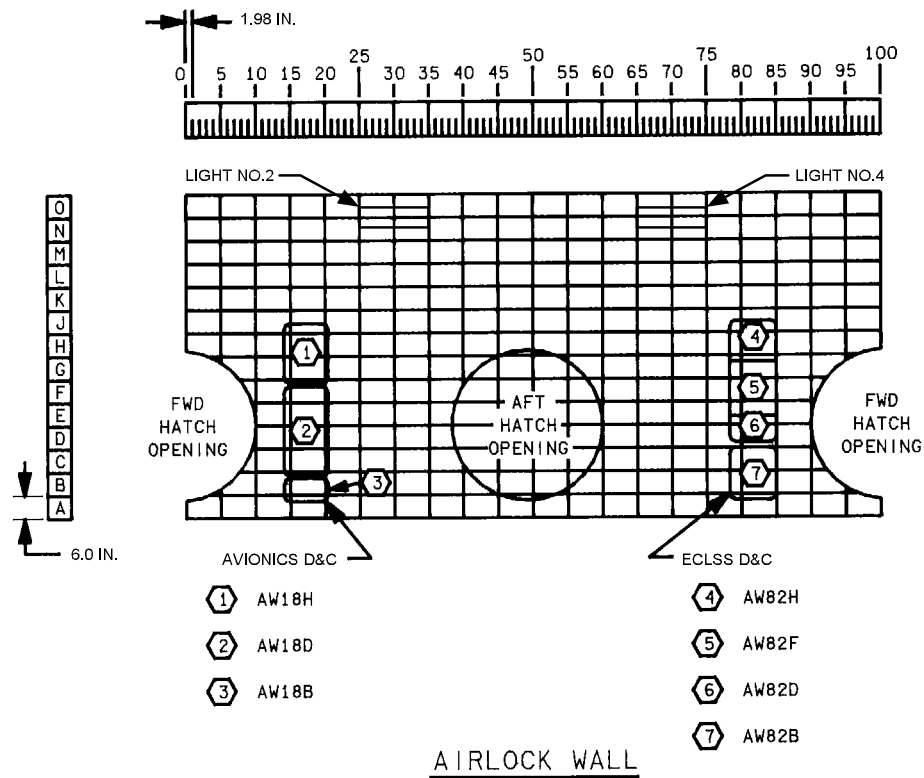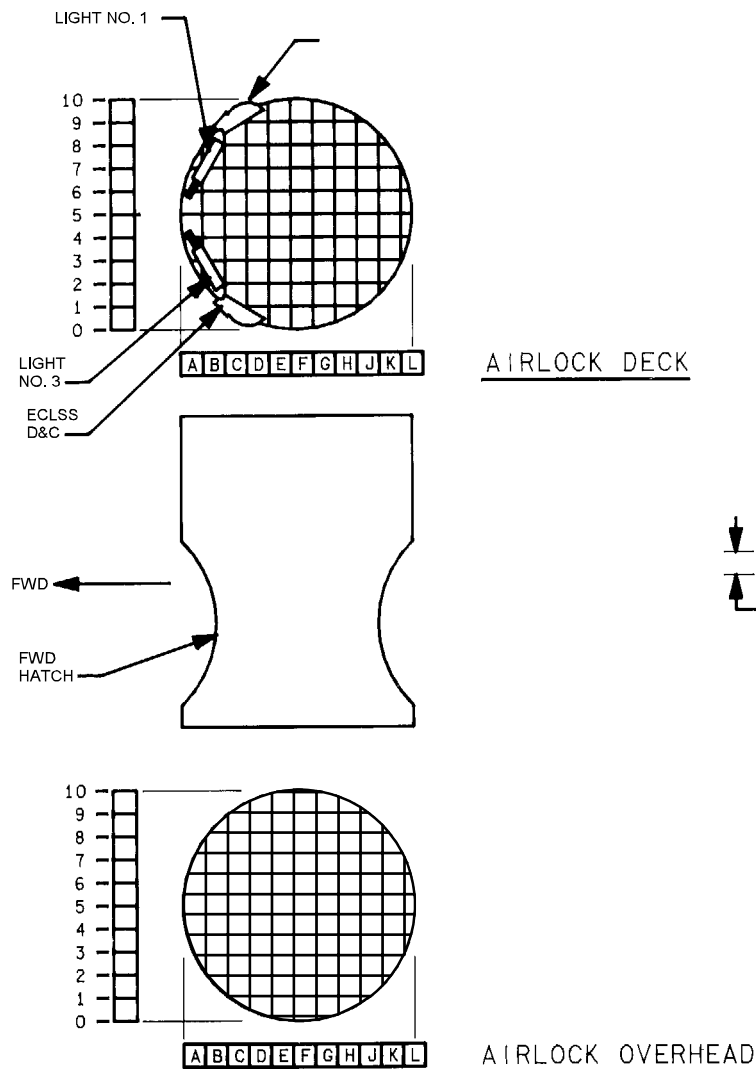
Figure 4-1. Airlock location codes

jsc26419_017.cnv

STARBOARD SIDE: VIEW SHOWN FOR EQUIPMENT LOCATION

PORT SIDE: FINAL LAUNCH CONFIGURATION

SERVICE AND
COOLING
UMBILICAL

AIRLOCK ADAPTER
PLATE (AW29L)

EMU (AW29L)

AW18H

AW18D

AW18B

SHORT EMU
KIT EM4

AIRLOCK
ADAPTER
PLATE
(AW71L)

SERVICE AND
COOLING
UMBILICAL

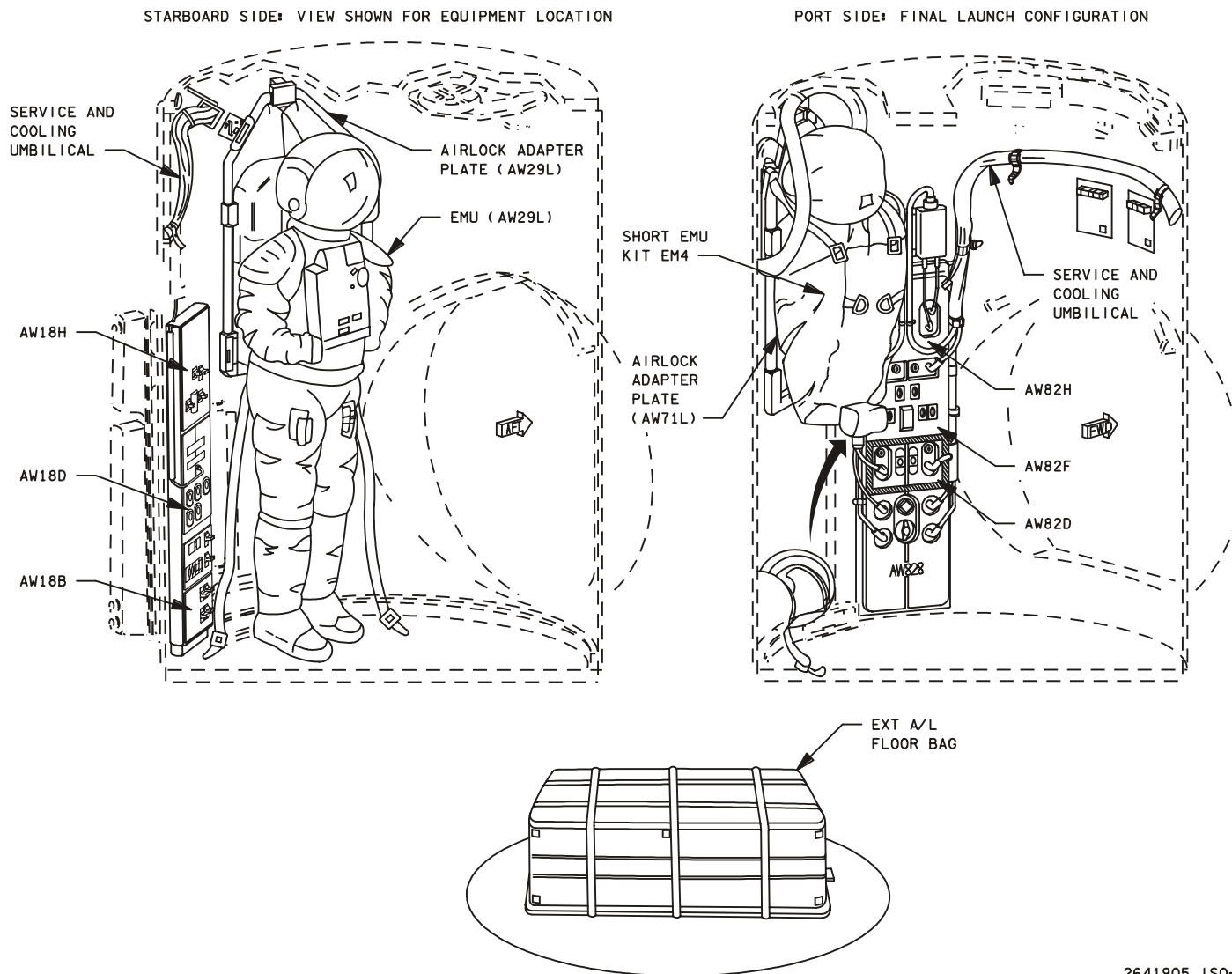AW82H

AW82F

AW82D

AW82B

EXT A/L
FLOOR BAG

2641905.ISO.1

Figure 4-2. Airlock equipment and associated location codes

5.0   PRACTICE EXERCISE

For each location code, fill in the blanks in the table below with the crew compartment, surface, and grid coordinates (if applicable):

Code	Crew compartment	Surface	Location grid coordinates
Example: AW30B	Airlock	Wall	30% of circumference from FWD hatch centerline (cw) ~12 inches from overhead surface
Example: F7	Flight deck	Forward	
MD40C	_____	_____	_____ of surface width from _____ side ~____ inches from _____ of surface
AW90D	_____	_____	_____ of circumference from FWD hatch centerline (cw) ~____ inches from _____ surface
O11	_____	_____	
MO10E	_____	_____	_____ of surface width from _____ side ~____ inches from _____ of surface
S2	_____	_____	
W2	_____	_____	
AD7A	_____	_____	
MR12B	_____	_____	_____ of surface width from _____ side ~____ inches from _____ of surface
A13	_____	_____	
AO8C	_____	_____	
R2D2	_____	_____	

5.1   PRACTICE EXERCISE ANSWERS

Code	Crew compartment	Surface	Location grid coordinates
AW30B	Airlock	Wall	30% of circumference from FWD hatch centerline (cw)
			~12 inches from overhead surface
F7	Flight deck	Forward	
MD40C	Middeck	Deck	40% of surface width from left side
			~18 inches from top of surface
AW90D	Airlock	Wall	90% of circumference from FWD hatch centerline (cw)
			~24 inches from overhead surface
O11	Flight deck	Overhead	
MO10E	Middeck	Overhead	10% of surface width from left side
			~30 inches from top of surface
S2	Flight deck	Seat (PLT)	
W2	Flight deck	Window	
AD7A	Airlock	Deck	
MR12B	Middeck	Right	12% of surface width from left side
			~12 inches from top of surface
A13	Flight deck	Aft	
O08C	Airlock	Overhead	
R2D2	N/A	N/A	(Not an orbiter code)