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UNCLASSIFIED KTM-1327-01 NAEC-91-7958 NL

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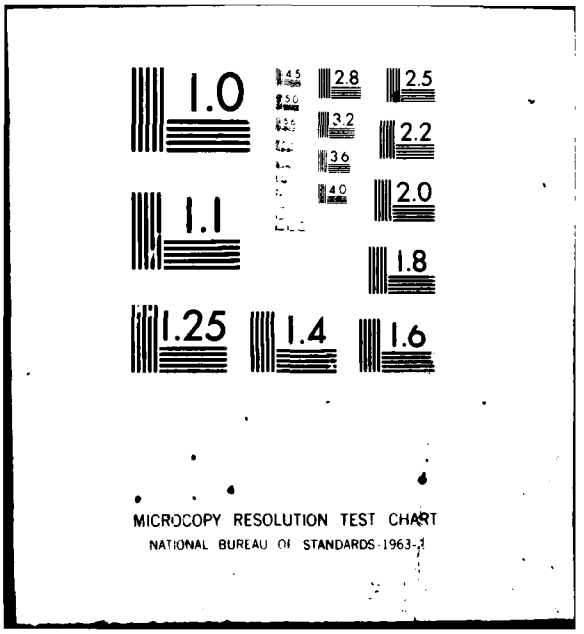
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NAVAL AIR ENGINEERING CENTER
LAKEHURST, N.J.
08733

REPORT NAEC-91-7958

HAZARDS/FAILURE MODES AND EFFECTS ANALYSIS
MK 1 MOD 0 LSO HUD
CONSOLE SYSTEM

Ship Installation Engineering Department
Naval Air Engineering Center
Lakehurst, New Jersey 08733

24 March 1980

Technical Report
Contract No. N68335-78-C-2002

APPROVED FOR PUBLIC RELEASE;
DISTRIBUTION UNLIMITED

Prepared for

Commanding Officer
Naval Air Engineering Center
Lakehurst, New Jersey 08733

NAEC-91-7958

HAZARDS/FAILURE MODES AND EFFECTS ANALYSIS
MK 1 MOD 0 LSO HUD
CONSOLE SYSTEM

Prepared by: _____
F. Sevcik,
P.E., C.Eng., Dipl. Ing.

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John Glenn
91133 Section

Approved by: _____
F. B. BOICE
Engineering Officer

NOTICE

3/24/80 da

LAKEHURST, N.J.
08733

NAVAL AIR ENGINEERING CENTER

REPORT NAEC-91-7958

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The MK 1 MOD 0 LSO-HUD Console System provides aircraft recovery information to the Landing Signal Officer aboard aircraft carriers. This analysis identifies individual failure modes of the LSO-HUD Console System and assesses hazard level and probability of occurrence of these modes. Design recommendations are included.

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PREFACE

The work on this report has progressed hand-in-hand with the design effort on the Console System.

This caused an inevitable delay in completing the report, but on the other hand, it proved beneficial in introducing corrective actions, resulting from this Analysis, in parallel with the Design.

The author wishes to acknowledge significant contributions provided by his KETRON, INC. collegues: Messrs. G. S. Farber and W. S. Mann; the PGI Supervisor, Mr. Nathan Melman; and particularly, Mr. John Glenn, NAEC 91133 Section.

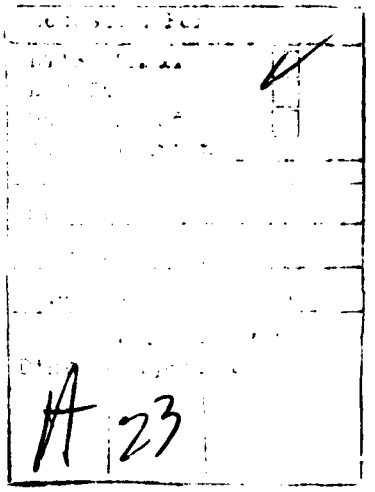

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TABLE OF CONTENTS

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I. INTRODUCTION

This report presents the results of the Hazards/Failure Modes and Effects Analysis (H/FMEA) for the NAVAIRENGCEN designed MK 1 MOD 0 LSO Heads-Up Display (HUD) Console System.

II. PURPOSE OF THE ANALYSIS

A. The analysis of the MK 1 MOD 0 LSO HUD Console System was performed primarily to disclose potentially critical and catastrophic safety-related functional failure modes of components and sub-assemblies comprising the System.

B. Efforts were directed toward identifying single-point failure modes that could result in:

1. personnel hazards leading to injury or death; and

2. loss of equipment and mission capability.

C. A major objective of the analysis was to provide design improvement recommendations to preclude or circumvent identified failure possibilities, so that the resulting hazard risks would either be eliminated or greatly reduced.

D. The scope and methodology of the H/FMEA are discussed in detail in Section VI of this report.

III. SYSTEM DESCRIPTION

A. The LSO HUD Console System is located at the LSO's (Landing Signal Officer) Work Station on the aircraft carrier.

B. The mission of the LSO Work Station Facility is to serve as a focal point for recovery information display and communications required for flight path guidance control coordination between the LSO and pilot of the landing aircraft. The MK 1 MOD 0 LSO HUD Console System has been developed as part of an effort to increase the accessibility and visibility of information displays and communications facilities in the LSO Work Station to permit more rapid perception and response by the LSO to flight path deviations under all weather conditions to improve the safety of recovery operations.

C. The LSO HUD Console System consists of a display subsystem and a hydraulic lifting unit subsystem.

1. THE DISPLAY SUBSYSTEM receives data signals from various existing shipboard systems for processing and display in the LSO HUD console. Calibration, testing, and troubleshooting of display circuits is facilitated with a piece of portable special purpose test equipment. Those systems providing inputs to the HUD console include:

a. SPN-42 Radar (automatic carrier landing system)
b. SPN-44 Radar
c. ILARTS (Integrated Launch and Recovery Television Surveillance) or PLAT (Pilot Landing Aid Television) system
d. FLOLS (Fresnel Lens Optical Landing System)/Arresting gear cross-check system
e. Landing area status system
f. Ship's wind measuring system
g. Ship's 21MC intercom system
h. MOVLAS (Manually Operated Visual Landing Aid System) MK 1, MOD 2
i. FLOLS MK 6 MOD 3 or MK 6 MOD 2 with Trim/Harmonization computer
j. FLOLS Wave-Off subsystem

2. THE HYDRAULIC LIFTING UNIT SUBSYSTEM provides a means for raising the HUD console to an adjustable height to accommodate viewing by an LSO standing on the LSO Platform. It also provides for lowering the HUD console to an unobstructing level below the flight deck into a storage enclosure. Raising and lowering control is accomplished within the LSO work station, and control circuit interlocks guard against retracting the console when it is misaligned with its storage enclosure and raising the console when the storage enclosure lid is down.

D. MK1 MOD 0 LSO HUD Console System components (Units 1 through 5) are identified in the table of contents of this report (page 3)and individually described in the work sheets in Appendix A.

E. The LSO HUD console will be complemented in an improved LSO Work Station with side mounted LSO and assistant LSO communications attachments, an LSO "Base console", and provisions to hydraulically operate the LSO platform windscreen from a central control using the LSO HUD Console System Hydraulic power package. The communications attachments to the HUD console and the base console are the result of a repackaging of existing communications and display facilities in the LSO Work Station to eliminate redundant displays and provide for more accessible communications facilities with more efficient utilization of space.

IV. RESULTS AND RECOMMENDATIONS

A. RESULTS

The tabulated determinations of the H/FMEA of the HUD Console System are presented in Appendix A of this report.

The evaluation of the subsystems is included in Section V of this report.

Basically, the System was found well designed, with appropriately used redundancies and fail safe principles.

The few possible hazards found were immediately brought to the attention of the Program Management (NAEC), which provided the needed corrective actions.

B. RECOMMENDATIONS

Design improvement recommendations, resulting from the analysis, are presented in Appendix B of this report.

Each recommendation is numbered related to the H/FMEA table and item.

In the matrix, there are indications whether the recommended improvement is for:

a -- General Reliability, Simplification, Design Improvement
b -- Avoiding, Eliminating & Reducing Potential Hazards
c -- Controlling & Minimizing Potential Hazards
d -- Incorporation of Fail-Safe Principles

There is also an indication, whether the respective recommended design improvement should be used for:

e -- Existing Design
f -- Future Design

V. SUBSYSTEM CONSIDERATIONS

Analysis of this System's components and functions suggests that even though the possibility of failure modes of critical or catastrophic nature (category II or I) does exist, the corresponding probabilities are reasonably low.

By identifying these particular hazards, the corresponding corrective actions will eliminate them from operating times, or will reduce the probabilities of their occurrences to much lower figures, reducing the risks to acceptable levels.

The review of the categories I and II in each subsystem follows:

UNIT 1: Category I: None found.

Category II: a) See Nos. 1 and 2 in Appendix B.

b) The loss of Console and HUD control due to discontinuity in the Cable's connector is expected to be corrected in a routine check-out of the System. (See Item No. 18.0 of the Unit 1 work sheets.)

UNIT 2: Category I: None found.

Category II: See Nos. 6, 7, 8 and 9 of Appendix B for the recommended corrective actions.

UNIT 3: Category I: None found.

Category II: See Nos. 11, 18, 19, 26, 28, 30, 31 and 32 for the recommended corrective actions.

UNIT 4:	Category I-II:	An interesting problem was found in specification, testing and requirements for operation of the Relays 518915-1, that provided a high probability, in fact a certainty, that the Relays would not allow low current signals (below 40 m amp) to pass through. The Program Management was apprised of the problem as soon as it was discovered, and immediately provided a corrective action: to form two groups of these Relays -- one for the high current uses to be tested with 10 Amp current through the contacts, and one for the low current Signals, to be tested with appropriately low currents. However, even with a good marking applied to distinguish these two kinds of Relays, there will exist a probability of a human error and, therefore, the corrective actions, as suggested in Appendix B, Nos. 33 and 34, would seem more appropriate.
CABLES:	Category I(-II):	The Wave-off Signals and the Deck Status warning were found with redundant wiring going through the same Cable (W-O Signals), or there is no redundancy for the Foul Deck warning. See Nos. 36 and 38 of Appendix B for recommendations.
UNIT 5:	Category I:	None found.
	Category II:	See Nos. 39, 40, 41 and 43 of Appendix B for identification and recommendations.

VI. SCOPE AND METHODOLOGY OF ANALYSIS

A. SCOPE

The Hazards/Failure Modes and Effects Analysis (H/FMEA) was performed on the MK 1 MOD 0 Heads-Up Display (HUD) Console System in accordance with the Work Statement of the Purchase Order 2288 of Power Generators, Inc., dated 5 June 1978.

The "Unit" Cables, even though not included in the Work Statement, was included by the Analyst because of the logical need for the completeness of the System.

The list of all the Subsystems ("Units") appears in the Table of Contents, page 3, under Appendix A.

The Analysis was performed at the levels of assembly consistent with available design definition and criticality of the various System functions.

The lowest level to which the Analysis was carried out was the component; i.e., Switches, Relays, Valves, etc. Failure modes associated with these elements were identified and related to their effect on the performance of higher assemblies or functions up to and including the System.

B. METHODOLOGY

1. DESCRIPTION OF THE H/FMEA FORMAT

Documentation structure of the H/FMEA is in general accordance with accepted industry standards, namely the Society of Automotive Engineers publication, Design Analysis Procedures for Failure Mode, Effects and Criticality Analysis (SAE ARP 926), and MIL-STD-1629, Procedures for Performing a Failure Mode and Effect Analysis. The FMEA was performed utilizing the System's related drawings and schematics provided by PGI/NAEC.

Reference is made to Figure 1 at the end of this section illustrating the H/FMEA form utilized for compiling the analysis.

The form heading information is used as follows:

a) The TABLE denotes the major system and subsystem ("Unit") indexes.

b) NAME presents the major system and subsystem titles.

c) The system document where the treated components are defined is entered on the DWG. NO./REV. line.

d) The page and total pages of a given subsystem table is at the upper right of the heading.

Column 1 numerically codes the component analyzed with respect to the subsystem indexes. The complete component/table item index is, for instance: Unit 1.7.0. for reference use.

Column 2 indicates the system, subsystem and component titles and includes brief descriptions of the functions at each level so the reader may gain insight into the significance of the component analyzed. Sketches, Schematics and other useful information have been entered when of importance or interest.

Column 3 lists the hazardous-functional failure modes of the component being treated and examples of causes where necessary.

Columns 4 through 9 are utilized to describe the effects of each assumed component failure mode upon the personnel, system and mission. These effects were determined based on a detailed analysis of the component functional relation to each system level.

Column 10 entries indicate if the considered failure would be detectable by the operator.

Column 11 classifies failure effects on a scale of I to IV in decreasing severity in accordance with Military Standard 882A, System Safety Program Requirements. A detailed explanation of the classifications is included on the next page. The numerical system of failure criticality codes is intended to quickly highlight for the reader those areas of the analysis where serious problems have been identified.

Column 12 is reserved for the Probability of Occurrence of the identified Failure Mode, in accordance with MIL-STD-882A.

Column 13 presents commentary the analyst may provide in the form of pertinent information which will clarify the results of the particular failure mode considered. These remarks include statements describing inherent compensating provisions of the design, and/or recommended design or procedures improvements.

At the bottom of the form there is the "NOTE", which explains in detail Column 11 ("Hazard Level") and Column 12 ("Hazard Probability") headings.

2. FAILURE/HAZARD CLASSIFICATION CRITERIA

Potential failures were classified relative to their criticality in accordance with the following criteria (per MIL-STD-882A, paragraph 5.4.3.1: Hazard level):

a) Category I - Catastrophic

-- Will cause death or severe injury to personnel or system loss

b) Category II - Critical

-- Will cause personnel injury or major system damage, or will require immediate corrective action for personnel or system survival.

c) Category III - Marginal

-- Can be counteracted or controlled without injury to personnel or major system damage.

d) Category IV - Negligible

-- Will not result in personnel injury or system damage.

The probabilities of the potential failures-hazards were selected according to the following criteria (per MIL-STD-882A, paragraph 5.4.3.2):

A -- Frequent
B -- Reasonably Probable
C -- Occasional
D -- Remote
E -- Extremely Improbable
F -- Impossible.

NOTE: In classifying the Failure/Hazards, the worst case effects on operating personnel or equipment were considered.

FAILURE MODES & EFFECTS ANALYSIS - SYSTEM SAFETY ANALYSIS

HAZARD ANALYSIS

TABLE: _____

NAME: (Sub-system) _____

DWG. NO./REV.: _____

Page ____of____

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON:						FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			PERSONNEL		SYSTEM		MISSION					
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

FIGURE 1

APPENDIX A

HAZARDS/FAILURE MODES AND EFFECTS ANALYSIS

MK 1 MOD 0 LSO HUD CONSOLE SYSTEM

WORK SHEETS

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(Failure Modes & Effects Analysis - System) Safety Analysis MK1 MOD 0 LSO-HUD Console System

NAEC-91-7958

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON:						FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			PERSONNEL		SYSTEM		MISSION					
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	INTRODUCTION This segment of the System Safety Analysis focuses on the MK-I MOD 0 Landing Signal Officer's (LSO) Heads-Up-Display (HUD) Console and the Auxiliary Electronics Box depicted as UNIT 1 and UNIT 2, respectively, in Figure 1. The display system consists of two major parts: A Display Console located at the LSO station, and an Auxiliary Electronics Box located one deck and almost directly below the LSO platform. The information displayed by the Console is obtained from the ship's radars and recovery-status sources. The front panel of the Console, Figure 2, contains scales and indicators that display Airspeed, Range, Rate of Descent, Ramp (or deck) Motion, Aircraft Type, Wind Direction and Speed, Deck Status, Pilot Landing Aid Television (PLAT), and Automatic Carrier Landing System (ACLS) operating status. In addition, the Console provides a Heads-Up Display (HUD) that shows Rate of Descent, Range, Ramp Motion, and aircraft Glide-Slope position. The HUD information is optically focused to appear at infinity and it can be superimposed on the sky by Console tilt and rotation. This enables the LSO to see a distant aircraft and the HUD Display in the same field of view; both are simultaneously in focus. Cross lines in the HUD are glide-slope reference lines for showing the position of its electronically generated Aircraft Symbol, but do not function as a "gunsight" reference to use the HUD for visual aircraft tracking. The Display Subsystem takes data signals from various existing shipboard equipment sets for processing and display in the HUD Console. Calibration, testing and troubleshooting of the display circuits is facilitated with the test simulator that synthesizes interface equipment output signals. Interface equipment signals that drive the displays and other facilities in the HUD Console come from: a. SPN-42 Radar (Automatic Carrier Landing System - ACLS) b. SPN-44 Radar c. PLAT (Pilot Landing Aid Television) system d. FRESNEL (Fresnel Lens Optical Landing System) MK 6 MOD 3 or MK 6 MOD 2 with Trim/Harmonization computer. e. Landing area with status system f. Ship's wind measuring system g. Ship's 21MC intercom system h. MOVLAS (Manually Operated Visual Landing Aid System) MK1, MOD 2 i. FRESNEL Wave-Off subsystem. (continuation on page iv)										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

17(A-1)

NAEC-91-7958

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)

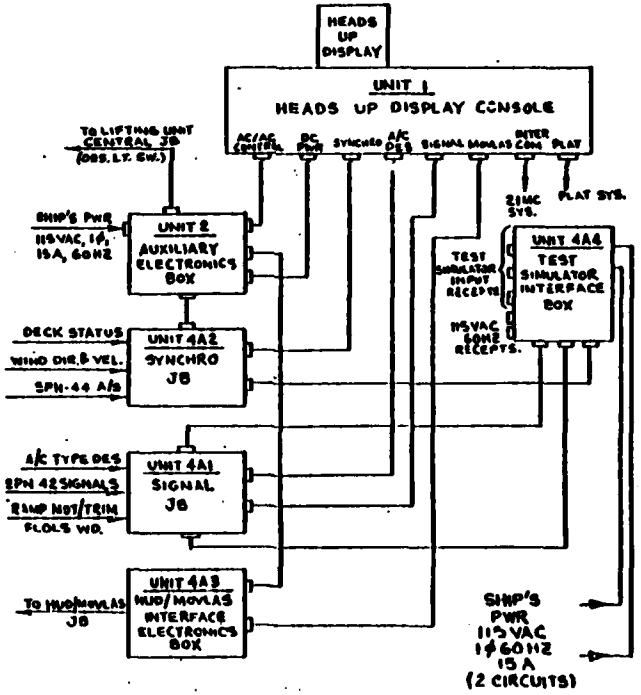

FIGURE 1
DISPLAY SUBSYSTEM
MK1 MOD0 LSO HUD CONSOLE SYSTEM

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

NAEC-91-7958

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)

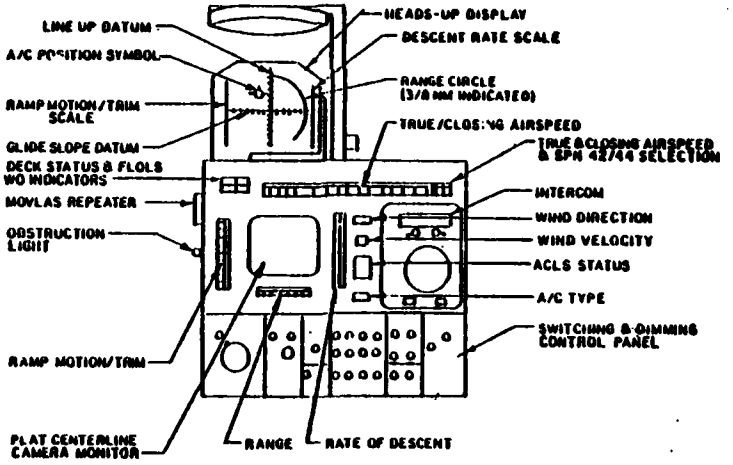

FIGURE 2
LSO HEADS-UP DISPLAY CONSOLE
DISPLAYS & FACILITIES

19(A-3)

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NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	PERSONNEL INJURY	SYSTEM LOSS	SYSTEM DAMAGE	MISSION LOSS	MISSION POTENTIAL LOSS	FAILURE - HAZARD DETECTABLE BY OPERATOR?	FAILURE - HAZARD CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	The measurement capabilities and appearance of the console displays are: (1) Airspeed: 80 to 180 knots, one knot resolution, approx. 38.5 cm (15.15 in) scale incandescent moving pointer indicator, adjacent trend pointer. (2) Range: 0 to 6 nautical miles, 0.2 nautical mile resolution, approx. 11.8 cm (4.65 in) scale, incandescent moving pointer indicator. (3) Rate of Descent: 0 to 2000 ft/min, 50 ft/min resolution, approx. 15.6 cm (6.15 in) scale, incandescent moving pointer indicator, adjacent trend lamp. (4) Ramp Motion: 0 to 20 ft and -19 ft., with one foot resolution, approx. 15.6 cm (6.15 in) center zero scale, incandescent moving pointer indicator, trim lamp for ship's trim independent of Ramp Motion. (5) Deck Open: Green lamp. (6) Deck Closed: Red lamp. (7) LSO Wave-Off: Red flashing, approx. 90/min. (8) True Airspeed: White light, TAS, indicator. (9) Closing Airspeed: White light, CLSG, indicator. (10) SPN-42: White light, 42, indicator. (11) SPN-44: White light 44, indicator. (12) Aircraft Type Designator: Alpha-numeric incandescent (white light) characters for A3, A4, A5, A6, A7, T34, E2C, C2, S2, C2, E2, S3, E1, F4, F8, F14, T2, T28, F18 (22 character capacity).											

20(A-4)

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	(13) Automatic Carrier Landing System (ACLS): White light incandescent characters for Lock-On, Mode II or III. Mode I is green color.											
	(14) ACLS Wave-Off: Blue flashing, approx. 100/min.											
	(15) Wind Angle: White light incandescent characters/0 to 80° port and 0 to 100° Starboard											
	(16) Wind Speed: White light incandescent characters for 0 to 99 knots.											
	(17) PLAT: Pilot Landing Aid Television monitor.											
	(18) MOVLAS: Incandescent repeater of the ship's Manually Operated Visual Landing Aid System. Datum bar, green light amber light for "meatball" except red light for danger lights.											
	The measurement capabilities and appearance of the Heads-Up-Display combiner glass are:											
	(1) Rate of Descent: 200 to 1500 ft/minute rate of descent. Vertical scale on right of HUD display.											
	(2) Ramp Motion: +20 ft and -19 ft of ship's ramp motion plus ship's trim separately. Vertical scale on left of HUD display.											
	(3) Glide-Slope & Line-Up Path: Aircraft symbol showing azimuth and altitude relative to the touch-down-point with 30 ft or 10 ft scale factor selection. Azimuth of 240 ft left and right and altitude of +240 ft up and -150 ft down are indicated with the 30 ft scale factor. Azimuth of 80 ft left and right and altitude of +80 ft and -50 ft are indicated with the 10 ft scale factor.											
	(4) Range Circle: Appears when range of aircraft is one nautical mile or less from the carrier and disappears as a function of its distance from the carrier; as the aircraft approaches the deck, 3/4 circle equals 3/4 mile, 1/2 circle equals 1/2 mile, 1/4 circle equals 1/4 mile, etc.											

21(A-5)

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NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

(Failure Modes & Effects Analysis - System) Safety Analysis for HUD Console System

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

NASC-91-7958

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON:						FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			PERSONNEL		SYSTEM		MISSION		DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	A description of the individual subsystems contained within the Heads-Up-Display Console are described on the separate worksheets. The various sub-systems described and their location within this document are listed on Table 1. The drawing numbers for the sub-systems contained in Unit 1 are listed on Table 2. Figures 3 to 10 illustrate, by use of block diagrams, the input/output connections between each of the sub-systems, their power supply requirements, and operating controls.											

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

NASC-91-7958

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL: LIVES	PERSONNEL: INJURY	SYSTEM: LOSS	SYSTEM: DAMAGE	MISSION: LOSS	MISSION: POTENTIAL LOSS	FAILURE - HAZARD: DETECTABLE BY OPERATOR?	FAILURE - HAZARD: CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD: PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)

TABLE 1. WORKSHEET TABLE OF CONTENTS

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON:						FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			PERSONNEL		SYSTEM		MISSION					
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)

TABLE 2. HEADS-UP-DISPLAY CONSOLE

UNIT 1 ASSEMBLIES

DESIGNATION	DESCRIPTION	PART NUMBER
1A1	PLAT Video Monitor Chassis	620331-1
1A2	Airspeed Ind. Ass'y	620333-1
1A3	Deck Status & Scale Ass'y	620332-1
1A4	Regulator Board Ass'y	518659-1
1A5	HUD Deflection Amplifier	620392-1
1A6	ACLS Ind. Ass'y	620360-1
1A7	Rate of Descent Ind. Ass'y	620337-1
1A8	PLAT CRT and Deflection Yoke	519039-1
1A9	Range Indicator Ass'y	620339-1
1A10	Ramp Motion Ind. Ass'y	620338-1
1A11	MOVLAS Ass'y	620326-1
1A12	Card Cage Ass'y	620361-1
1A13	Transformer Shield Ass'y	620371-1
1A14	High Voltage Ass'y	620329-1
1A15	HUD CRT and Deflection Yoke	620318-1
1A16	Heater Ass'y	620328-1
1A17	Control Panel Ass'y	620370-1
1A18	Card Extender Ass'y	518656-1
1A19	Rate of Descent Card Ass'y	518645-1
1A20	Range & Ramp Motion Card Ass'y	518641-1
1A21	Synchro/Analog Card No. 1 Ass'y	518653-1
1A22	Synchro/Analog Card No. 2 Ass'y	518653-1
1A23	Airspeed Card Ass'y	518663-1
1A24	HUD Display Card Ass'y	518649-1
1A25	21MC Intercom Ass'y	620336-1
1A26	Back Plate Ass'y	620321-1

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)

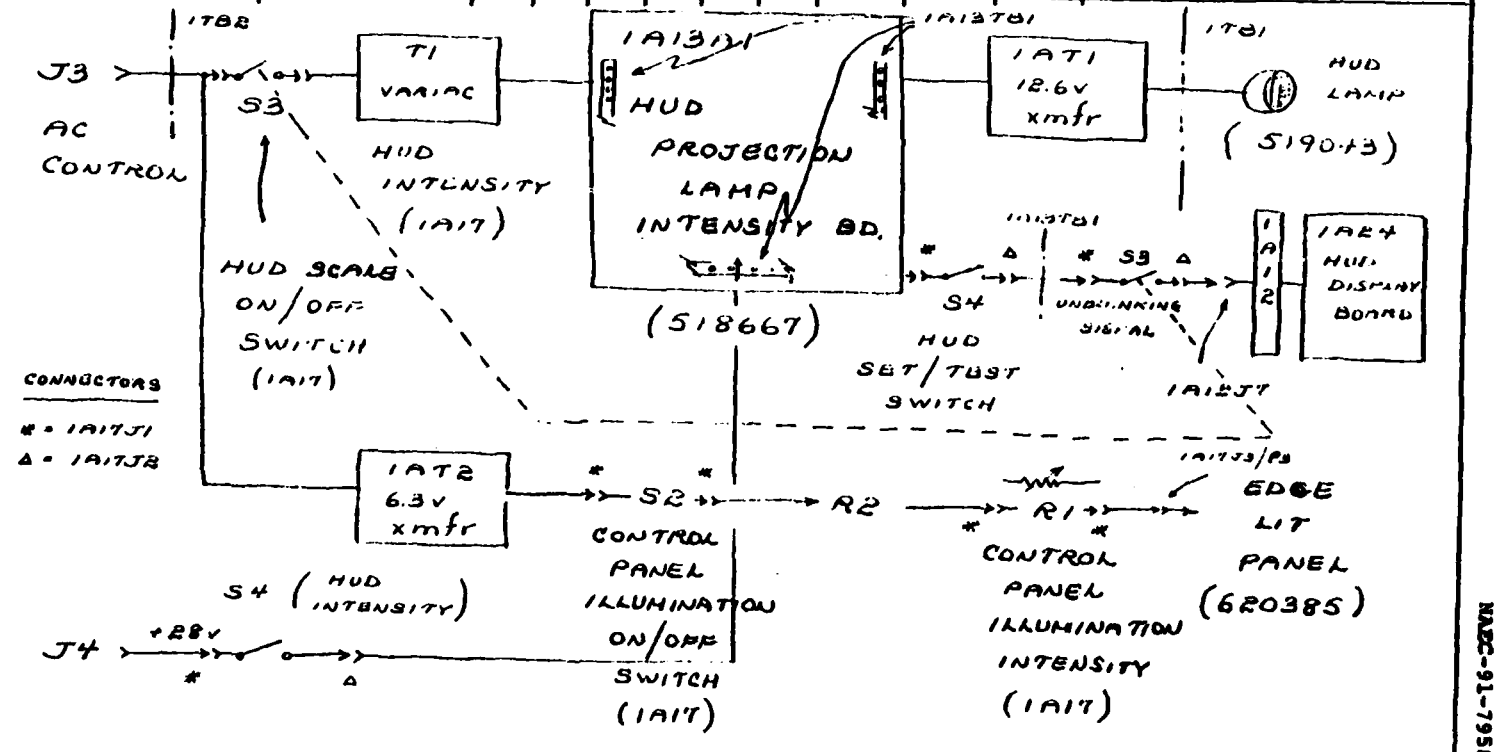

FIGURE 3. HUD RETICLE PROJECTION LAMP CIRCUITRY AND PANEL ILLUMINATION CONTROL

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

(Failure Modes & Effects Analysis - System) Safety Analysis MK1 MOD 0 LSO-HUD Console System

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TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)

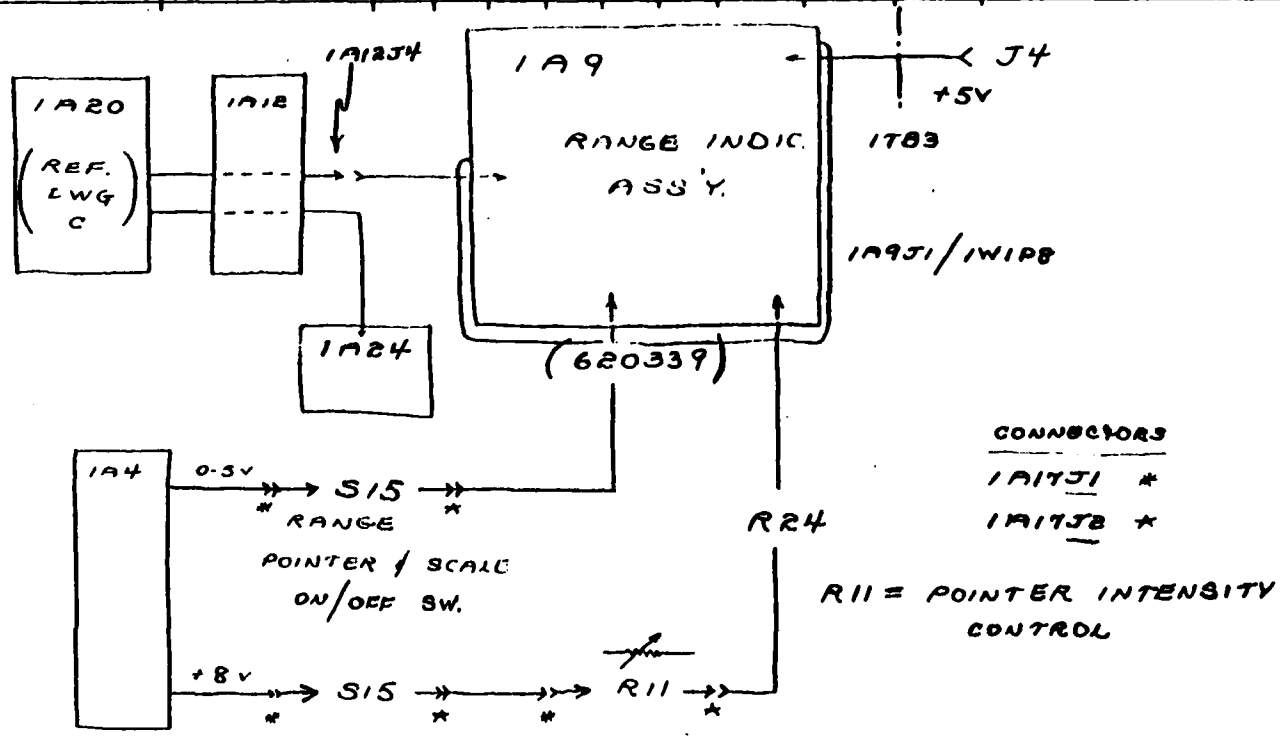

FIGURE 4. RANGE INDICATOR

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	PERSONNEL INJURY	SYSTEM LOSS	SYSTEM DAMAGE	MISSION LOSS	MISSION POTENTIAL LOSS	FAILURE - HAZARD DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)

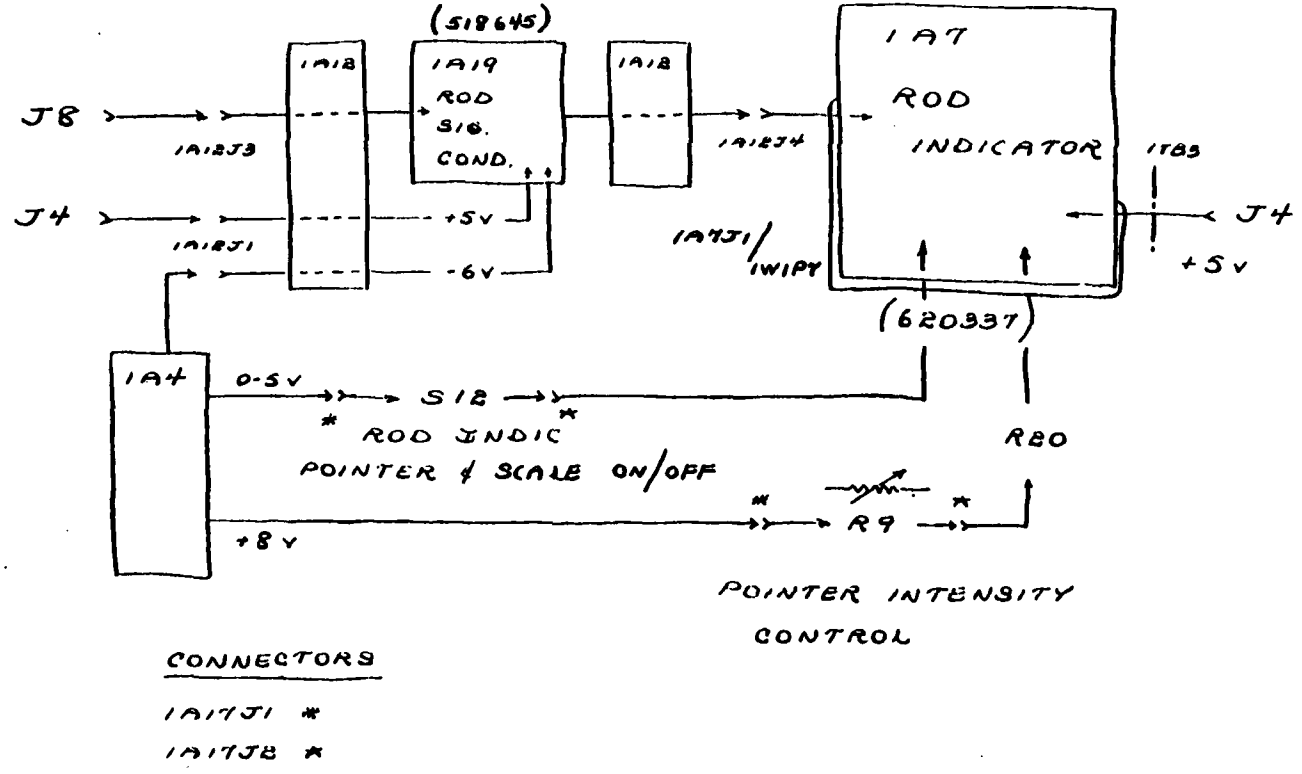

FIGURE 5. RATE OF DESCENT INDICATION

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)

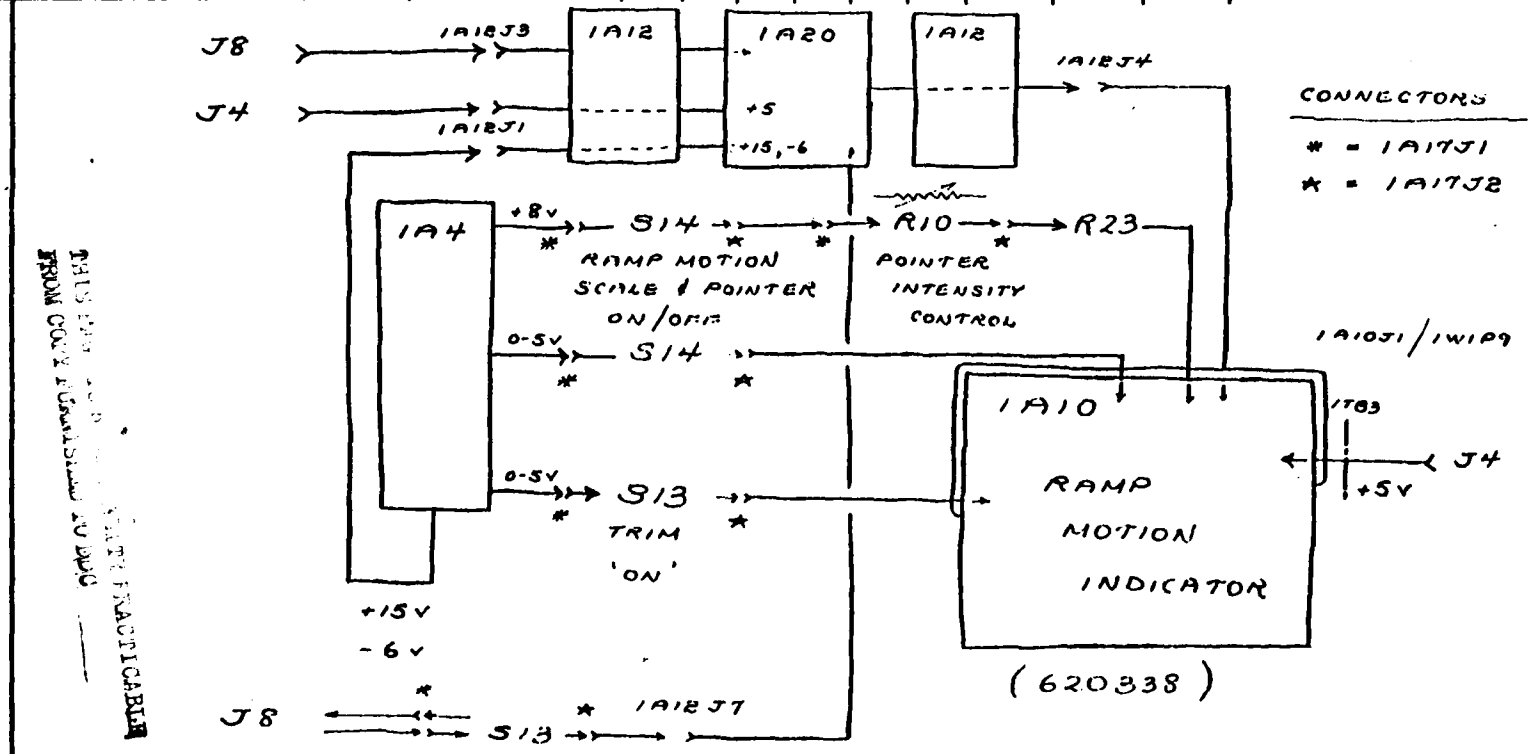

FIGURE 6. RAMP MOTION/TRIM INDICATION

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

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TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	PERSONNEL INJURY	SYSTEM LOSS	SYSTEM DAMAGE	MISSION LOSS	MISSION POTENTIAL LOSS	FAILURE - HAZARD DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)

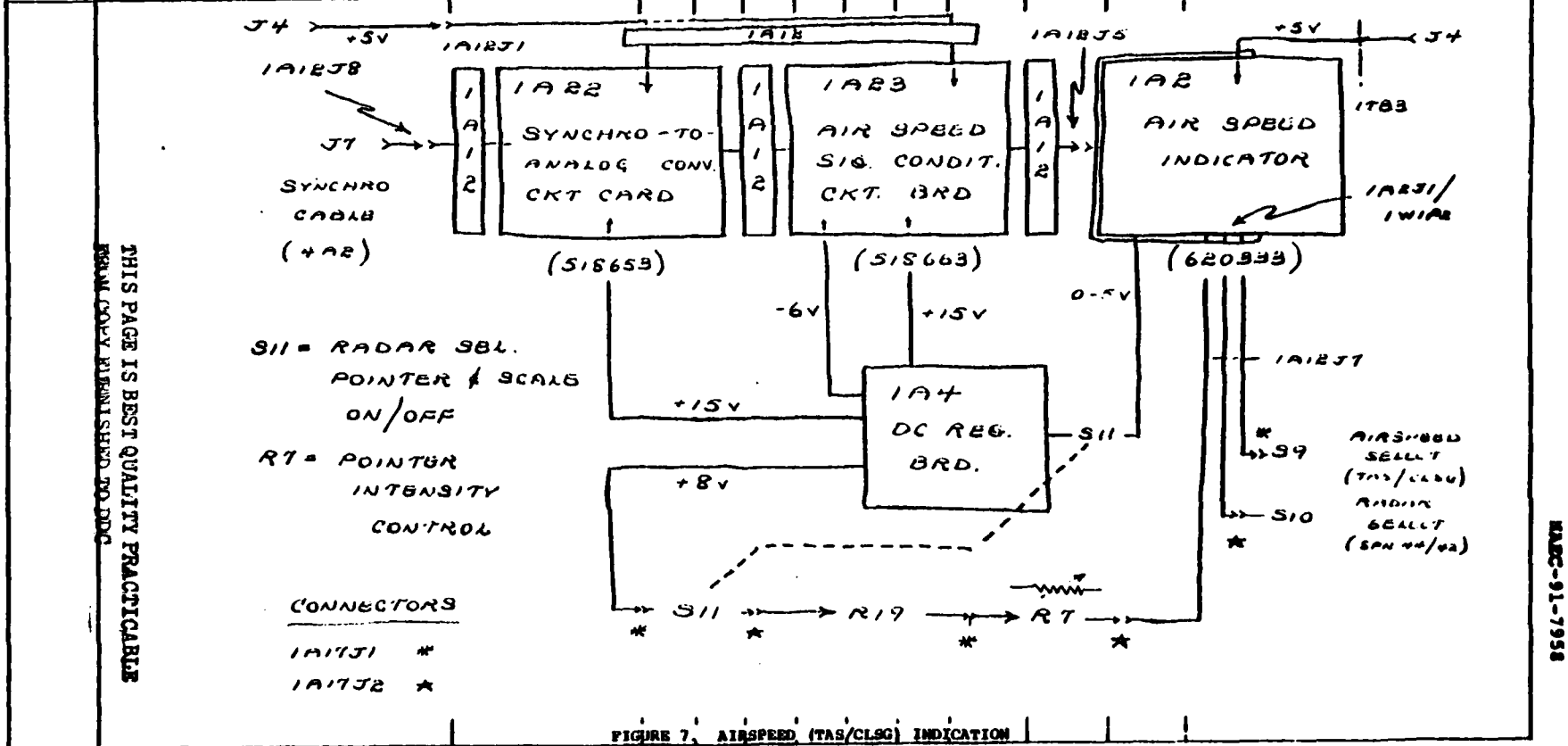

FIGURE 7. AIRSPEED (TAS/CLSG) INDICATION

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)

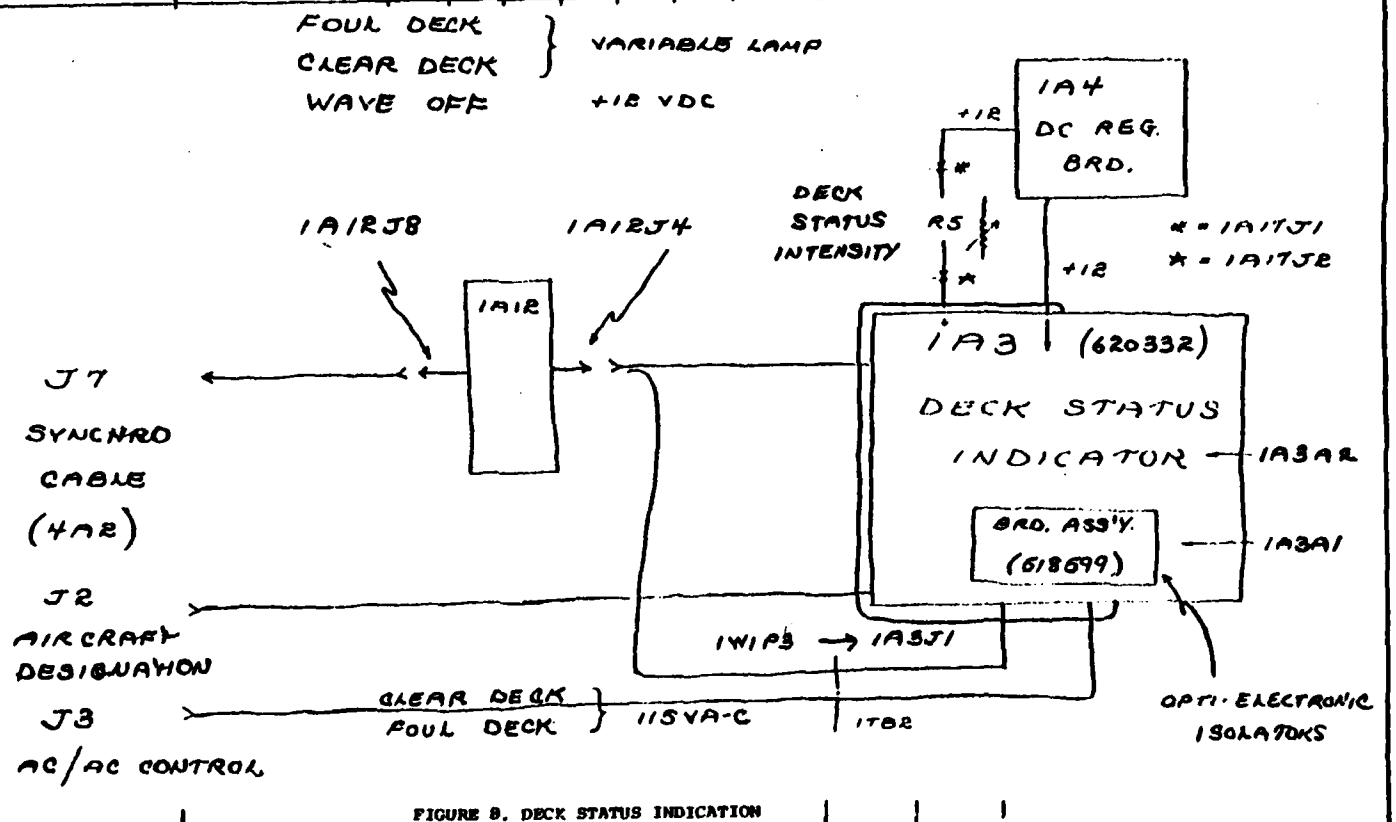

FIGURE 8. DECK STATUS INDICATION

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	EFFECT ON: PERSONNEL INJURY	EFFECT ON: SYSTEM LOSS	EFFECT ON: SYSTEM DAMAGE	EFFECT ON: MISSION LOSS	EFFECT ON: MISSION POTENTIAL LOSS	FAILURE - HAZARD DETECTABLE BY OPERATOR?	FAILURE - HAZARD CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)

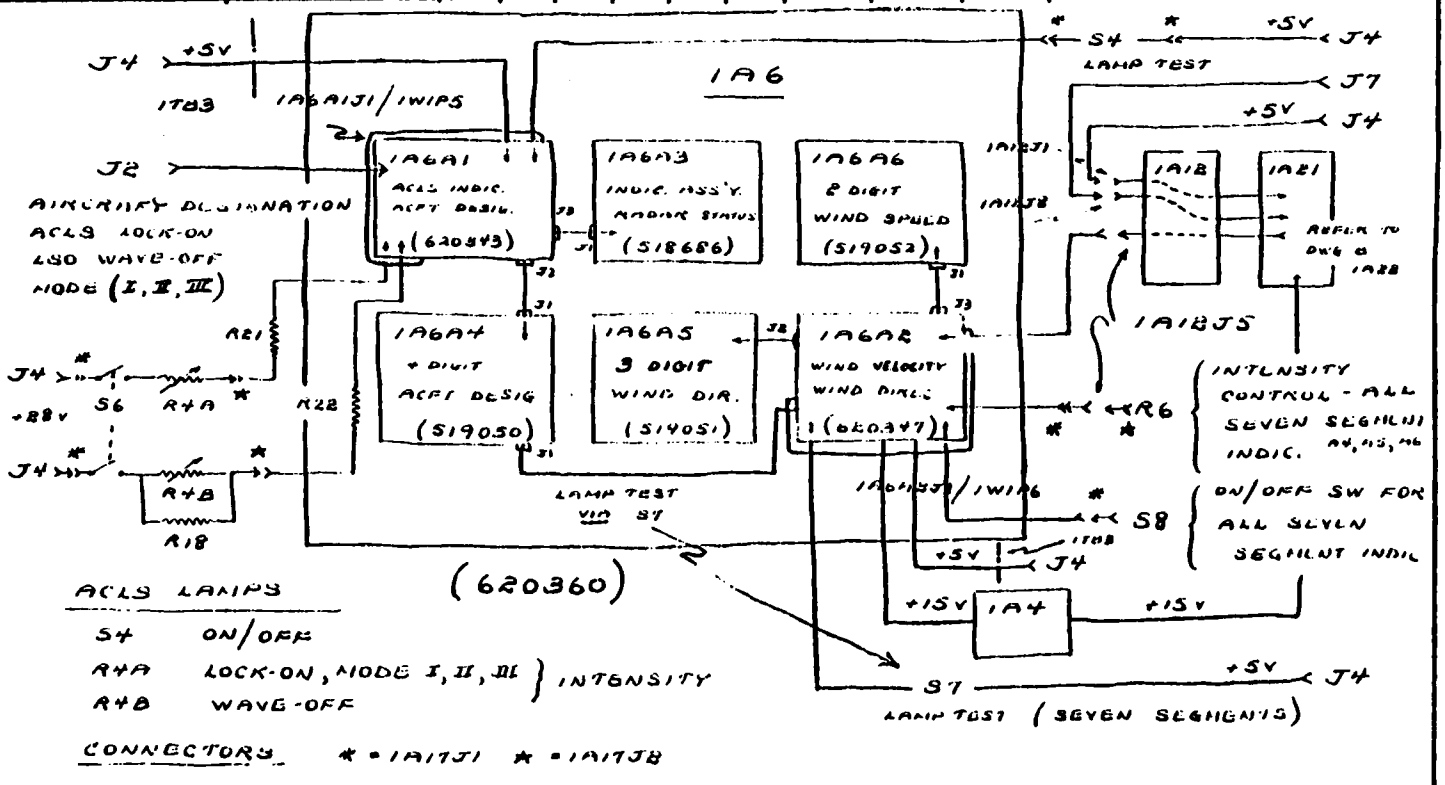

FIGURE 9. ACLS STATUS, AIRCRAFT DESIGNATION, WIND SPEED, WIND DIRECTION INDICATION

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON:						FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			PERSONNEL		SYSTEM		MISSION		DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)

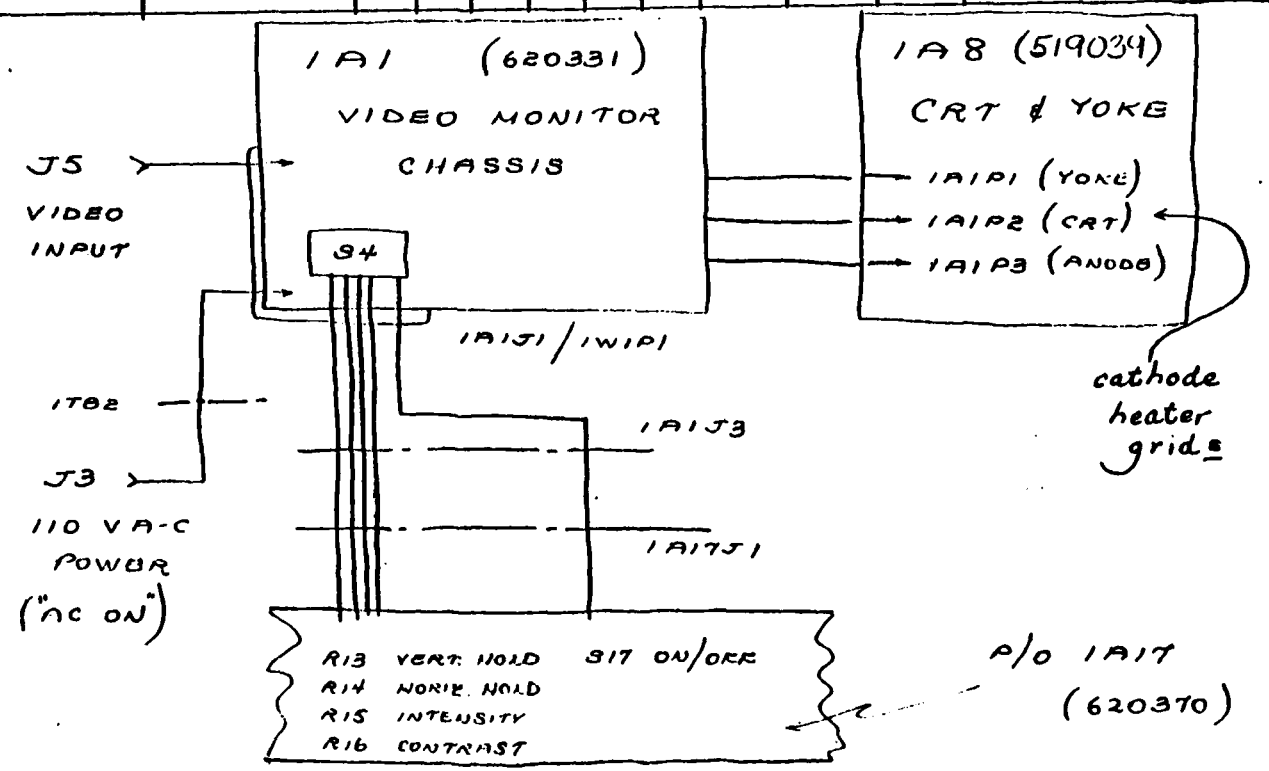

FIGURE 10. FLAT MONITOR SYSTEM

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

NAEC-91-7958

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	EFFECT ON: PERSONNEL INJURY	EFFECT ON: SYSTEM LOSS	EFFECT ON: SYSTEM DAMAGE	EFFECT ON: MISSION LOSS	EFFECT ON: MISSION POTENTIAL LOSS	FAILURE - HAZARD DETECTABLE BY OPERATOR?	FAILURE - HAZARD CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)

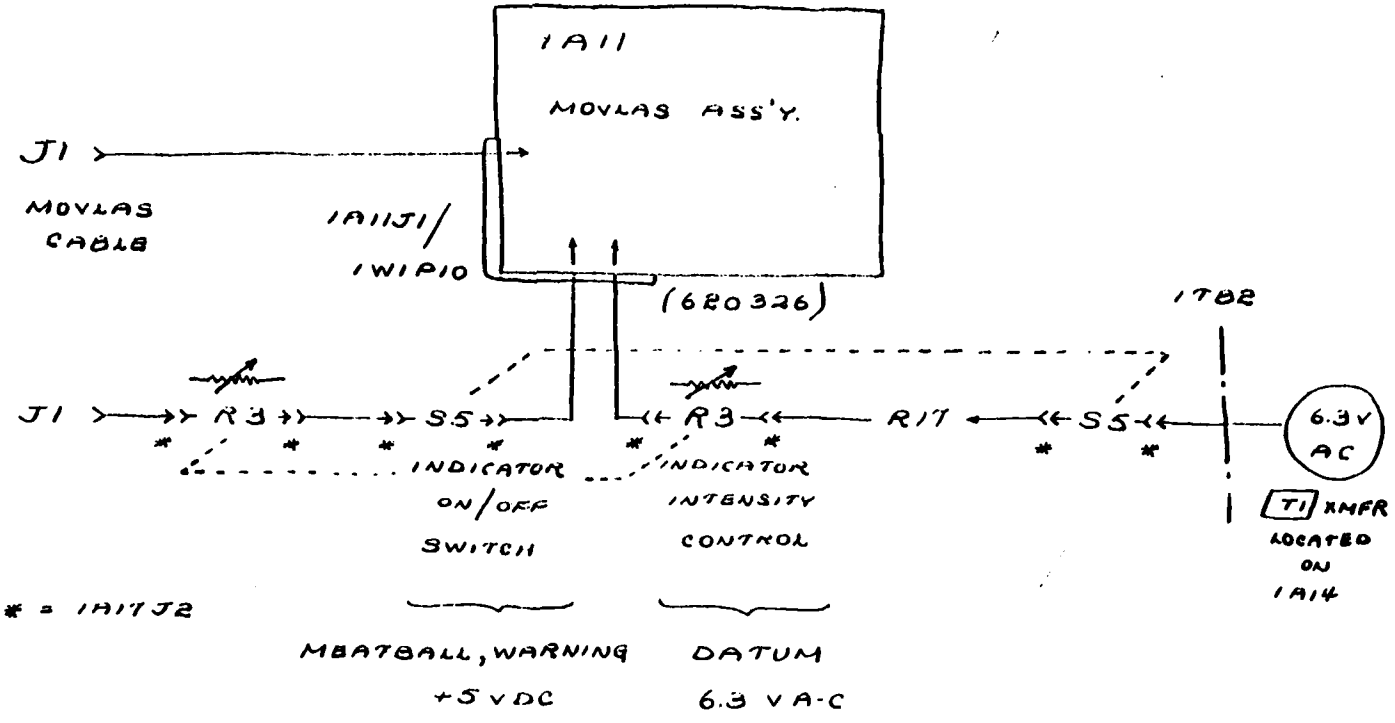

FIGURE 11. MOVLAS REPEATER

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	21 MC SHIP'S INTERCOM → J6 (INTERCOM)											

FIGURE 12. INTERCOMMUNICATION

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)

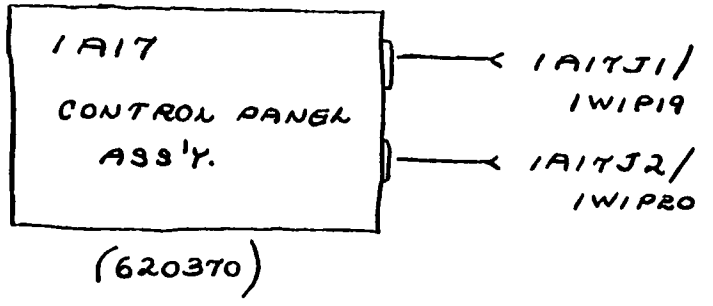

FIGURE 13. CONSOLE CONTROL PANEL

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)

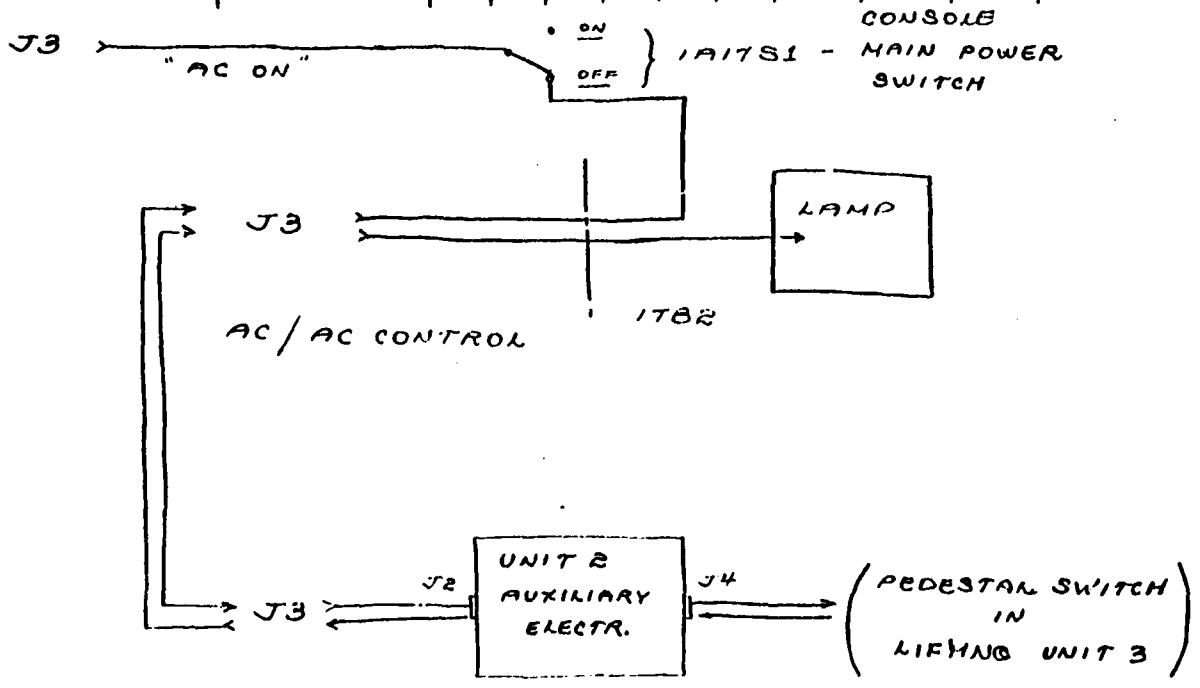

FIGURE 14. CONSOLE OBSTRUCTION LAMP

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

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TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)

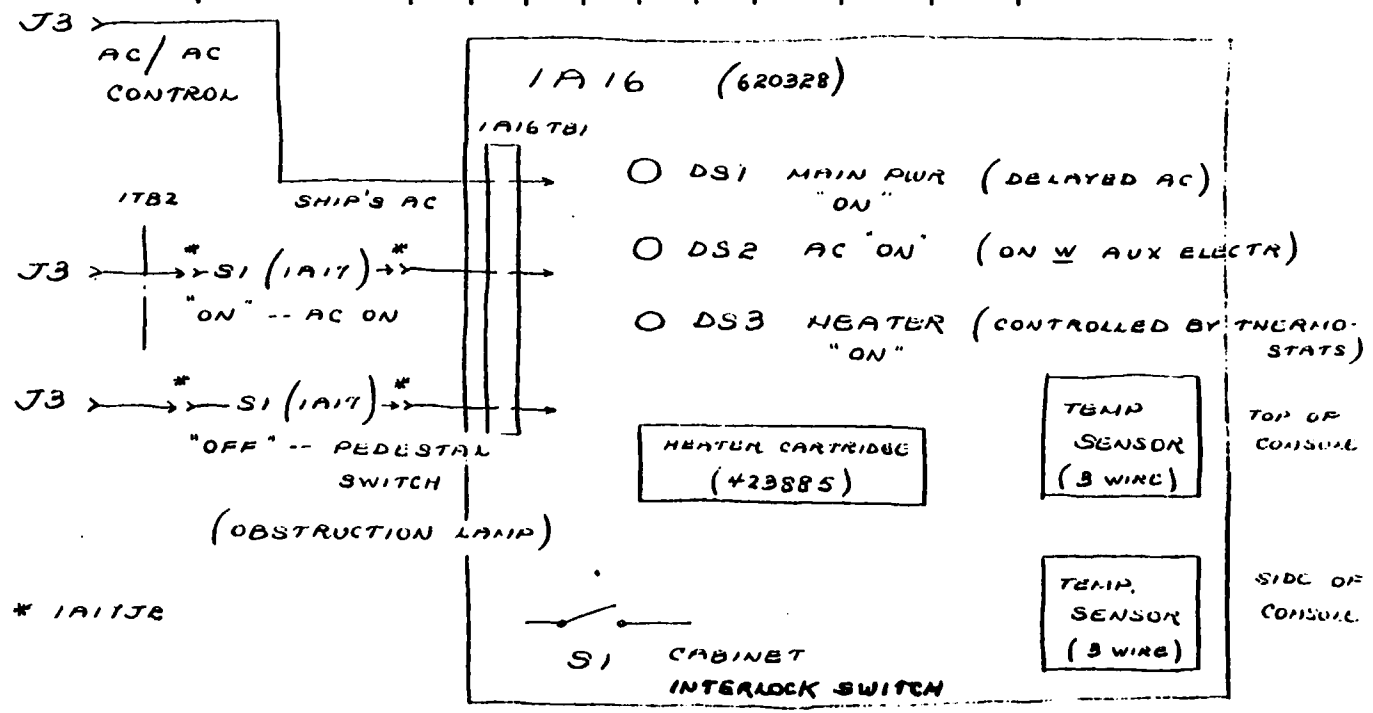

FIGURE 15. CONSOLE DEHUMIDIFICATION

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	EFFECT ON: PERSONNEL INJURY	EFFECT ON: SYSTEM LOSS	EFFECT ON: SYSTEM DAMAGE	EFFECT ON: MISSION LOSS	EFFECT ON: MISSION POTENTIAL LOSS	FAILURE - HAZARD DETECTABLE BY OPERATOR?	FAILURE - HAZARD CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)

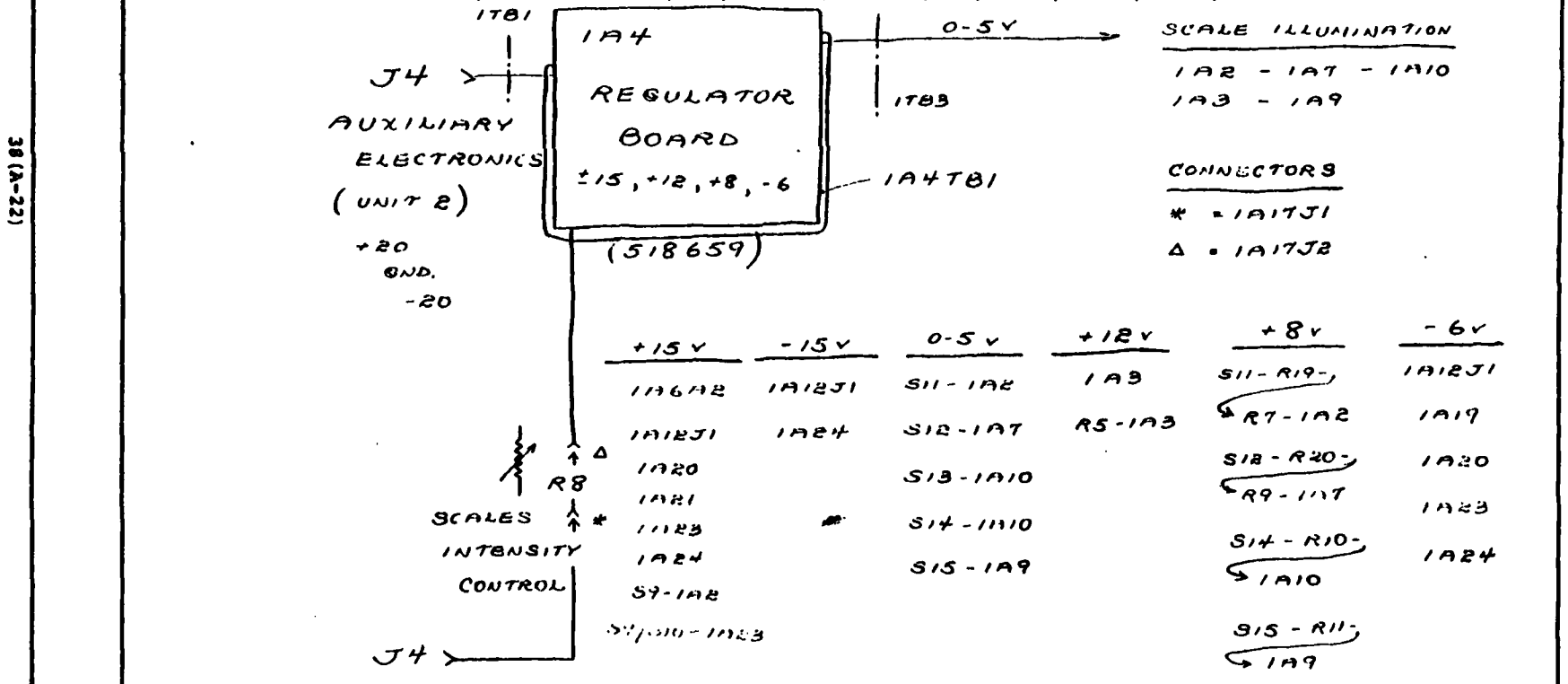

FIGURE 16. DC POWER REGULATORS

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

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TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)

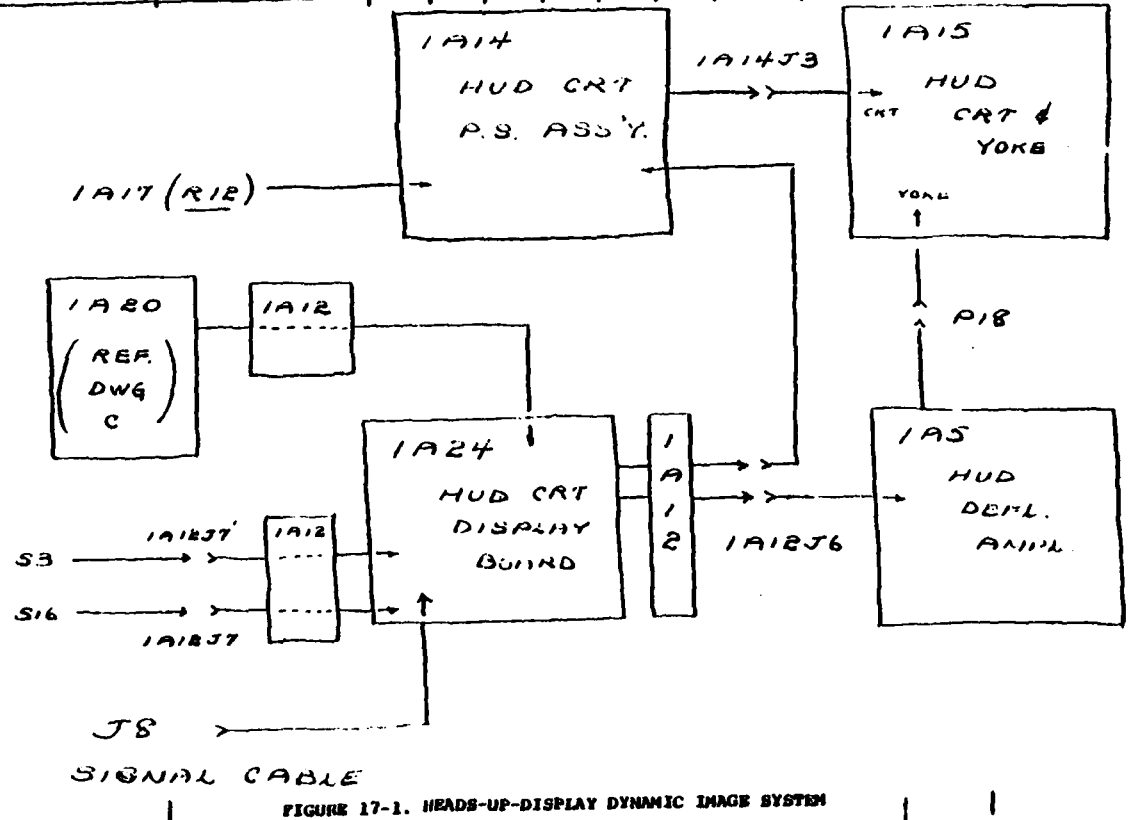

FIGURE 17-1. HEADS-UP-DISPLAY DYNAMIC IMAGE SYSTEM

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL: LIVES	PERSONNEL: INJURY	SYSTEM: LOSS	SYSTEM: DAMAGE	MISSION: LOSS	MISSION: POTENTIAL LOSS	FAILURE - HAZARD: DETECTABLE BY OPERATOR?	FAILURE - HAZARD: CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD: PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)

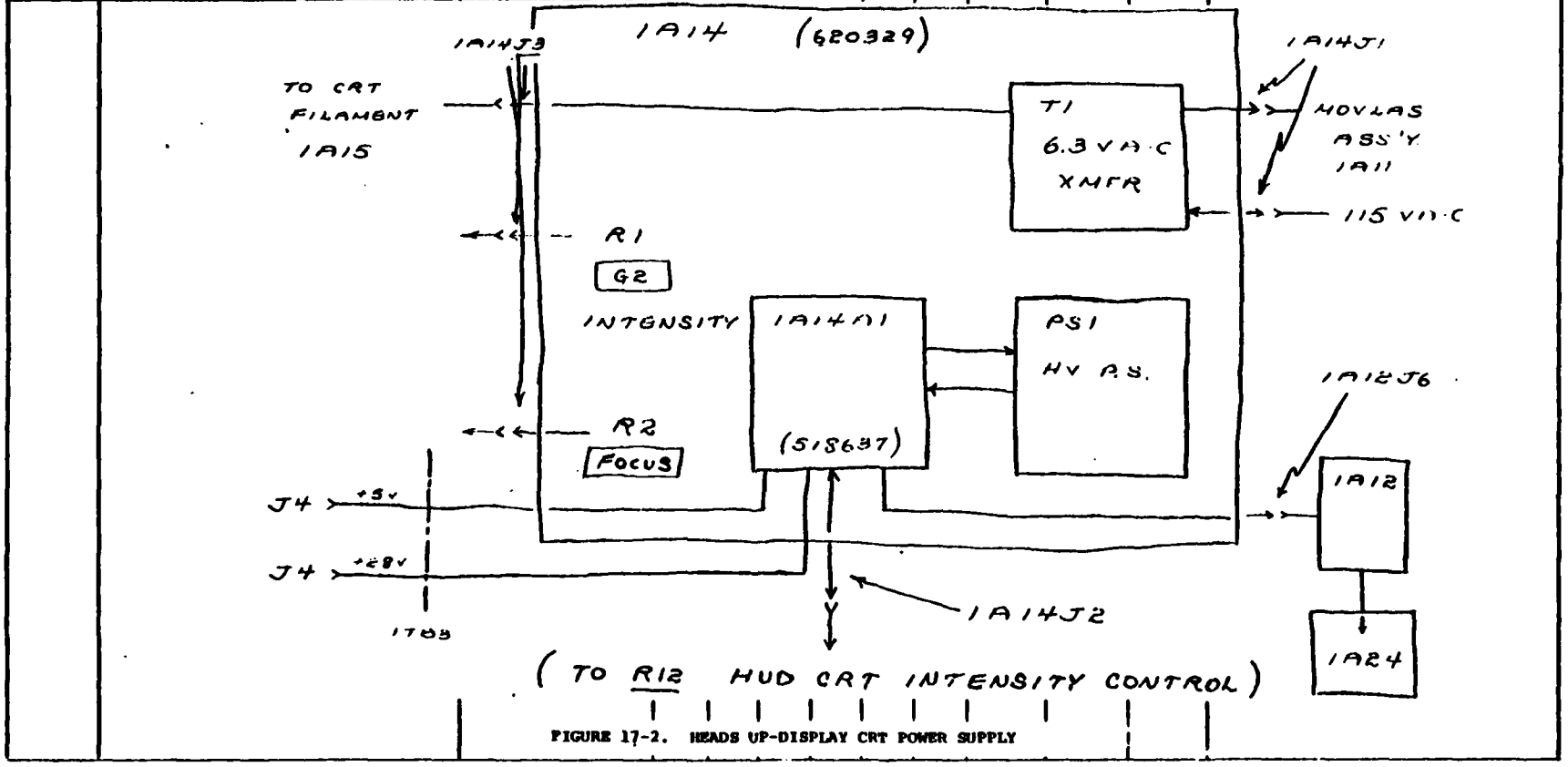

FIGURE 17-2. HEADS UP-DISPLAY CRT POWER SUPPLY

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)

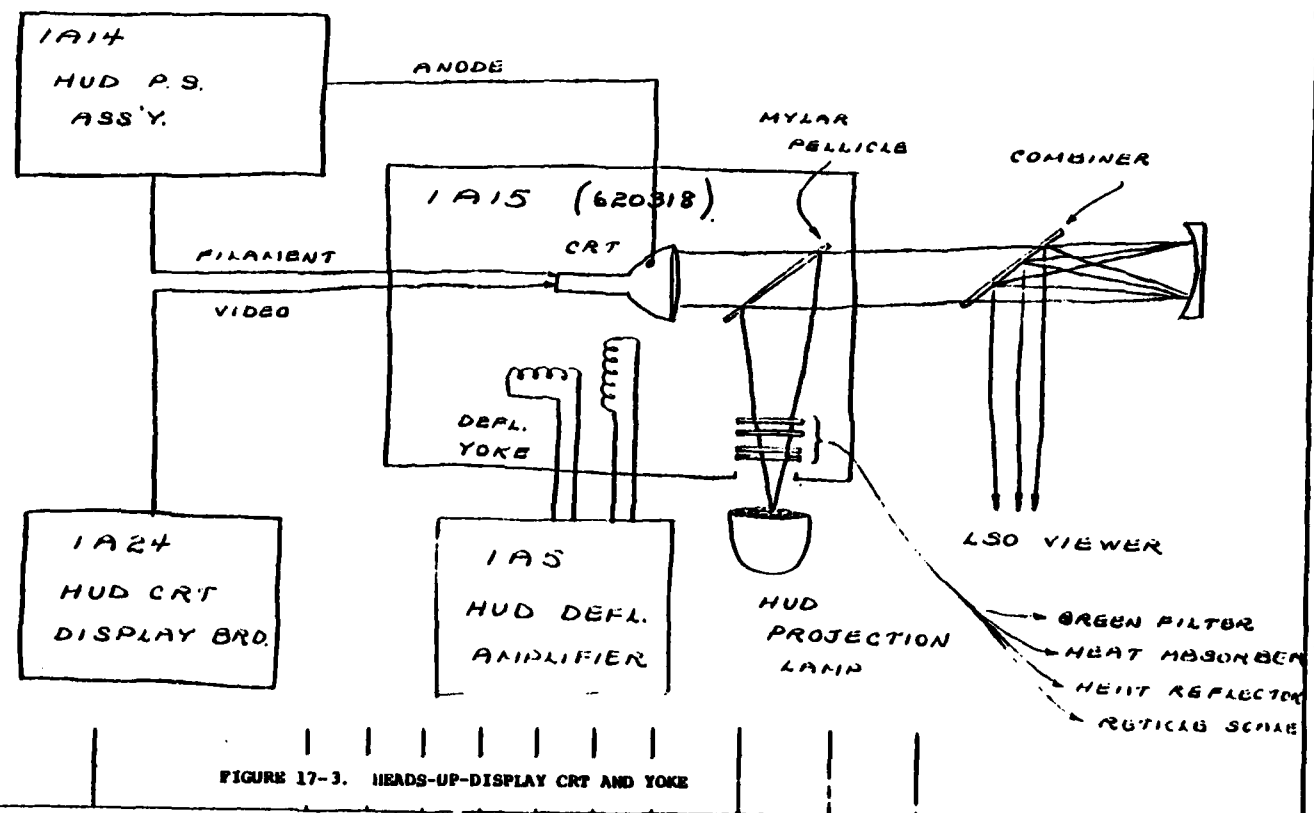

FIGURE 17-3. HEADS-UP-DISPLAY CRT AND YOKE

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)

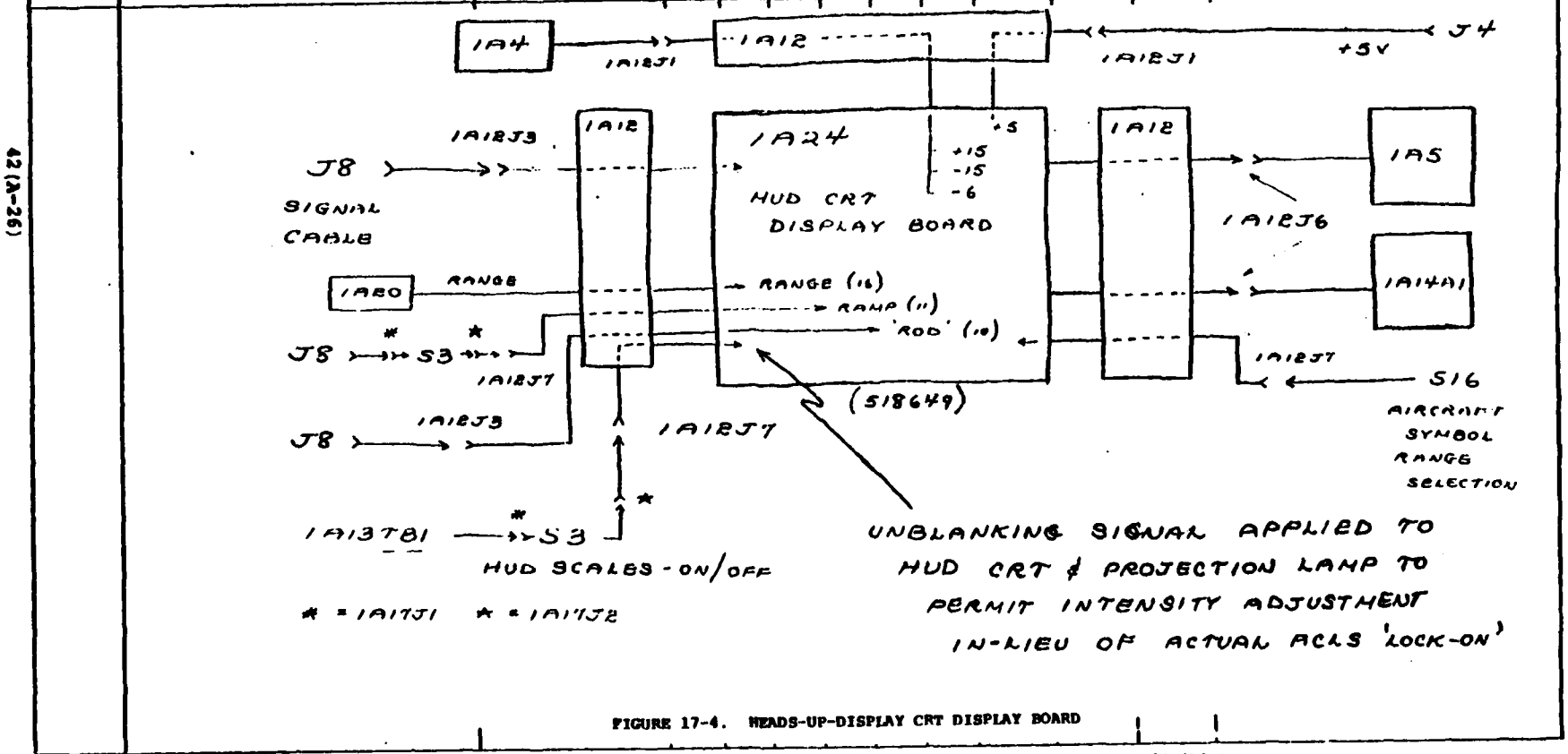

FIGURE 17-4. HEADS-UP-DISPLAY CRT DISPLAY BOARD

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

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TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON:						FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			PERSONNEL		SYSTEM		MISSION					
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)

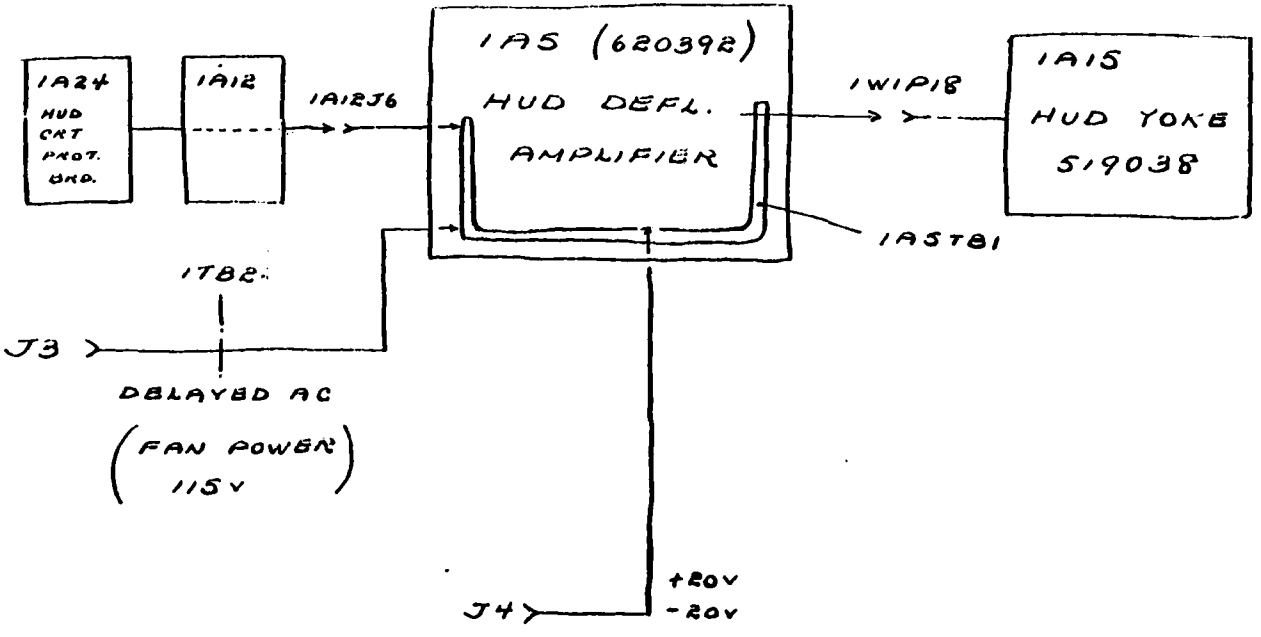

FIGURE 17-5. HEADS-UP-DISPLAY DEFLECTION AMPLIFIER

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)

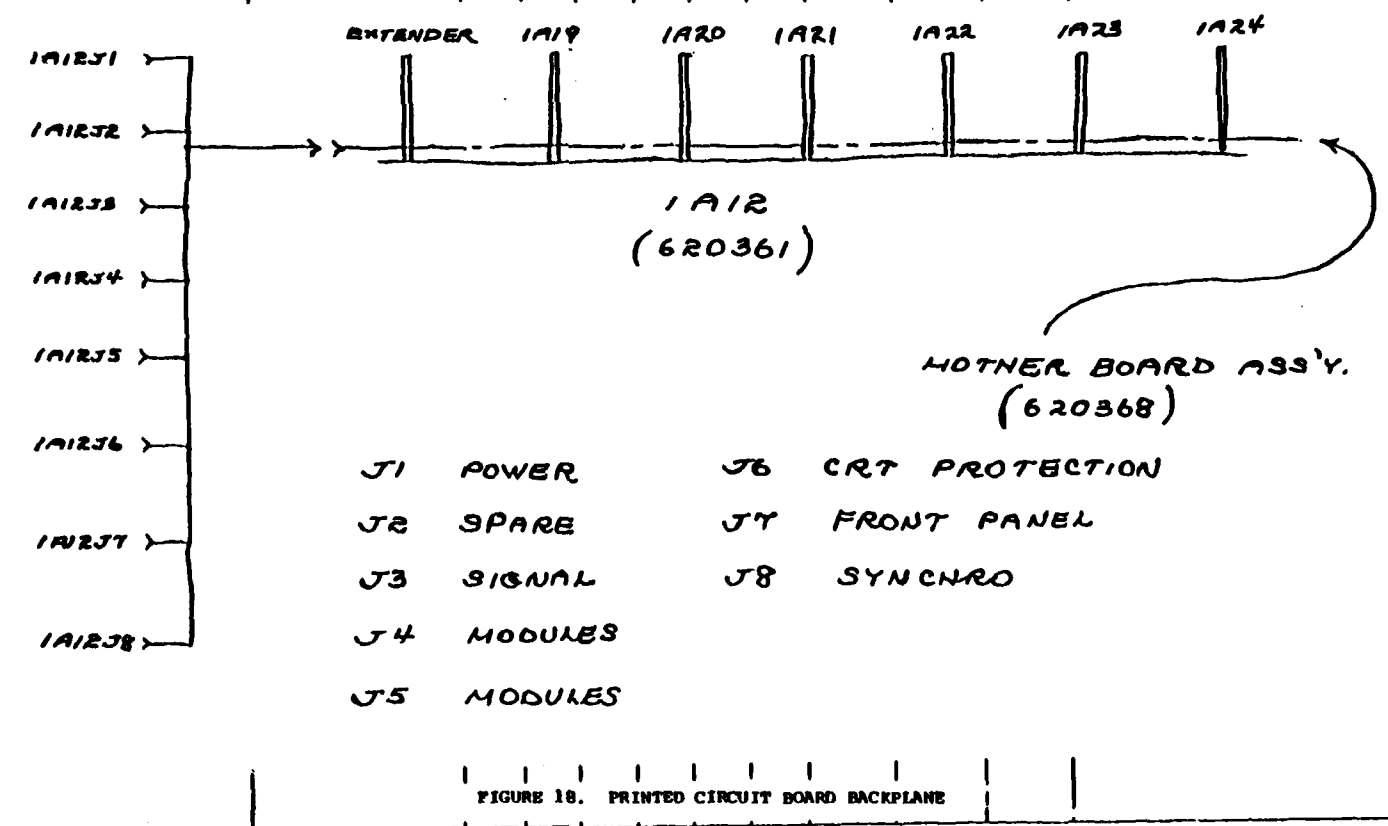

FIGURE 18. PRINTED CIRCUIT BOARD BACKPLANE

44(A-28)

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

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TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)

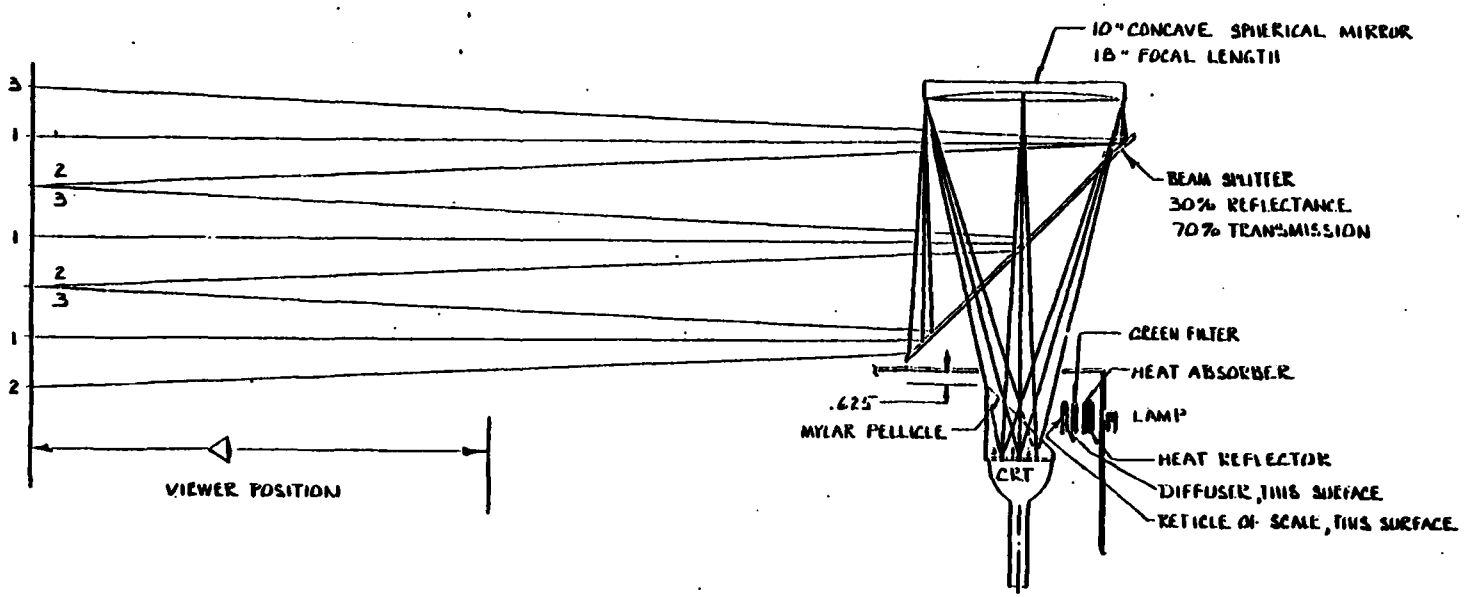

FIGURE 19. HUD PROJECTION LAMP ASSEMBLY

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.1 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

(Failure Modes & Effects Analysis - System) Safety Analysis MK1 MOD 0 LSO-HUD Console System

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TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.0	Range Indication/Heads-Up-Display (HUD). The range data superimposed on the HUD combiner class is a disappearing circular arc segment commencing when returning aircraft reach the CV within one (1) nautical mile of the ramp edge. Range signals are provided by the SPN-42 radar and are fed to the HUD console as varying DC stimulus via cable W227 to connector J8. When the aircraft is more than one nautical mile away, the circle does not appear. When the aircraft approaches to 0.99 miles, a nearly complete circle suddenly appears on the display. At 0.5 miles, half a circle remains; at 0.25 miles a quarter of the circle remains visible; and so on until at about 0.01 miles, the circle disappears completely. The circle, or a portion thereof, has a constant diameter at all times.											
		a) No image (while A/C within 1nm)	-	-	-	-	-	-	x	III	D	When failures occur that affect loss of only the HUD display of *range information*, the LSO will use the lower console range display. When a failure occurs that disables both displays, the LSO will depend on his visual contact with the aircraft and his experience to judge the range of the aircraft. This failure mode would therefore cause no problem during a given recovery period and it would be corrected before the next one.
		i) Loss of 1A24 image generator printed circuit board output,										
		ii) Loss of HUD CRT subsystem,										
		iii) Loss of input stimulus to 1A24 from console connector J8 (Signal) due to signal breakdown in cable W227 and/or Signal Junction Box (Unit 4A1),										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.0	(cont'd) a)	iv) Loss of internal console circuitry paths from J8 to 1A24 caused by open pin crimp/broken wire/high resistance pin connection in connectors 1A12J1 (Power) or 1A12J3 (Signal) or interconnection within card cage back-plane 1A12										
		v) Loss of DC power supply input voltages to 1A24 (HUD Display Board) and HUD CRT subsystems provided by Auxiliary Electronics Box (Unit 2) through console connector J4 (DC power), assembly 1A4 (Regulator Board Assembly,										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	PERSONNEL INJURY	SYSTEM LOSS	SYSTEM DAMAGE	MISSION LOSS	MISSION POTENTIAL LOSS	FAILURE - HAZARD DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.0	(cont'd) a)	vi) Loss of range & Ramp Motion Signal Condition circuit board 1A20 output										
		b) Incorrect value displayed	-	-	-	-	-	-	x	III	D	This failure mode is detectable by the LSO when large incremental errors develop. Small errors are of little consequence to the LSO because of his visual contact with the aircraft in the approach. Small errors will ultimately be detected through periodic calibrations and corrected with an appropriate maintenance action. If only the HUD display is affected in this failure mode, the LSO will use the console display.
		i) Component malfunction on 1A24 PCB causing misinterpretation of conditioned Range data,										
		ii) Component malfunction on 1A20 PCB causing incorrect signal conditioning of input DC stimulus (varying DC voltage) from SPN-42 radar,										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

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TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.0	(cont'd) b)	iii) Loss of critical voltages to 1A24 and 1A20 from Auxiliary Electronics Box (Unit 2) and 1A4.										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	PERSONNEL INJURY	SYSTEM LOSS	SYSTEM DAMAGE	MISSION LOSS	MISSION POTENTIAL LOSS	FAILURE - HAZARD DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
2.0	Rate of Descent (ROD) Indication on Heads-Up-Display (HUD). The ROD scale on the HUD is a facsimile of the console indicator the rate of descent (sink rate) of the incoming aircraft as it approaches the CV on its glide-slope path to its final touchdown point. The ROD scale is located on the extreme right of the combiner glass. It displays a range from 200 feet per minute to 1500 feet per minute of aircraft descent during a recovery. Its pointer will move slightly off-scale at each end of the scale for descent rates outside of the range. This display is generated by the SPN-42 radar ACLS system which provides varying analog stimulus of 0-10 VDC corresponding to 0-2000 feet per minute.											
		a) No Pointer indication	-	-	-	-	-	-	x	III	D	When failures occur that affect only the HUD display of ROD information, the LSO will use the console display. When a failure occurs that disables both displays, the LSO will depend on his visual contact with the aircraft and his experience to judge the normality of the aircraft ROD. This failure mode would, therefore, not significantly affect safety during a given recovery period and it would be corrected before the next one.
		i) Loss of 1A24 image generator printed circuit board output,										
		ii) Loss of HUD CRT sub-system,										
		iii) Loss of input stimulus to 1A24 from console connector J8 (Signal) due to signal breakdown in cable W227 and/or Signal Junction Box (Unit 4A1),										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

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TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	EFFECT ON: PERSONNEL INJURY	EFFECT ON: SYSTEM LOSS	EFFECT ON: SYSTEM DAMAGE	EFFECT ON: MISSION LOSS	EFFECT ON: MISSION POTENTIAL LOSS	FAILURE - HAZARD: DETECTABLE BY OPERATOR?	FAILURE - HAZARD: CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD: PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
2.0	(cont'd) a)	iv) Loss of internal console circuitry paths from J8 to 1A24 caused by open pin crimp/broken wire/high resistance pin connection in connectors 1A12J1 (Power) or 1A12J3 (Signal) or interconnection within card case back-plane 1A12 or connector 1A12J4 (Modules)										
		v) Loss of DC power supply input voltages to 1A24 (HUD Display Board) and HUD CRT subsystems provided by Auxiliary Electronics Box (Unit 2).										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	PERSONNEL INJURY	SYSTEM LOSS	SYSTEM DAMAGE	MISSION LOSS	MISSION POTENTIAL LOSS	FAILURE - HAZARD DETECTABLE BY OPERATOR?	FAILURE - HAZARD CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
2.0	(cont'd) a)	through console connector J4 (DC power) assembly 1A4 (Regulator Board ass'y, and the 115 VA-C input ("AC On"), v) Loss of range & ramp motion Signal Conditioning circuit board 1A19 output.										
	b) Incorrect Value displayed	i) Component malfunction on 1A24 PCB causing misinterpretation of conditioned range data, ii) Component malfunction on 1A19 PCB causing incorrect signal conditioning of input DC	-	-	-	-	-	-	X	III	D	This failure mode is detectable by the LSO when large incremental errors develop. Small errors are of little consequence to the LSO because of his visual contact with the aircraft in the approach. Small errors will ultimately be detected through periodic calibrations and corrected with an appropriate maintenance action. If only the HUD display is affected in this failure mode, the LSO will use the console display.

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NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	EFFECT ON: PERSONNEL INJURY	EFFECT ON: SYSTEM LOSS	EFFECT ON: SYSTEM DAMAGE	EFFECT ON: MISSION LOSS	EFFECT ON: MISSION POTENTIAL LOSS	FAILURE - HAZARD: DETECTABLE BY OPERATOR?	FAILURE - HAZARD: CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD: PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
2.0	(cont'd) b)	stimulus (varying DC voltage) from SPN-42 radar, iii) Loss of critical voltages to 1A24 and 1A19 from Auxiliary Electronics Box (Unit 2) and 1A4.										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

(Failure Modes & Effects Analysis - System) Safety Analysis MK1 MOD 0 LSO-HUD Console System

NAEC-91-7958

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
3.0	Ramp Motion/Trim Indication on the Heads-Up-Display (HUD). The Ramp Motion/Trim scale on the HUD is a facsimile of the redundant console indicator display displaying sum of ramp displacement due to sea and any fixed displacement due to the ship's trim. The ramp motion is displayed on the vertical scale at the extreme left of the combiner glass. The pointer will move off-scale if the scale limits are exceeded. The input ramp motion signal is from hte Ship Harmonization Computer (SHC). A momentary switch located on the console selects the ship's trim which is displayed (without ramp motion) on the ramp scale. NOTE: The most dangerous ramp position during landing operations is a high ramp from +10 feet to +20 feet. This range is indicated by a red filter on the scale. A high ramp is much more dangerous than a low ramp since the latter means a hard landing and less danger to the pilot and aircraft, while the former may mean a ramp strike.											
	a) No indication	i) Loss of 1A24 image generator printed circuit board output, ii) Loss of HUD CRT subsystem, iii) Loss of input stimulus to 1A24 from console connector J8 (Signal) due to signal breakdown in W227 cable and/or Signal Junction Box (Unit 4A1),	x	-	x	-	x	-	x	III	D	When failures occur that affect only the HUD display of ramp motion/trim information, the LSO will use the console display. When a failure occurs that disables both displays, the LSO will depend on the hook to ramp alarm in an auxiliary instrument facility (base console) in the LSO work station. A red light is illuminated for a ramp condition causing a 7 to 3 ft. hook to ramp clearance and an audible alarm sounds when the clearance is less than 3 ft. This failure mode would, therefore, not significantly affect safety during a given recovery period and it would be corrected before the next one.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	EFFECT ON: PERSONNEL INJURY	EFFECT ON: SYSTEM LOSS	EFFECT ON: SYSTEM DAMAGE	EFFECT ON: MISSION LOSS	EFFECT ON: MISSION POTENTIAL LOSS	FAILURE - HAZARD: DETECTABLE BY OPERATOR?	FAILURE - HAZARD: CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD: PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
3.0	(cont'd) a)	iv) Loss of internal console circuitry paths from J8 to 1A24 caused by open pin crimp/ broken wire/ high resistance pin connection in connectors 1A12J1 (Power) or 1A12J3 (Signal) or interconnection within card cage backplane 1A12 including connector 1A12J7 (front panel),										
		v) Loss of DC power supply input voltages to 1A24 (HUD Display										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

NAEC-91-7958

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
3.0	(cont'd) a)	v) Board) and HUD CRT subsystems provided by Auxiliary Electronics Box (Unit 2) through console connector J4 (DC Power), assembly 1A4 (Regulator Board Assembly, and the 115 VA-C input ("AC ON"),										
		vi) Loss of trim information due to open or shorted momentary switch 1A17S13,										
		vii) Loss of range & ramp motion signal conditioning circuit board 1A20 output-										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
3.0	(cont'd)	viii) No trim selection due to shorted or open control switch 1A17S13.										
		b) Single unchanging indication or erroneous readout.	-	-	-	-	-	-	x	III	E	When failures occur that affect only the HUD display of ramp motion/trim information, the LSO will use the console display. When a failure occurs that disables both displays, the LSO will depend on the hook to ramp alarm in an auxiliary instrument facility (base console) in the LSO work station. A red light is illuminated for a ramp condition causing a 7 to 3 ft. hook to ramp clearance and an audible alarm sounds when the clearance is less than 3 ft. This failure mode would, therefore, not significantly affect safety during a given recovery period and it would be corrected before the next one.
		i) Component malfunction on 1A24 PCB causing misinterpretation of conditioned ramp data,										
		ii) Component malfunction on 1A20 PCB causing incorrect signal conditioning of input DC stimulus										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
3.0	(cont'd) b)	ii) (varying DC voltage) from ship's trim/harmonization computer. iii) Loss of critical voltages to 1A24 and 1A19 from Auxiliary Electronics Box (Unit 2) and 1A4.										

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NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
4.0	Glidepath and Line-Up Imaging on Heads-Up-Display (HUD). The glide-slope line-up information is presented by the location of an electronically generated aircraft symbol relative to a vertical line-up reference datum and a horizontal glidepath referenced datum. A choice of two scale factors is available, 30 feet per division (ft/div) and 10 feet per division. To indicate to the observer that the 30 ft/div is in use, the aircraft is represented as a small circle. Wings and a tail are added when the 10 ft/div scale factor is in use. The selection is made with a three-position rotary switch on the HUD illumination panel. The third position is an automatic (Auto) mode and produces a scale factor of 30 ft/div for the aircraft symbol when the aircraft is more than one nautical mile away, and a symbol scale factor of 10 ft/div when the aircraft is less than one mile away. For the 30 ft/div scale factor, the displacement of the aircraft symbol is electronically limited so that the symbol will remain in view no matter how far the aircraft is from the desired glide slope. With the 10 ft/div scale factor, the symbol can be driven completely out of view. The displacement of the electronically generated aircraft symbol is determined by analog DC signals from the SPN-42 radar.											
		a) No aircraft symbol	-	-	-	-	-	-	X	III	D	Recognizing this defect at his console, the LSO can employ the PLAT centerline monitor as an alternative line up and glide path indicator.
		i) Loss of image generator printed circuit board 1A24 output,										
		ii) Loss of HUD CRT subsystem,										
		iii) Loss of input stimulus to 1A24 from console connector J8 (Signal) due to signal breakdown in cable W227										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

NAEC-91-7958

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON:						FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			PERSONNEL		SYSTEM		MISSION					
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
4.0	(cont'd)	iii) and/or Signal Junction Box (Unit 4A1), iv) Loss of internal console circuitry paths from J8 to 1A24 caused by open pin crimp/ broken wire, high resistance pin connection in connectors 1A12J1 (power) or 1A12J3 (signal) or interconnection within card case back-plane 1A12, v) Loss of DC power supply input voltages to 1A24 (HUD Display										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
4.0	(cont'd) a)	v) Board) and HUD CRT subsystems provided by Auxiliary Electronics Box (Unit 2) through console connector J4 (DC power), assembly 1A4 (Regulator Board Assembly), and the 115 VA-C input ("AC ON"),										
		b) Incorrect position of aircraft symbol with respect to datum lines or incorrect scale factors	-	-	-	-	-	-	x	III	E	By experience, the LSO can visually detect the manfunction, and at a glance, it can then be checked against the PLAT centerline monitor.
		i) Component malfunction on 1A24 PCB causing misinterpretation of conditioned range data,										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
4.0	(cont'd) b)	ii) Component malfunction on 1A20 PCB causing incorrect signal conditioning of input DC stimulus (varying DC voltage) from SPN-42 radar. iii) Loss of critical voltages to 1A24 and 1A20 from Auxiliary Electronics Box (Unit 2) and 1A4.										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

NAEC-91-7958

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
5.0	The Heads-Up-Display Reticle Scale Projection Lamp Circuitry - Refer to Figure 3. The reticle scale projection lamp is mounted on the back-plate assembly (1A26-Dwg.620361) and provides the backlighting for the HUD combiner reticle scales (ramp motion/trim, descent, line-up datum, glide slope datum). The reticle scale illumination is obtained by passing the light from a 50-watt, 12.6 volt AC lamp through a heat deflector, a heat absorber, a diffuser and a green filter. This produces a green scale display of approximately 520 nano-meters. The pointer display is green; the CRT phosphor is green. The two light sources in the green region are not of the same wave-length so that the pointers and scale lines are not confused. The intensity of the CRT pointer is controlled by a variable autotransformer (T1) whose control is located on the console control panel 1A17.										
		a) Low, intermittent, or loss of HUD combiner reticle scale lighting.	-	-	-	-	-	-	X	III	D	The likelihood of a projection lamp failure is extremely remote, because as a routine preventative maintenance measure, it will be replaced before the end of its rated life. If the attendant circuitry would fault, the LSO would have to depend upon the indicators on the console itself. Coincident failure of the Heads-Up-Display and the Console is extremely improbable.
		i) Loss of A-C input to common 115 VAC power connection 1TB2,										
		ii) Shorted or open "Scale On/Off" control switch 1A17S3,										
		iii) Shorted or open winding in variac T1 resulting in a random level of proj. lamp intensity & possible information										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.7 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL: LIVES	EFFECT ON: PERSONNEL: INJURY	EFFECT ON: SYSTEM: LOSS	EFFECT ON: SYSTEM: DAMAGE	EFFECT ON: MISSION: LOSS	EFFECT ON: MISSION: POTENTIAL LOSS	FAILURE - HAZARD: DETECTABLE BY OPERATOR?	FAILURE - HAZARD: CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD: PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
5.0	(cont'd)	'washout', iv) Open isolation diodes, (no unblanking control) open relay coil or frozen contacts in K1 located on the HUD Projection Lamp Board 1A13A1 (Dwg. 518667) or its terminal strip 1A13TB1 causing low A-C input to transformer 1AT1, v) Shorted or open winding in transformer 1AT1 (12.6 VAC), vi) Open or loose connection on terminal board 1TB1 linking 1TB1 and the HUD projection lamp,										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

NAEC-91-7958

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
5.0	(cont'd) a)	vii) Open HUD projection lamp (dwg. 519043),										
		viii) Shorted or inoperative HUD ntensity control switch 1A17S4 locking manual unblanking function associated with 'Set' or 'Test' to be constantly on.										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

NAEC-91-7958

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
6.0	Console Range Indicator - Refer to Figure 4. The console Range Scale is below the PLAT display. It operates when the aircraft is six nautical miles or less from the touchdown point. Its pointer will remain at 6 miles when the range is 6 miles or greater. The scale has a resolution of 0.2 nautical mile. Range signals are provided by the SPN-42 radar and are fed to the HUD console as varying DC stimulus via cable W227 to connector J8. The range PCB is located in the console card cage.											
		a) No indication	-	-	-	-	-	-	x	III	D	When failures occur that affect loss of only the console display of range information, the LSO will use the redundant indication on the HUD. When a failure occurs that disables both displays, the LSO will depend on his visual contact with the aircraft and his experience to judge the range of the aircraft. This failure mode would, therefore, cause no problem during a given recovery period and it would be corrected before the next one.
		i) Loss of input *stimulus to* 1A20 from console connector J8 (Signal) due to signal breakdown in cable W227 or Signal Junction Box -Unit 4A1,										
		ii) Loss of Range & Ramp Motion Signal Conditioning circuit board 1A20 output,										
		iii) Loss of DC power supply input voltages to 1A4 and 1A20 through console connector J4 (DC Power)										

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NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
6.0	(cont'd) a)	iii) provided by Auxiliary Electronics Box and the supplementary DC voltages generated by 1A4, iv) Loss of a complete segment of redundant incandescent lamps within 1A9 indicator assembly, v) Loss of circuit path between 1A9 indicator assembly and card cage back-plane 1A12, vi) Loss of pointer and scale intensity caused by failure (short or high resistance open) within indicator on/off										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	PERSONNEL INJURY	SYSTEM LOSS	SYSTEM DAMAGE	MISSION LOSS	MISSION POTENTIAL LOSS	FAILURE - HAZARD DETECTABLE BY OPERATOR?	FAILURE - HAZARD CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
6.0		switch 1A17S15 and/or indicator intensity potentiometer 1A17R11.										
		b) Single unchanging indication, nonlinear response, or premature limiting less than full-scale.	-	-	-	-	-	-	x	III	E	This failure mode is detectable by the LSO when large incremental errors develop. Small errors are of little consequence to the LSO because of his visual contact with the aircraft in the approach. Small errors will ultimately be detected through periodic calibrations and corrected with an appropriate maintenance action. If only the HUD display is affected in this failure mode, the LSO will use the console display.
		i) Component failure within population of 1A20 signal conditioning board causing geometric non-linearity of load isolation amplifiers and/or loss of the analog-to-digital (A/D) conversion										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

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ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
6.0	(cont'd) b)	i) which drives the 1A9 indicator assembly.										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL: LIVES	EFFECT ON: PERSONNEL: INJURY	EFFECT ON: SYSTEM: LOSS	EFFECT ON: SYSTEM: DAMAGE	EFFECT ON: MISSION: LOSS	EFFECT ON: MISSION: POTENTIAL LOSS	FAILURE - HAZARD: DETECTABLE BY OPERATOR?	FAILURE - HAZARD: CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD: PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
7.0	Console Rate-Of-Descent Indicator - Indicator displays the Rate Of Descent (sink rate) of the incoming aircraft as it approaches the CV on its glide-slope path to its final touch-down point. The scale covers a range of zero to a maximum of 1912 feet per minute with a resolution of 50 feet per minute. If the rate of descent is greater than 1912 feet per minute, it will continue to read this value. A trend lamp adjacent to the main pointer and of lesser intensity is used to indicate the direction of change for rate of descent. If the trend lamp is a higher number, the rate of descent is decreasing; and if it is a lower number, the rate is increasing. The ROD indicator input is generated by the SPN-42 radar ACLS system which provides varying analog stimulus of 0-10 VDC corresponding to 0-2000 feet per minute descent rates. Refer to Figure 5.	a) No indication	-	-	-	-	-	-	x	III	D	When failures occur that affect loss of only the console display of rate of descent information, the LSO will use the redundant indication on the HUD. When a failure occurs that disables both displays, the LSO will depend on his visual contact with the aircraft ROD. This failure mode would, therefore, not significantly affect safety during a given recovery period and it would be corrected before the next one.
		i) Loss of input stimulus to 1A19 from console connector J8 (signal) due to signal breakdown in cable W227 or Signal Junction Box Unit 4A1,										
		ii) Loss of ROD signal conditioning circuit board 1A19 output,										
		iii) Loss of DC power supply input voltages to 1A4 and 1A19 through console connector J4										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

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TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
7.0	(cont'd) a)	iii) (DC power) provided by Auxiliary Electronics Box and the supplementary DC voltages generated by 1A4, iv) Loss of a complete segment of redundant incandescent lamps within 1A7 indicator assembly, v) Loss of circuit path between 1A7 indicator assembly and card cage back-plane 1A12, vi) Loss of pointer and scale intensity caused by failure (short or high resistance open) within										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	EFFECT ON: PERSONNEL INJURY	EFFECT ON: SYSTEM LOSS	EFFECT ON: SYSTEM DAMAGE	EFFECT ON: MISSION LOSS	EFFECT ON: MISSION POTENTIAL LOSS	FAILURE - HAZARD: DETECTABLE BY OPERATOR?	FAILURE - HAZARD: CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD: PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
7.0	(cont'd) a)	vi) Indicator on/off switch 1A17S12 and/or indicator intensity potentiometer 1A17R9.										
		b) No trend indication	-	-	-	-	-	-	X	III	E	A malfunction of this variety is extremely unlikely. If it would occur, the sense of direction for changing data would not be as evident, but identifiable by noting the directional movement of primary pointer lamp.
		i) Component failure within the population of the 1A23 conditioning board in the comparator and latch circuitry where periodically stored A/D data is compared with current A/D data for the display of the sense of direction for changing data.										
		c) Single unchanging indication, non-linear response, or premature	-	-	-	-	-	-	X	III	E	This failure mode is detectable by the LSO when large incremental errors develop. Small errors are of little consequence to the LSO because of his visual contact with

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

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TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
7.0	(cont'd) c)	limiting less than full-scale. 1) Component failure within population of 1A19 signal conditioning board causing loss of analog-to-digital (A/D) conversion and/or loss of the decoder/multiplexers output to the console lamp power driver.										the aircraft in the approach. Small errors will ultimately be detected through periodic calibrations and corrected with an appropriate maintenance action. If only the HUD display is affected in this failure mode, the LSO will use the console display.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
8.0	Console Ramp Motion/Trim Indicator - Refer to Figure 6. The Ramp Motion Scale is the vertical scale to the left of the PLAT display. The input information source is the ship's Harmonization Computer (SPHC) instead of the SPN-42 radar. It indicates ramp motion plus ship's trim in the normal operating mode. A momentary toggle switch on the control panel is used to select ship's trim as a separate display on the Ramp Scale. A Trim lamp below the scale comes on when ship's trim is being selected for display. The scale is a zero center display with a range of +20 feet of high ramp to -19 feet of low ramp. The area between +10 feet and +20 feet is covered by a red filter to produce a red pointer indication. This is the danger area and warns the LSO of a possible ramp strike. The ramp pointer remains at full scale when the ramp motion exceeds the +20 or -19 feet extremes.											
		a) No indication	x	-	x	-	x	-	x	III	D	When failures occur that affect only the console display of ramp motion/trim information, the LSO will use the HUD display. When a failure occurs that disables both displays, the LSO will depend on the hook to ramp alarm in an auxiliary instrument facility (base console) in the LSO work station. A red light is illuminated for a ramp condition causing a 7 to 3 ft. hook to ramp clearance and an audible alarm sounds when the clearance is less than 3 ft. This failure mode would, therefore, not significantly affect safety during a given recovery period and it would be corrected before the next one.
		i) Loss of input stimulus to 1A20 from console connector J8 (Signal) due to signal breakdown in cable W227 or Signal Junction Box Unit 4A1,										
		ii) Loss of ramp & ramp motion signal conditioning circuit board 1A20 output,										
		iii) Loss of DC power supply input voltages to 1A4 and 1A20 through console,										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

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ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
8.0	(cont'd) a)	iii) connector J4 (DC power) provided by Auxiliary Electronics Box and the supplementary DC voltages generated by 1A4, iv) Loss of a complete segment of redundant incandescent lamps within 1A10 indicator assembly, v) Loss of circuit path between 1A10 indicator assembly and card cage back-plane 1A12, vi) Loss of pointer and scale intensity caused by failure (short or high										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL: LIVES	EFFECT ON: PERSONNEL: INJURY	EFFECT ON: SYSTEM: LOSS	EFFECT ON: SYSTEM: DAMAGE	EFFECT ON: MISSION: LOSS	EFFECT ON: MISSION: POTENTIAL LOSS	FAILURE - HAZARD: DETECTABLE BY OPERATOR?	FAILURE - HAZARD: CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD: PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
8.0	(cont'd) a)	vi) resistance open) within indicator on/off switch 1A17S14 and/or indicator intensity potentiometer 1A17R10.										
		vii) No trim selection due to shorted or open control switch 1A17S13.										
		b) Single unchanging indication, non-linear response or premature limiting less than full-scale.	x	-	x	-	x	-	x	III	E	A malfunction of this variety is extremely unlikely. If it would occur, the LSO would depend on the auxiliary provisions described in item (a) above.
		i) Component failure within population of 1A20 signal conditioning board causing geometric non-linearity of load isolation amplifiers										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

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TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
8.0	(cont'd) b)	i) and/or loss of the analog-to-digital (A/D) conversion which drives the 1A10 indicator assembly.										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

NAEC-91-7958

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL: LIVES	EFFECT ON: PERSONNEL: INJURY	EFFECT ON: SYSTEM: LOSS	EFFECT ON: SYSTEM: DAMAGE	EFFECT ON: MISSION: LOSS	EFFECT ON: MISSION: POTENTIAL LOSS	FAILURE - HAZARD: DETECTABLE BY OPERATOR?	FAILURE - HAZARD: CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD: PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
9.0	Console Airspeed Indicator - Refer to Figure 7. The airspeed scale, located above the pointer light over a range of from 80 to 180 knots (0 to 100 point(s). Its pointer will less than or equal to 80, and will read 180 knots whenever the correct value is equal to or greater than 180. a trend light of lesser intensity adjacent to the main pointer to indicate either increasing or decreasing airspeed. The scale incorporates is increasing, the trend lamp is one knot less and with decreasing airspeed, the trend lamp is one knot greater. Either true airspeed (TAS) or closing airspeed (CLSG) may be chosen for presentation. The selection is made by the TAS/CLSG toggle switch located near the middle and at the bottom of the control panel. The choice thus made is shown by the letters *TAS or CLSG* appearing at the right-hand end of the Airspeed scale. In addition, either the ship's SPN-42 ACLS radar or its SPN-44 radar can be selected as the source of the airspeed signal. The selection is made by the SPN-42 or SPN-44 toggle switch adjacent to the TAS/CLSG switch. The choice thus made is indicated at the right-hand end of the Airspeed scale by the presence of the number, 42 or the number, 44. The SPN-42 airspeed signal is a varying DC stimulus voltage. The SPN-44 is a synchro output. A synchro-to-analog converter is used to convert its output to analog voltage of the *same range* as the SPN-42.	a) No indication i) Loss of input stimulus 1A20 from console connector J7 (Synchro) due to signal breakdown in cable W226 or Synchro Junction Box Unit 4A2, ii) Loss of circuitry paths between 1A22 (synchro-to-analog converter ckt. board), 1A23 (airspeed signal con-	-	-	-	-	-	-	x	III	D	A malfunction of this variety is remote. However, if it should occur, the LSO will depend on visual contact with the aircraft or its angle of attack lights, the sound of the aircraft's engines (power state) to judge approach speed.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

(1)	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION) (2)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM) (3)	EFFECT ON: PERSONNEL LIVES (4)	PERSONNEL INJURY (5)	SYSTEM LOSS (6)	SYSTEM DAMAGE (7)	MISSION LOSS (8)	MISSION POTENTIAL LOSS (9)	FAILURE - HAZARD DETECTABLE BY OPERATOR? (10)	CLASSIFICATION (HAZARD LEVEL) (11)	PROBABILITY OF OCCURRENCE (12)	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS) (13)
	(cont'd) a)	ii) ditioning ckt board), and 1A2 (console airspeed indicator) interconnected via card cage backplane 1A12,										
		iii) Loss of pointer and scale intensity caused by failure (short or high resistance open) within indicator on/off switch 1A17S11 and/or indicator intensity potentiometer 1A17R7,										
		iv) Loss of DC power supply input voltages to 1A2, 1A4, 1A22 and 1A23 through console connector J4 (DC power)										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.3 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.4 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
9.0	(cont'd) a)	iv) provided by Auxiliary Electronics Box and the supplementary DC voltages generated by 1A4, v) Loss of a complete segment of redundant incandescent lamps within 1A2 indicator assembly, vi) Loss of air-speed select (TAS/CLSG) or radar select (SPN 42/44) indication due to failure of redundant incandescent indicator lamps resident on air-speed indicator lamp board (Dwg. 5[illegible]0633) portion of 1A2 indicator assy.										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

NAEC-91-7958

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
9.0	(cont'd)	b) No trend indication i) Component failure within the population of the 1A23 signal conditioning board in the comparator and latch circuitry where periodically stored A/D output data is compared with current A/D data for the display of sense of direction for changing data.	-	-	-	-	-	-	x	III	E	A malfunction of this variety is extremely unlikely. If it would occur, the sense of direction for changing data would not be as evident, but identifiable by noting the directional movement of the main pointer lamp.
		c) Single unchanging indication, nonlinear response or premature limiting less than full scale. i) Component failure within population of	-	-	-	-	-	-	x	III	E	A malfunction of this variety is extremely unlikely and detectable by the LSO under periodic calibrations which will lead to an appropriate maintenance action. Recognizing the problem, the LSO will depend more fully on the alternate described in item 9(a) above.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL: LIVES	EFFECT ON: PERSONNEL: INJURY	EFFECT ON: SYSTEM: LOSS	EFFECT ON: SYSTEM: DAMAGE	EFFECT ON: MISSION: LOSS	EFFECT ON: MISSION: POTENTIAL LOSS	FAILURE - HAZARD: DETECTABLE BY OPERATOR?	FAILURE - HAZARD: CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD: PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
9.0	(cont'd) c)	i) 1A23 signal conditioning board causing geometric non-linearity of load isolation amplifiers and/or loss of the analog-to-digital (A/D) conversion which drives the 1A2 indicator assembly.										
		d) Non-select of true airspeed (TAS) or closing airspeed (CLSG).	-	-	-	-	-	-	x	IV	E	The ability to alternate between TAS and CLSG is supplemental to the LSO.
		i) Inoperative control switch 1A17S9 due to internal short, high resistance open, or mechanical fatigue of toggle stem.										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON:						FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			PERSONNEL		SYSTEM		MISSION		DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
9.0	(cont'd)	e) Non-select of radar systems (SPN 42/44) 1) Inoperative control switch 1A17S10 due to internal short, high resistance open, or mechanical fatigue of toggle stem.	-	-	-	-	-	-	x	IV	E	Inability to select a functional radar system, if the alternate faults, would not preclude the measurement of actual TAS/CLSG.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

NAEC-91-7958

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
10.0	Console Deck Status and FLOLS Wave-Off Status Indicator - Refer to Figure 8. Three deck status indicators are located on the left of the Airspeed Scale. A green light indicates the deck is open (clear) and ready to land aircraft. An adjacent red light indicates a closed (fouled) deck and any approaching aircraft must not land. With a fouled deck, any aircraft is given a wave-off. The LSO initiates a Fresnel Lens Optical Landing System Wave-Off (FLOLS wave-off) with a "pickle switch." The wave-off is indicated by the red flashing lamps below the open and closed deck lamps. The rate is approximately 90 flashes per minute.											
		a) No indication of deck status.	-	-	-	-	-	-	-	III	C	This indicator is extremely important during landing operations involving the condition of the deck. Without accurate information, the LSO can err by allowing an incoming aircraft to land on an obstructed flight deck. The clear deck/foul deck indicators are repeaters of a deck status system display located aft of the LSO platform. If there is no indication on the display console, the LSO will depend on the aft display.
		i) Loss of deck status input stimulus to 1A3A1 (Dwg. 518599) deck status/LSO wave-off ckt. card ass'y due to signal breakdown in cable W222 from Auxiliary Electronics Box (Unit 2) and/or cable W231 from Synchro Junction Box (Unit 4A2) to Unit 2,										
		ii) Loss of 1A3A1 (dwg. 518599) deck status/LSO wave-off circuit assembly lamp drive caused by component										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

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ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
10.0	(cont'd) a)	ii) breakdown in assembly, iii) Loss of DC input voltage (+12v) to 1A3 from 1A4, iv) Loss of indication due to failure of redundant indicator lamps resident in the deck status lamp assembly (1A3A2), v) Wiper lift-off in intensity control potentiometer 1A17R5										
		b) No indication of LSO wave-off. i) Loss of wave-off signal input to 1A3A1 from console connector J2 (A/C Designation) due to signal breakdown in	-	-	-	-	-	-	x	III	D	This indicator is the only display indicator, by which the LSO can verify that his "pickle switch" has initiated the Fresnel Lens Optical Landing System (FLOLS) wave-off to signal the pilot on the glide-slope landing approach not to land. FLOLS Wave-Off Monitor Assembly, located aft of the LSO platform, offers a redundant indication that wave-off has been initiated.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
10.0	(cont'd) b)	i) cable W221 and/or Signal Junction Box (Unit 4A1), ii) Loss of 1A3A1 (dwg. 510599) deck status/ LSO wave-off circuit assembly lamp drive cause by component breakdown in assembly, iii) Loss of DC input voltage (+12v) to 1A3 from 1A4, iv) Loss of indication due to failure of redundant indicator lamps resident in the deck status lamp assembly (1A3A2)										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	PERSONNEL INJURY	SYSTEM LOSS	SYSTEM DAMAGE	MISSION LOSS	MISSION POTENTIAL LOSS	FAILURE - HAZARD DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
11.0	Console Wind Direction Indicator - angle in degrees is indicated by three alpha-numeric characters above the ACLS Status displays. The angle is relative to the centerline of the angled landing deck which is 10.5 degrees to port of the ship's centerline. Therefore, wind down the centerline of the ship would be indicated on the Console as an S 10.5° wind. Seven-segment, incandescent indicators are also used for these alpha-numeric characters. Approximately 50° can be displayed by the wind angle indicators in either the port or starboard direction. Normal landing operations are conducted with the wind within 10° of the centerline touch-down-point.	Refer to Figure 9. The wind direction, either port (P) or starboard (S), and the magnitude of the										
		a) No indication	-	-	-	-	-	-	x	III	D	Wind direction across the carrier deck is important and critical for the recovery of aircraft. Once the malfunction is evident to the LSO, he will alert Primary Flight who will communicate wind direction information taken from a PRI-FLY indicator.
		i) Loss of input synchro information from console connector J7 (Synchro) due to signal breakdown in cable W226 and/or Synchro Junction Box (Unit 4A2),										
		ii) Loss of internal console circuitry paths between J7, 1A21 (synchro-to-analog ckt. board), and 1A6A2 interconnected via card cage back-plane 1A12,										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

NAEC-91-7958

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
11.0	(cont'd) a)	iii) Loss of DC power supply input voltages to 1A4, 1A6A2, and 1A21 through console connector J4 (DC power) provided by Auxiliary Electronics Box and the supplementary DC voltages generated by 1A4, iv) Loss of Light-emitting-Diode (LED) segments of 7-segment indicators in assembly 1A6A5, v) Component failure within the population of the 1A21 synchro-to-analog Ckt. board, 1A6A2 wind velocity, wind direction										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

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ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	PERSONNEL INJURY	SYSTEM LOSS	SYSTEM DAMAGE	MISSION LOSS	MISSION POTENTIAL LOSS	FAILURE - HAZARD DETECTABLE BY OPERATOR?	FAILURE - HAZARD CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
11.0	(cont'd) a)	ckt. board, or 1A6A5 - the 3-digit wind direction indicator assembly,										
		vi) Loss of intensity caused by wiper lift-off in intensity control potentiometer 1A17R6 or open in control switch 1A17S8,										
		vii) Loss of DC input voltage (+5) to 1A6A2 from 1A4.										
		b) Single unchanging indication, non-linear response, or premature limiting less than full-scale.	-	-	-	-	-	-	x	III	E	A malfunction of this variety is extremely unlikely. If it would occur, the LSO would notify Primary Flight of his problem; and they would communicate information to the LSO. PRI-FLY monitors wind-over-deck on a routine basis and would ascertain an unsafe condition that went undetected by the LSO.
		i) Component failure within populations of 1A21 and 1A6A2 causing the synchro-										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL: LIVES	PERSONNEL: INJURY	SYSTEM: LOSS	SYSTEM: DAMAGE	MISSION: LOSS	MISSION: POTENTIAL LOSS	FAILURE - HAZARD: DETECTABLE BY OPERATOR?	FAILURE - HAZARD: CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD: PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
11.0	(cont'd) b)	i) to-analog output to skew the 10.5 to port of the center line of the carrier reference compensation (synchro rotation) for the angled landing deck and/or magnitude buffer amplifier non-linearity in the wind angle magnitude display,										
		ii) Component failure within population of 1A6A5 causing seven segment indicator drives to improperly decode BCD input information or failure to unlatch from previous state,										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

NAEC-91-7958

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
11.0	(cont'd) b)	iii) Failure of test lamp switch 1A17S7 in the closed position causing all seven segment indicator elements to illuminate (resulting output indication will be all 8's).										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	PERSONNEL INJURY	SYSTEM LOSS	SYSTEM DAMAGE	MISSION LOSS	MISSION POTENTIAL LOSS	FAILURE - HAZARD DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
12.0	Console Wind Speed Indicator - Refer to Figure 9. The two numeric characters below the wind angle indicators display the wind speed. These are capable of 0 to 99 knots indication. The characters are the same type as in the wind angle display. Normal operations are 30 knots of wind speed at the proper angle down the recovery deck.											
		a) No indication	-	-	-	-	-	-	x	III	D	Wind speed across the carrier deck is important and critical for the recovery of aircraft. Once the malfunction is evident to the LSO, he will alert Primary Flight who will communicate information to the LSO.
		i) Loss of input synchro information from console connector J7 (Synchro) due to signal breakdown in cable W226 and/or Synchro Junction Box (Unit 4A2),										
		ii) Loss of internal console circuitry paths between J7, 1A21 (synchro to-analog ckt board), and 1A6A2 interconnected via card cage back-plane 1A12,										
		iii) Loss of DC power supply input vol-										

Hazard Lev. I, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

NAEC-91-7958

AD-A083 720 KETRON INC WAYNE PA F/G 5/8
HAZARDS/FAILURE MODES AND EFFECTS ANALYSIS MK 1 MOD 0 LSO-HUD C--ETC(U)
MAR 80 F SEVCIK, G S FARBER, W S MANN N68335-78-C-2002
UNCLASSIFIED KTM-1327-01 NAEC-91-7958 NL

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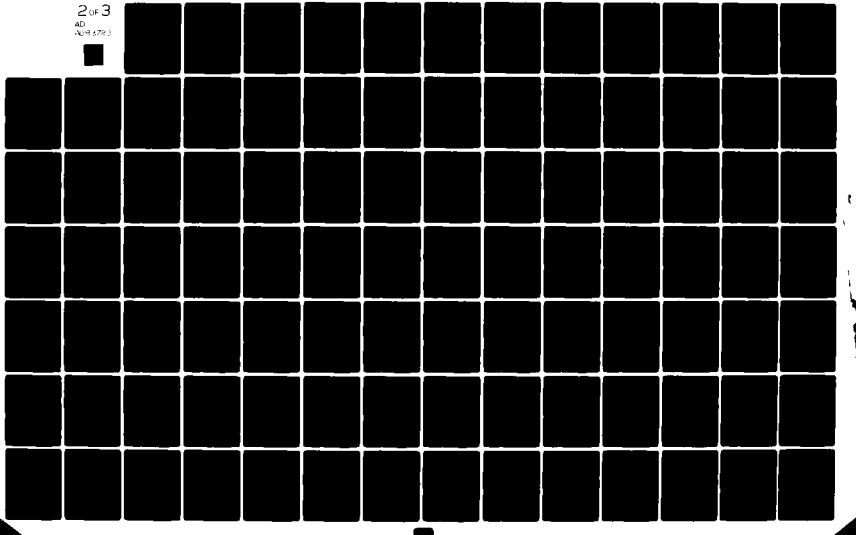

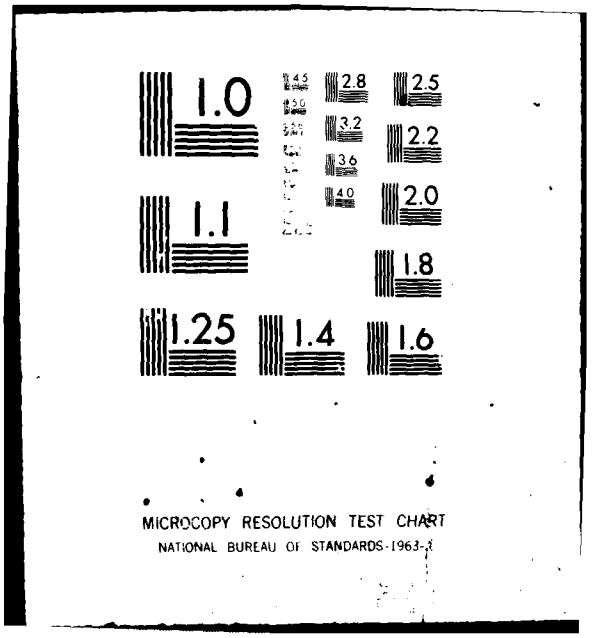
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1.1
1.25
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4.0
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL: LIVES	EFFECT ON: PERSONNEL: INJURY	EFFECT ON: SYSTEM: LOSS	EFFECT ON: SYSTEM: DAMAGE	EFFECT ON: MISSION: LOSS	EFFECT ON: MISSION: POTENTIAL LOSS	FAILURE - HAZARD: DETECTABLE BY OPERATOR?	FAILURE - HAZARD: CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD: PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
12.0	(cont'd) a)	iii) tages to 1A4 and 1A6A2, and 1A21 through console connector J4 (DC power) provided by Auxiliary Electronics Box and the supplementary DC voltages generated by 1A4, iv) Loss of Light-Emitting-Diode (LED) segments of seven segment indicators in assembly 1A6A5, v) Component failure within the population of the 1A21 synchro-to-analog ckt. board, 1A6A2 wind velocity/wind direction ckt. board,										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

NAEC-91-7958

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES, SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
12.0	(cont'd) a)	v) or 1A6A6 - the 2-digit wind speed indicator assembly,										
		vi) Loss of intensity caused by wiper lift-off in intensity control potentiometer 1A17R6 or open in control switch 1A17S8,										
		vii) Loss of DC input voltage (+5) to 1A6A2 from 1A4										
		b) Single unchanging indication, nonlinear response or premature limiting less than full-scale.	-	-	-	-	-	-	x	III	E	A malfunction of this variety is extremely unlikely. If it would occur, the LSO would notify Primary Flight of his problem; they would communicate information to the LSO. Any unsafe condition would be ascertainable by PRI-FLY in their monitoring of wind-over-deck conditions.
		i) Component failure within the populations of 1A21 and										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
12.0	(cont'd) b)	i) 1A6A6 causing the synchro-to-analog output to improperly drive the leveling operational amplifier, subsequent A/D converters, and seven segment numeric indicator BCD decoders, ii) Failure of test lamp switch 1A17S1 in the closed position causing all seven segment indicator elements to illuminate (resulting output indication will be all 8's).										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.1 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	EFFECT ON: PERSONNEL INJURY	EFFECT ON: SYSTEM LOSS	EFFECT ON: SYSTEM DAMAGE	EFFECT ON: MISSION LOSS	EFFECT ON: MISSION POTENTIAL LOSS	FAILURE - HAZARD: DETECTABLE BY OPERATOR?	FAILURE - HAZARD: CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD: PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
13.0	Console Aircraft Designator Indication - Refer to Figure 9. The aircraft type that is being recovered on each landing is indicated by one alpha and one numeric character. These characters are displayed between the Rate of Descent scale and the Intercom station just below the ACLS status indicators. This display is set up by signals from Primary Flight and is used for verification between the recovery set-up and the aircraft in the glide-slope path to be recovered. Seven-segment, incandescent lamp indicators are used for the alpha-numeric aircraft type characters.											
		a) No indication	-	-	-	-	-	-	x	IV	D	If this information is lost, the LSO can be informed by PRI-FLY via the ship's intercommunication system.
		i) Loss of DC stimulus from console connector J2 (Aircraft Type Desig.) caused by signal breakdown in cable W221 and/or Signal Junction Box (Unit 4A1),										
		ii) Loss of internal console circuitry path between J2 and 1A6A1,										
		iii) Loss of DC input supply (0-5v) to 1A6A1 from 1A4,										
		iv) Loss of DC power supply										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

NAEC-91-7958

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
13.0	(cont'd) a)	iv) input voltage to 1A6A1 through console connector J4 (DC Power),										
		v) Loss of Light-Emitting-Diode (LED) segments of seven segment indicators in assembly 1A6A4,										
		vi) Component failure within the population of 1A6A1 - the ACLS indicator/aircraft type designator circuit board and 1A6A4 - the aircraft type designator indicator assembly,										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

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ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	EFFECT ON: PERSONNEL INJURY	EFFECT ON: SYSTEM LOSS	EFFECT ON: SYSTEM DAMAGE	EFFECT ON: MISSION LOSS	EFFECT ON: MISSION POTENTIAL LOSS	FAILURE - HAZARD: DETECTABLE BY OPERATOR?	FAILURE - HAZARD: CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD: PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
13.0	(cont'd) a)	vii) Loss of intensity caused by wiper lift-off in intensity control potentiometer 1A17R6 or open in control switch 1A17S8.										
	b)	Single unchanging, partial, or erroneous indication.	-	-	-	-	-	-	x	IV	E	Recognizing the malfunction, the LSO will have to depend on solution above.
		i) Component failure within 1A6A4 indicator assembly causing BCD decoder/ drivers to synthesize alphanumeric aircraft type in error,										
		ii) Failure of test lamp switch 1A17S7 in the closed position causing all seven										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

NAEC-91-7958

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
13.0	(cont'd) b)	segment indicator elements to illuminate (resulting output indication will be all 8's).										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL: LIVES	PERSONNEL: INJURY	SYSTEM: LOSS	SYSTEM: DAMAGE	MISSION: LOSS	MISSION: POTENTIAL LOSS	FAILURE - HAZARD: DETECTABLE BY OPERATOR?	FAILURE - HAZARD: CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD: PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
14.0	Console ACLS Status Indicator - Refer to Figure 9. The operating status of the Automatic Carrier Landing System (ACLS) is indicated just above the aircraft type by backlighted indicators. The ACLS system indicates a Lock-On and three modes of operation. Mode I is a full ACLS landing. Mode II is an instrument landing approach and Mode III is a "talk down" landing. The mode indicators are below the Lock-On light. The ACLS system generates a wave-off when data obtained from the computer and radar system or aircraft response to the landing instructions are questionable. The ACLS wave-off signal is displayed as a blue flashing light below the Mode lamps. The flash rate of this wave-off is approximately 180 per minute.											
		a) No indication	-	-	-	-	-	-	x	IV	D	If this information is lost, the LSO can be informed via the ship's intercommunication system. Regardless of LSO action, the abort of an aircraft not adhering to flight path is automatic.
		i) Loss of DC stimulus from console connector J2 (Aircraft Type Desig.) caused by signal breakdown in cable W221 and/or Signal Junction Box (Unit 4A1),										
		ii) Loss of internal console circuitry path between J2 and 1A6A1,										
		iii) Loss of DC input voltage (+12v) to 1A6A1 from 1A4,										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

NAEC-91-7958

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
14.0	(cont'd) a)	iv) Loss of redundant incandescent lamps (Lock-On, Mode I-II-III, Wave Off) in indicator assembly 1A6A3,										
		v) Component failure within the population of 1A6A1 causing loss of lamp drive to lock-on and mode indicators and/or an inoperative wave-off flashing multivibrator enable,										
		vi) Loss of intensity caused by wiper lift-off in intensity control potentiometer 1A17R4 or open in control switch 1A17S6.										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	PERSONNEL INJURY	SYSTEM LOSS	SYSTEM DAMAGE	MISSION LOSS	MISSION POTENTIAL LOSS	FAILURE - HAZARD DETECTABLE BY OPERATOR?	FAILURE - HAZARD CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
15.0	Console PLAT Centerline Camera Monitor - Refer to Figure 10. At the center of the left side of the display panel is the Pilot Landing Air Television monitor (PLAT), which connects to the ship's common centerline television camera that monitors the glide-slope approach of the landing aircraft. The picture tube and circuit chassis were separated in order to physically locate them in the available space of the console. Remote controls were brought out to a PLAT control panel located at the extreme right of the Console control panel and includes an on-off switch, contrast, brightness, horizontal hold and vertical hold controls. A parallel power on/off switch, together with a rotary switch located on the chassis and designated 1A1S4 permit the selection of either internal or remote operation. The two hold controls are screwdriver adjustments on the original chassis. They are included on the console panel in addition to the normal chassis controls of brightness and contrast for the operator's use. The arrangement for remote operation permits the monitor to be removed and switched back to normal internal controls for testing and servicing.	a) No raster (no image).	-	-	-	-	-	-	x	IV	D	This is an aircraft line-up and redundant glidepath indicator to the LSO, and a back-up to the HUD display indicator. This failure mode would, therefore, cause no problem during the actual mission of the CV landings, and it would be corrected before the next one.
		i) Loss of center-line camera video input to console connector J5 (Video In) caused by discontinuity in cable W224.										
		ii) Loss of primary A-C power input to chassis (power supply) assembly 1A1 caused by breakdown in cable W222 linking the Auxiliary Electronics Box (Unit 2) with										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

HAEC-91-7958

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
15.0	(cont'd) a)	ii) the console via console connector J3 (AC Power), iii) Loss of A-C power to video monitor chassis 1A1 caused by intermittent service (local/remote) operation switch 1A1S4 or control panel switch 1A17 1A17S17, iv) Loss of screen intensity caused by lifted wiper arm or high resistance open in the element of control panel potentiometer 1A17R15, v) Component breakdown within the populations										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	PERSONNEL INJURY	SYSTEM LOSS	SYSTEM DAMAGE	MISSION LOSS	MISSION POTENTIAL LOSS	FAILURE - HAZARD DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
15.0	(cont'd) a)	v) of the video monitor chassis 1A1 and/or CRT/ Yoke assembly 1A8 causing loss of video drive to CRT, loss of high voltage to CRT anode, or weak deflection current to yoke.										
		b) Airborne splintered glass.	-	x	-	x	-	-	-	II	B	• It is recommended that the CRT and Yoke be enclosed by a protective cover if the only removal path is through the console front. The cover should be secured to the CRT envelope and provide access for the removal of the high voltage lead and connections to the CRT and yoke.
		i) The PLAT CRT and yoke assembly (1A8) must be removed from the console front after the plastic faceplate and its restraining bezel are removed. The unprotected CRT neck can be dealt a glancing blow causing the tube to										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

HAEC-91-7958

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
15.0	(cont'd) b)	i) implode causing immediate injury to the maintenance personnel.										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

MAEC-91-7958

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
16.0	Console MOVLAS Repeater - Refer to Figure 11. A MOVLAS repeater is incorporated on the left side of the LSO Console. The Manual Operated Visual Landing Aid System (MOVLAS) is used when the Fresnel lens Landing System is inoperative. The repeater is driven from the ship's MOVLAS source and repeats what the pilot sees for the LSO station. The datum bar is supplied by 6.3V AC for the green indicators. The "meatball" indicators are vertical amber lamps except for the three lower lamps, which are red, indicating danger. The system's +5V DC is common to one side of these lamps and the proper amber or red lamps are turned on by the MOVLAS controller grounding the other lamp terminal. A dual control potentiometer is used to adjust the datum bar and "meatball" intensity. The system has a separate on/off switch to turn it off when not in use. These controls are located on the Console control panel.											
		a) No indication — "meatball", datum bar, or warning lamps.	-	-	-	-	-	-	x	IV	D	This repeater serves to indicate what the incoming aircraft is shown by the MOVLAS display. If the descending aircraft does not follow the glideslope path, the aircraft deviation will be detected by redundant indicating systems permitting an LSO wave-off command.
		i) Loss of lamp illumination control caused by discontinuity in cable W22 feeding console connector J1 (MOVLAS),										
		ii) Loss of datum bar 6.3V A-C lamp supply voltage caused by failure of transformer T1 located on the HUD CRT power supply chassis 1A14										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
16.0	(cont'd) a)	ii) (or loss of 115V A-C to 1A14), iii) Loss of "meatball" and warning lamp +5 VDC supply voltage caused by failure of ship's +5V DC power supply, iv) Loss of lamp intensity caused by wiper lift-off in intensity control potentiometer 1A17R3 or open in control switch 1A17S5.										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.1 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	EFFECT ON: PERSONNEL INJURY	EFFECT ON: SYSTEM LOSS	EFFECT ON: SYSTEM DAMAGE	EFFECT ON: MISSION LOSS	EFFECT ON: MISSION POTENTIAL LOSS	FAILURE - HAZARD DETECTABLE BY OPERATOR?	FAILURE - HAZARD CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
17.0	Console Intercommunication System - Refer to Figure 12. An outlet junction box for a radio phone handset is mounted to the right and below the storage box for the console. The radio handset is used to communicate with the pilot in the aircraft glideslope approach path. The radio handset, along with the "pickle switch" hook to the front bar at the base of the console for convenient access. Several transmit-receive channels are available for use with this radio phone handset. A standard, two-station, intercommunication station 21MC (LS-458/SIC) is mounted on the right side of the Console above the control panel. It communicates with Primary Flight (Pri. Fly) and the Carrier Traffic Control Center (CATCC). All of its controls are on the front and it is powered from the ship's intercom system.											
		a) No communication link.	-	-	-	-	-	-	X	IV	E	Upon failure of the 21MC intercom, the LSO will communicate with PRI-FLY and CATCC via existing sound powered communication circuits.
		i) Loss of signal path between 'pri fly' and 'CATCC' caused by discontinuity in cable W225 and console connector J5 (Intercom).										
		ii) Operational breakdown within the 21MC (LS-458/SIC) assembly.										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

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TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON:						FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			PERSONNEL		SYSTEM		MISSION		DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
10.0	Console Operating Controls - Refer to Figures 3 and 13. All controls for the console displays are located on the console front. These controls are mounted on a control panel directly below the upper display information panel. The control panel functions include the power switching (on/off) of the console indicator pointers, scale reticles, MOVLAS, Heads-Up-Display, and the FLAT monitor. The control panel contains the capability to adjust the intensity (brightness) level for each of the enumerated display indicators and scales. The 21MC intercommunications station contains internal controls - there are no interface controls for it within the console. The console contains an auxiliary interlock switch S1 and three indicators DS1, DS2, DS3. The switch and indicators are part of assembly 1A16 and respectively permit the override for testing and maintenance and indicate delayed AC on, Ship's AC on, and heater power on.	a) Loss of console and Heads-Up-Display control.	-	-	-	-	-	-	x	II	D	NOTE: Refer to individual worksheets for criticality impact of separate control failure.
		i) Intermittent and/or malfunctioning console indicator pointer and scale intensity caused by open control switching and potentiometer lines between 1A17 and the other console and HUD readouts. This initial condition is caused by discontinuity/high pin										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

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ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL: LIVES	EFFECT ON: PERSONNEL: INJURY	EFFECT ON: SYSTEM: LOSS	EFFECT ON: SYSTEM: DAMAGE	EFFECT ON: MISSION: LOSS	EFFECT ON: MISSION: POTENTIAL LOSS	FAILURE - HAZARD: DETECTABLE BY OPERATOR?	FAILURE - HAZARD: CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD: PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
10.0		resistance internal to the 1A17 interface connector pairs 1A17J1/1W1P19, and 1A17J2/1W1P20 (1W1P19 and 1W1P20 are console harness connectors). NOTE: The failure mode and cause mechanisms for each control are separately treated on these worksheets. b) Loss of control panel backlighting. 1) Loss of A-C power input to the control panel edge-lit assembly caused by discontinuity in cable W222	-	-	-	-	-	-	x	II	D	Loss of panel backlighting will limit the use of the LSO console under subdued ambient light conditions (e.g., stormy weather or night recovery).

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	EFFECT ON: PERSONNEL INJURY	EFFECT ON: SYSTEM LOSS	EFFECT ON: SYSTEM DAMAGE	EFFECT ON: MISSION LOSS	EFFECT ON: MISSION POTENTIAL LOSS	FAILURE - HAZARD DETECTABLE BY OPERATOR?	FAILURE - HAZARD CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
18.0	(cont'd) b)	i) feeding console connector J3 (AC Control).										
		ii) Loss of low voltage to edge-lit assembly caused by open in 6.3V A-C transformer 1AT2.										
		iii) Loss of intensity and/or power caused by wiper lift-off in intensity control potentiometer 1A17R1 or open in control switch 1A17S2.										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
19.0	Console Obstruction Lamp - Refer to Figure 14. The obstruction lamp provides a proximity and directional warning to carrier personnel of a non-operating (dark) deployed LSO console. The pedestal assembly upon which the LSO console is mounted, contains limit switches actuated by the movement of hydraulic cylinder (part of the hydraulic lifting unit subsystem). The limit switch actuates the obstruction lamp when the HUD console is out of its storage enclosure and capable of orientation for use, but not in use (console main power switch off).											
		a) No energization of obstruction lamp.	-	x	-	-	-	-	x	III	D	The pedestal switch is the single element preventing obstruction lamp energization. Failure of the lamp to illuminate would indicate maintenance for its remedy.
		i) No circuitry path between A-C power input via console connector J3 (AC/AC Control) and obstruction lamp caused by open/high resistance connectors J2 and J4 of Auxiliary Electronics Box (Unit 2)										
		ii) Loss of pedestal switch (LSI-1) actuation										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

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TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
19.0		caused by internal 'open' failure condition and/or lack of mechanical depression of this switch by linear cam action of the elevated LSO console (raised by the hydraulic lifting subsystem-Unit 3), iii) Loss of power to obstruction lamp circuit caused by failure of console main power control switch 1A1781 in the 'open' state. (NOTE: 1A1781 is a DPDT switch.)										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
20.0	Console Dehumidification - Refer to Figure 15. The console incorporates a cartridge heater to maintain the inside of the console at an elevated temperature of +95°F to reduce the possibility of internal cabinet condensation and equipment corrosion. Two heat sensors, HS1 and HS2 wired in parallel, energize the heater cartridge (located in assembly 1A16) whenever the inside cabinet temperature falls below +90°F. The sensors permit the heater to cycle between +90°F and +95°F.											
		a) No dehumidification.	-	-	-	-	-	-	-	IV	D	The failure of 1A16 to provide some degree of dehumidification will be detected during the maintenance cycle - lack of heater energization is indicated by DS3 and 1A16 viewed inside the console.
		i) Loss of ship's A-C input power to heater circuitry caused by breakdown in cable W222 feeding console connector J3 (AC/AC Control),										
		ii) Loss of A-C input to 1A16 assembly feeding heater sensors caused by open interlock switch 1A16S1 contact,										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

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TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
20.0	(cont'd) a)	iii) Loss of heater cartridge power & control caused by failure of both heat sensors (HS1 & HS2).										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable;

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
21.0	Console DC Power Regulators - Refer to Figure 16. Using integrated circuit voltage regulators, the 1A4 regulator board assembly produces its internal supply voltages from the ± 20V and +5V regulated power supplies in the Auxiliary Electronics Box (Unit 2). These integrated circuit regulators contain built-in temperature-sensing circuitry that safely shuts down the regulator if for any reason it becomes too hot. This protects the device from problems such as short-circuited output and high ambient temperatures, but does not give protection against input voltages that exceed ±35 volts. The regulators produce voltages of +15, +12, +8, -6, -15, and a variable output of zero to +5 volts (controlled by control potentiometer 1A17R8).											
		a) No output - loss of console/HUD pointer & scale operation and illumination.	-	x	-	-	-	x	x	II	C	The varied voltages created by the regulator board assembly in tandem with the Auxiliary Electronics Box provide the energization of the instrumentation critical to the landing signal officer decision process. Failure of these supplies magnify the change of information loss. The predominant failure mode, an inoperative console readout, can cause an extraneous failure elsewhere due to a weak design in the console power supply circuitry. None of the regulator circuitry is sufficiently buffered within the console to isolate 'local' failures from causing 'remote' failures. Any short circuit on a common buss will cause the respective regulator to shut down causing the overall loss of all common buss supplied indicator outputs. The remedy is to provide individual current limiting distribution throughout the console. In tandem with this should be the addition of
		i) Loss of voltage regulator operator caused by breakdown in cable W223 feeding +5, +20, and -20 volts to 1A4 regulator board assembly in console via console connector J4 (DC Power),										
		ii) Loss of +15 +12, and +8										

Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

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TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
21.0	(cont'd) a)	ii) volt outputs caused by internal failure of VR1, VR2, and VR3 IC regulators and/or failure of PS3, the +20 volt power supply in the Auxiliary Electronics Box (Unit 2),										overvoltage protection on each DC line to prevent damage to decoupling and transient protection components and to prevent exaggerated/non-linear indications and/or complete failure of a vital indicator.
		iii) Loss of -6 and -15 volt outputs caused by internal failure of VR4 and VR5 IC regulators and/or failure of PS2, the -20 volt power supply in the Auxiliary Electronics Box (Unit 2),										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
21.0	(cont'd) a)	iv) Loss of variable zero to +5 volt output caused by internal component failure in hybrid circuitry and/or failure of PS1, the +5 volt power supply in the Auxiliary Electronics Box (Unit 2).										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

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ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
22.0	Console Heads-Up-Display Circuitry - Refer to Figures 17-1 thru 17.5. The Heads-Up-Display (HUD) is supported by a series of hardware elements resident within the LSO console. The display presents a facsimile of the rate of descent, ramp motion, and aircraft range information displayed on console indicators 1A7, 1A10, and 1A9, along with an aircraft symbol superimposed on reference crosslines representing the landing deck vertical and horizontal line-up, by conditioning input information for presentation on a high intensity cathode ray tube. The image on the face of the CRT is then projected to the combiner glass assembly mounted on top of the console. The process of creating this image on the HUD CRT assembly (1A15) is performed by the HUD CRT Display Circuit Board (1A24), the HUD Deflection Amplifier Assembly (1A5), and the HUD CRT Power Supply Assembly (1A14). The HUD CRT Display Circuit Board produces the dynamic portion of the HUD system while the static portion, the measurement reticle scale and reference cross lines are provided by a reticle projection lamp system (reference 5.0) and combined with the moving pointers and synthesized aircraft symbol on the combiner glass. The HUD CRT display circuit board produces two types of signals for the CRT; deflection signals that produce deflection in the X and Y directions, and a blanking signal that turns off the beam during intervals when a visible trace is not desired. The HUD CRT Display Board takes input data, in the form of analog signal voltages, and processes it into control signals (i.e., blanking signals and analog X and Y deflection signals) for the CRT. Except for the RAMP MOTION signal, analog input voltages are obtained from digital-to-analog (D/A) converters that are part of the ship's automatic aircraft landing radar system (SPN-42 radar). The RAMP MOTION signal is obtained from the Ship's Harmonization Computer (SHC). The output signals drive external interface circuits that develop the high-level signals required by the CRT interface circuits. The HUD CRT power supply circuit provides the filament voltages, grid voltages (electrostatic focusing), and anode voltage for the CRT. The HUD deflection amplifier provides the deflection current need to drive the CRT yoke assembly.											
		a) No dynamic presentation-reticle scale information. 1) Loss of CRT assembly (1A15) operating voltages from CRT power supply assembly (1A14).	-	-	-	-	-	-	K	III	D	The presentation of the HUD is a facsimile of the console and as such is redundant. It would not cause any problem during the recovery. If the glidepath line-up information is lost, it is backed up by the PLAT centerline monitor.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.1 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
22.0	(cont'd) a)	i) Failure of 1A14 can be caused by loss of D-C input voltages (+5V and +28V from Unit 2), 115VA-C input voltage from console connector J3 (AC/AC Control), wiper lift-off in HUD CRT intensity control panel potentiometer 1A17R12, or internal component (sub-assembly) failure within 1A14 (including wiper lift-off in sub-intensity potentiometer 1A14R1)										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

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TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
22.0	(cont'd)	ii) Loss of CRT assembly (1A15) deflection current caused by loss of D-C input voltages (+20V and -20V from Unit 2) 115V A-C 'delayed A-C' signal from console connector J3 (AC/AC Control), or loss of drive from HUD CRT display circuit board 1A24, iii) Loss of synthesized video drive to CRT from HUD CRT display circuit board (1A24) caused by loss of D-C input voltages										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
22.0	(cont'd) a)	iii) (+15V, -15V and -6V from 1A4 and +5V from Unit 2), circuitry breakdown between back-plane (1A12) connections (input/output) and 1A24, internal component failure within the population of the HUD CRT display circuit board, or a constant blanking signal caused by a failure within 1A13,										
		iv) Breakdown in CRT assembly caused by inter-electrode										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

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ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
22.0	(cont'd) a)	iv) short within CRT and/or open filament.										
		b) Single unchanging indication, non-linear response, premature limiting less than full-scale, no aircraft symbol, or incorrect reference cross-line divisions.	-	-	-	-	-	-	x	IV	D	The LSO would utilize the PLAT centerline monitor as an alternative.
		i) Non-linear or limited output indication caused by internal failure of component within population of 1A24,										
		ii) Incorrect references cross-lines										

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NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
22.0	(cont'd) b)	ii) (distance per division with reference to the electronically generated aircraft symbol) caused by open in control switch 1A17S16.										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

MAEC-91-7958

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
23.0	Console Back Plate Assembly. The back plate assembly, the Console (Unit 1) back cover, consists of an external bracket housing to store the PLAT monitor color filters and a protected hold-down fixture in which the Heads-Up-Display reticle scale projection lamp is mounted.											
		a) Airborne splintered glass. 1) The projection lamp, an evacuated 50-watt glass halogen, is protected from the rear only. It can implode if shattered from its front whenever the back plate is removed from the console cabinet for maintenance (Refer to Figure 19).	-	x	-	x	-	-	x	II	D	• RECOMMEND: Wide wire mesh screen be placed over front face to preclude accident during maintenance.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	PERSONNEL INJURY	SYSTEM LOSS	SYSTEM DAMAGE	MISSION LOSS	MISSION POTENTIAL LOSS	FAILURE - HAZARD DETECTABLE BY OPERATOR?	FAILURE - HAZARD CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
24.0	Heads-Up-Display Combiner and Mirror Assembly. The HUD mirror, a 10-inch diameter spherical concave reflecting device, projects the dynamic HUD CRT image combined with the static reticle scale upon the inclined 30% reflectance/70% transmittance combiner glass. The mirror and combiner are physically situated on top of the console (Reference Figure 2). During transitions from storage to use, the mirror and glass are manually deployed (erected). The mirror is raised into place by initially releasing a securing latch on the console side panel. The deployed mirror is firmly secured with a large diameter knurled knob on the right at the base of vertical arm (Refer to Figure 20).											

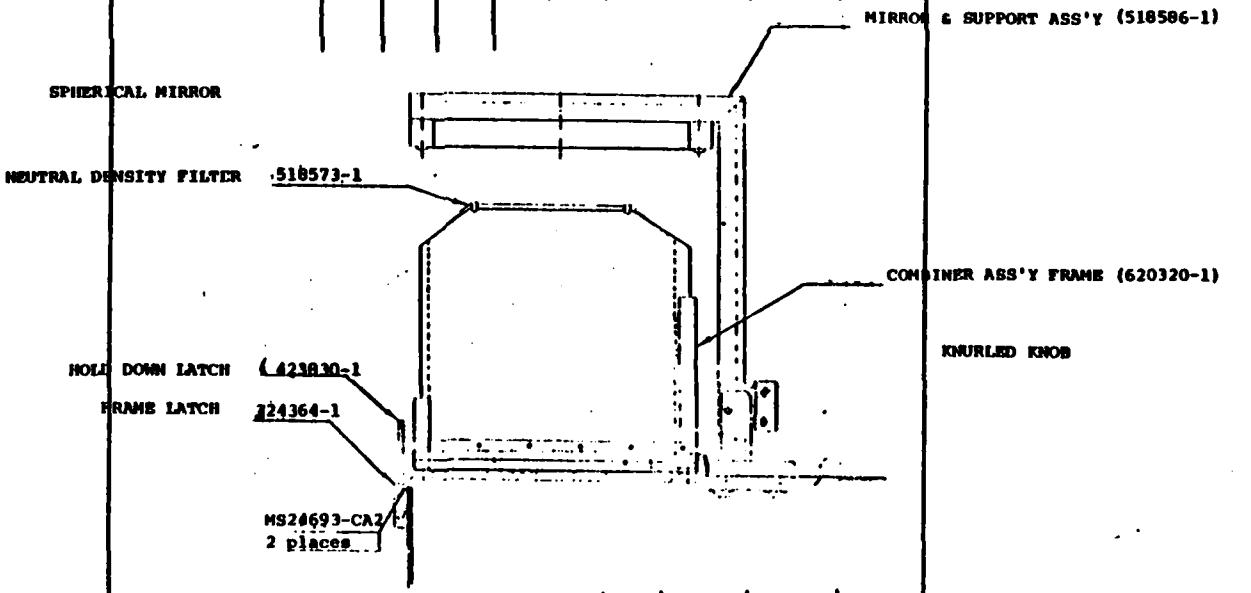

FIGURE 20. HUD FRONT VIEW

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

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ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-. FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
24.0	(cont'd) The combiner glass is manually raised to a 45° angle by compressing the two center knobs on the combiner frame base, sliding the bottom edge to the rear against a stop, and then assuring that the compressed knob pins snap into the track holes to secure the glass in place (refer to Figure 22).											

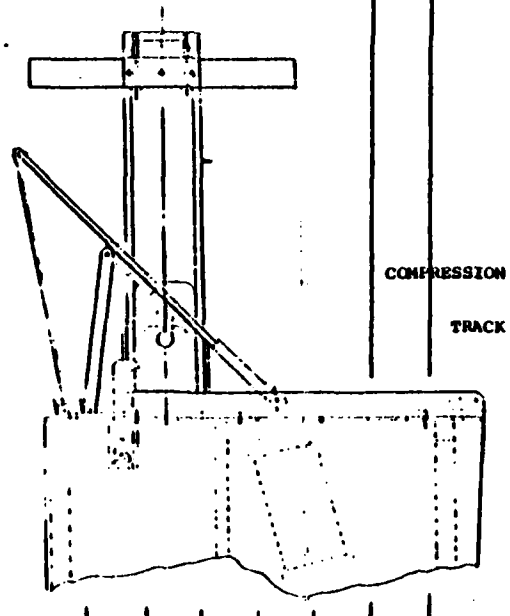

FIGURE 21. HUD SIDE VIEW

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASTIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
24.0	(cont'd)	a) Airborne splintered glass. i) Shattering of combiner glass caused by abrupt tiltover of spherical mirror support assembly (refer to Figures 20, 21, aggravated by loose tightening and/or abrupt lateral shock imparted by arrestment of recovered aircraft. ii) Breakage of combiner glass caused by impact of flying debris (including	-	x	-	x	-	-	x	II	D	• It is recommended that the following design changes be undertaken: (1) Create a sandwich of the combiner glass and a plastic neutral density filter on the observer side of the combiner glass. (2) Incorporate a compression pin locking device on the side of the mirror and support assembly base to lock and maintain the support arm in the vertical attitude regardless of the knurled knob tension, and (3) Incorporate a compression pin locking device on the spherical mirror hold-down latch.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

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TABLE: UNIT 1

NAME: (Sub-system) HEADS-UP-DISPLAY CONSOLE

DWG. NO./REV.: 620310

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL: LIVES	EFFECT ON: PERSONNEL: INJURY	EFFECT ON: SYSTEM: LOSS	EFFECT ON: SYSTEM: DAMAGE	EFFECT ON: MISSION: LOSS	EFFECT ON: MISSION: POTENTIAL LOSS	FAILURE - HAZARD: DETECTABLE BY OPERATOR?	FAILURE - HAZARD: CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD: PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
24.0	(cont'd) a)	ii) loose tools during maintenance cycle), iii) Shattering of spherical concave mirror caused by failure/ fatigue of hold-down latch and subsequent slapping motion against the cabinet face.										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

(FAILURE MODES & EFFECTS ANALYSIS - SYSTEM) SAFETY ANALYSIS MK1 MOD 0 LSO-HUD CONSOLE SYSTEM

TABLE: UNIT 2

NAEC-91-7958

NAME: (Sub-system) AUXILIARY ELECTRONICS BOX

DWG. NO./REV.: 620381

NAEC-91-7958

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	INTRODUCTION This segment of the System Safety Analysis focuses on the MK 1 MOD 0 Landing Signal Officer's (LSO) Auxiliary Electronics Box depicted as Unit 2 in Figure 1. The Auxiliary Electronic Box contains the D.C. power supplies for the LSO Console. This box is located directly below the LSO platform in a small room inside the ship's hull. The Auxiliary Electronics Box is secured to the inner surface of this room. This is the outside skin of the ship. This box also contains a blower with air flow detectors, elapsed time meter, pilot light indicators and a circuit breaker. A description of the Auxiliary Electronic Box's composition is described on the worksheets. Figure 2 illustrates, by use of a block diagram, the input/output connections between each of its elements, their supply voltage requirements, and operating controls.											

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

(FAILURE MODES & EFFECTS ANALYSIS - SYSTEM) SAFETY ANALYSIS MK1 MOD 0 LSO-HUD CONSOLE SYSTEM

TABLE: UNIT 2

NAEC-91-7958

NAME: (Sub-system) AUXILIARY ELECTRONICS BOX

DWG. NO./REV.: 620381

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)

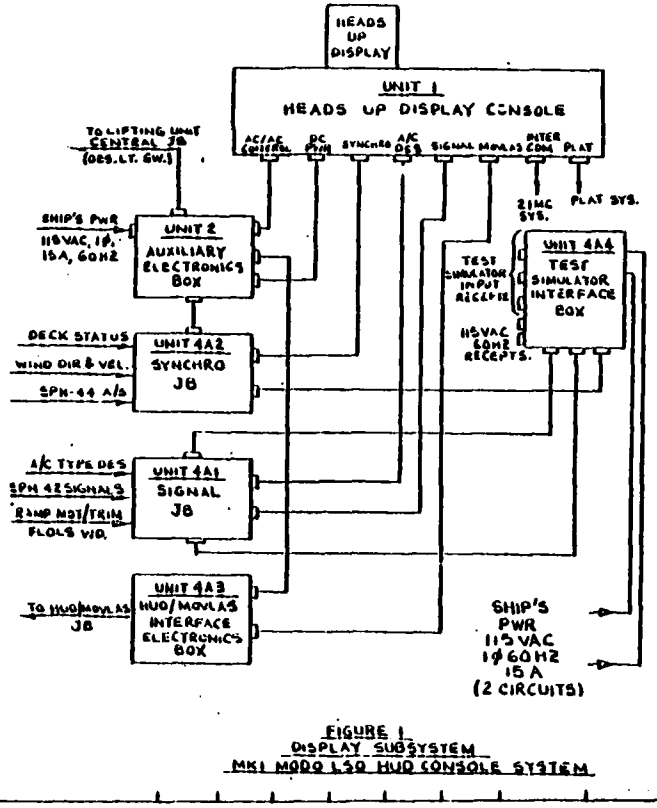

FIGURE 1
DISPLAY SUBSYSTEM
MK1 MOD0 LSO HUD CONSOLE SYSTEM

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 2

NAME: (Sub-system) AUXILIARY ELECTRONICS BOX

DWG. NO./REV.: 620381

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON:						FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			PERSONNEL		SYSTEM		MISSION					
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)

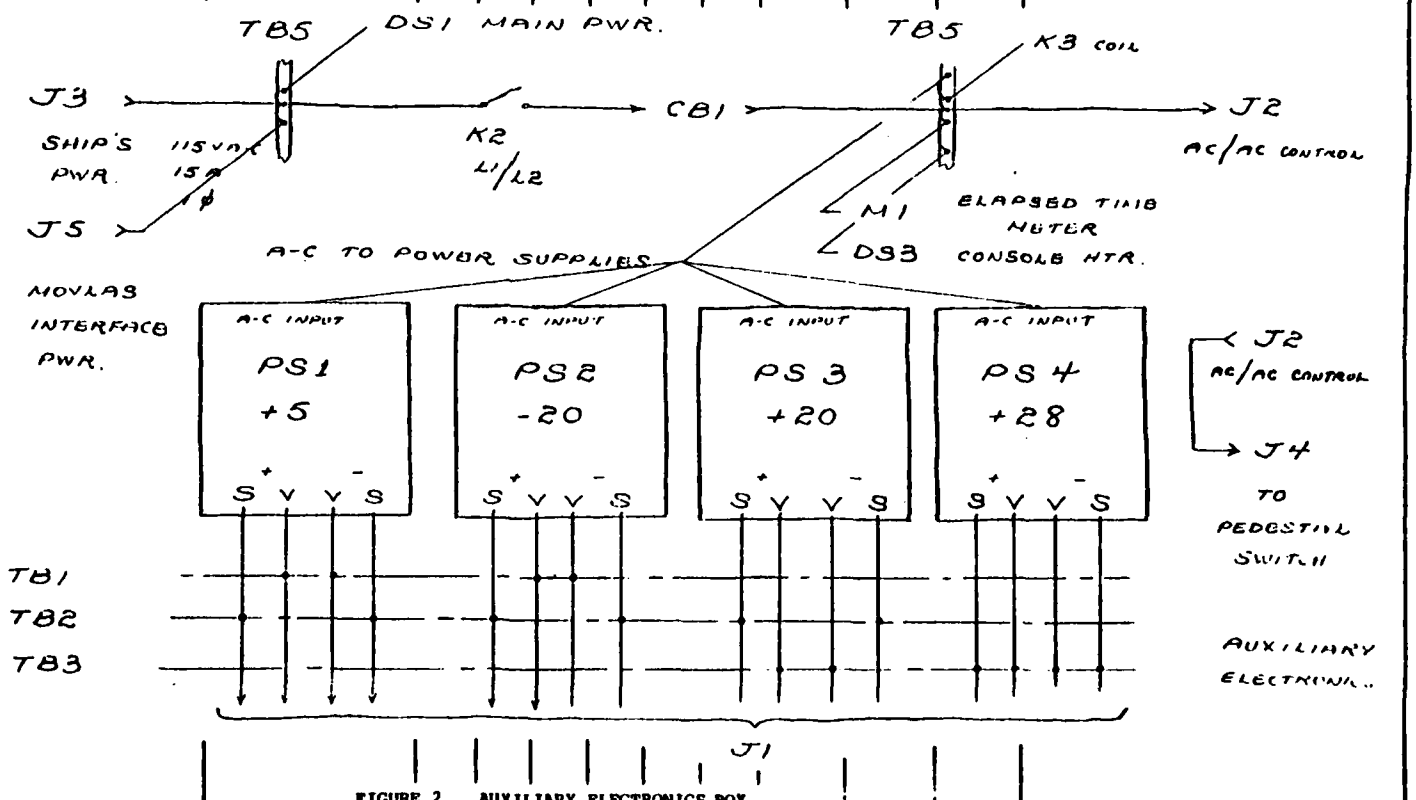

FIGURE 2. AUXILIARY ELECTRONICS BOX

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

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TABLE: UNIT 2

NAME: (Sub-system) AUXILIARY ELECTRONICS BOX

DWG. NO./REV.: 620381

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	PERSONNEL INJURY	SYSTEM LOSS	SYSTEM DAMAGE	MISSION LOSS	MISSION POTENTIAL LOSS	FAILURE - HAZARD DETECTABLE BY OPERATOR?	FAILURE - HAZARD CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)

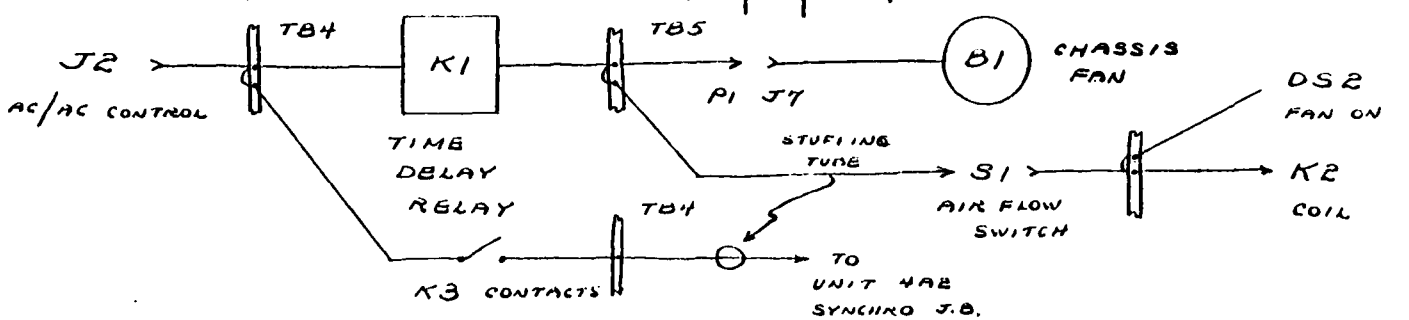

FIGURE 2 (cont'd). AUXILIARY ELECTRONICS BOX

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 2

NAME: (Sub-system) AUXILIARY ELECTRONICS BOX

DWG. NO./REV.: 620381

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	PERSONNEL INJURY	SYSTEM LOSS	SYSTEM DAMAGE	MISSION LOSS	MISSION POTENTIAL LOSS	FAILURE - HAZARD DETECTABLE BY OPERATOR?	CLASTFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.0	Auxiliary Electronics Box - Refer to Figure 1. The Auxiliary Electronics Box, Unit 2, contains the D.C. power supplies for the LSO console. The D.C. supplies provide +5 volts (PS1), -20 volts (PS2) +20 volts (PS3), and +28 volts (PS4). This box is located below the LSO platform in a small room inside the ship's hull. The Auxiliary Electronics Box is secured to the inner surface of this room. This is the outside skin of the ship. This box also contains a blower with air flow detectors, elapsed time meter, pilot light indicators and a circuit breaker. The AC power is applied to Unit 2 through the top of its case. A time delay relay within the assembly prevents rapid on/off power transitions from harming the Heads-Up-Display circuitry and CRT. After the delay period, AC is applied to the assembly cooling fan. This fan is also safety interlocked via a wind velocity detector so that airflow must exist within Unit 2 to cool its heat dissipating power supplies before AC power is applied to the LSO console main power bus and console dehumidifcation. The initial and delayed AC power events are indicated on incandescent lamps found on the relay chassis within Unit 2 and assembly 1A16 located inside the LSO console.											
		a) Loss of DC power supply output.	-	x	-	-	-	x	x	II	C	The varied voltages provided by the auxiliary electronics assembly provide the energization of the instrumentation critical to the Landing Safety Officer's decision process. Failure of these supplies magnify the chance of information loss. The control of the entire LSO console hinges on the mechanical operation of a few mechanical relays and an airflow detector. Coupled with this eventuality is the possibility that an undetected and unprotected excursion of any power supply can cause a catastrophic chain of events to occur. To alleviate these problems, the
		i) The loss of power supply outputs (PSI thru PS4) which correlate with a lack of power supply A-C input power caused by a failure of one or several interlinked time delayed components within Unit 2. The components are, in										• RECOMMENDATIONS: (1) Provide a warning circuit within the LSO console (aural

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

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ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.0	(cont'd)	their sequence of turn-on, K1 the Time Delay Relay, chassis fan B1, airflow detector switch S1, control relay K2, and circuit breaker CB1, ii) Loss of power supply output caused by internal component failure within the individual power supply.										& visual) to warn the user that an excursion has occurred which may, or may not, have caused damage that requires the attention of maintenance personnel, (2) Provide individual indicators on the LSO console for each voltage as a confidence indicator ("GO"/"NO-GO"), (3) Provide overvoltage protection for each power supply output to bar against damaging transients, (4) Replace the dependency of the main power control bus on the airflow switch - let loss of cooling airflow energize a warning indicator which coordinates with items (1) and (2), above.
		b) Out-Of-Spec Power Supply Output. i) Overvoltage condition caused by	-	x	-	-	-	x	-	II	C	

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 2

NAME: (Sub-system) AUXILIARY ELECTRONICS BOX

DWG. NO./REV.: 620381

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.0	(cont'd)	open sensing lines between junction at J1 connector of voltage lines (V+, V-) and sensing lines (S+, S-), ii) Under voltage condition caused by shorted voltage and sensing lines at immediate power supply output terminal board, iii) Non-regulated power supply output caused by internal failure within power supply.										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

NAEC-91-7958

TABLE: UNIT 2

NAME: (Sub-system) AUXILIARY ELECTRONICS BOX

DWG. NO./REV.: 620381

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON:						FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			PERSONNEL		SYSTEM		MISSION					
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.0	(cont'd)	c) No A-C power transmission to Synchro Junction Box (Unit 4A2). i) No power transmission to Unit 4A2 caused by failure of time delayed events described in item a)i), above, failure of control relay K2 within Unit 2.	-	x	-	-	-	x	-	II	C	

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

(Failure Modes & Effects Analysis - System) Safety Analysis MK1 MOD 0 LSO-HUD Console System

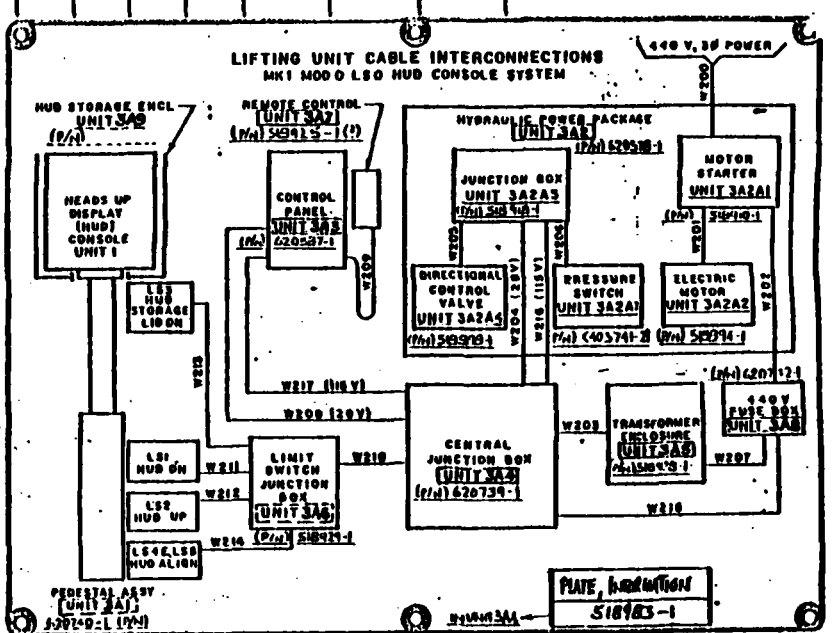
NAEC-91-7958

TABLE: UNIT 3A1

NAME: (Sub-system) THE RETRACTABLE PEDESTAL ASS'Y

DWG. NO./REV.: _____

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.0	From the USNABC document, "An Improved LSO (Landing Signal Officer) Work Station for CVNX Class Ships," 1 December 1977, the description of the equipment is as follows: "The retractable pedestal subsystem is a hydraulic lifting system that provides for raised deployment and retracted stowage of the display console. The lift is a double acting, non-rotable cylinder assembly capable of a 75-inch stroke to accommodate an Atlantic or Pacific Fleet platform installation. Atop the cylinder is the console storage enclosure with a hinged lid. Electrical interlocks are provided in the lift control system to guard against the lift being raised with the lid down. The interface between the rod of the cylinder assembly and the display console is a two-axis panning head for orienting the console. The panning head contains electrical interlocks to prevent retraction of the console when it is misaligned with the storage enclosure. The motor pump unit that will operate the cylinder assembly will be capable of forcing a full stroke in approximately 50 seconds. Integral to the motor pump unit will be the motor controller, zero leakage directional control valves, and all other hydraulic circuit components. The motor controller will provide for three minutes of motor operation before it automatically shuts it down. Remote and local controls of the motor will be provided. Consolidated remote controls for operating the lifting system will be provided on the LSO platform. Also, provisions will be made to raise the lift in the event of a hydraulics or power failure." The Plate, Information dwg. 518983-1 (see copy at right) shows the individual units/subunits and their interconnections. We use this information instead of the drawing tree, which is not available.											



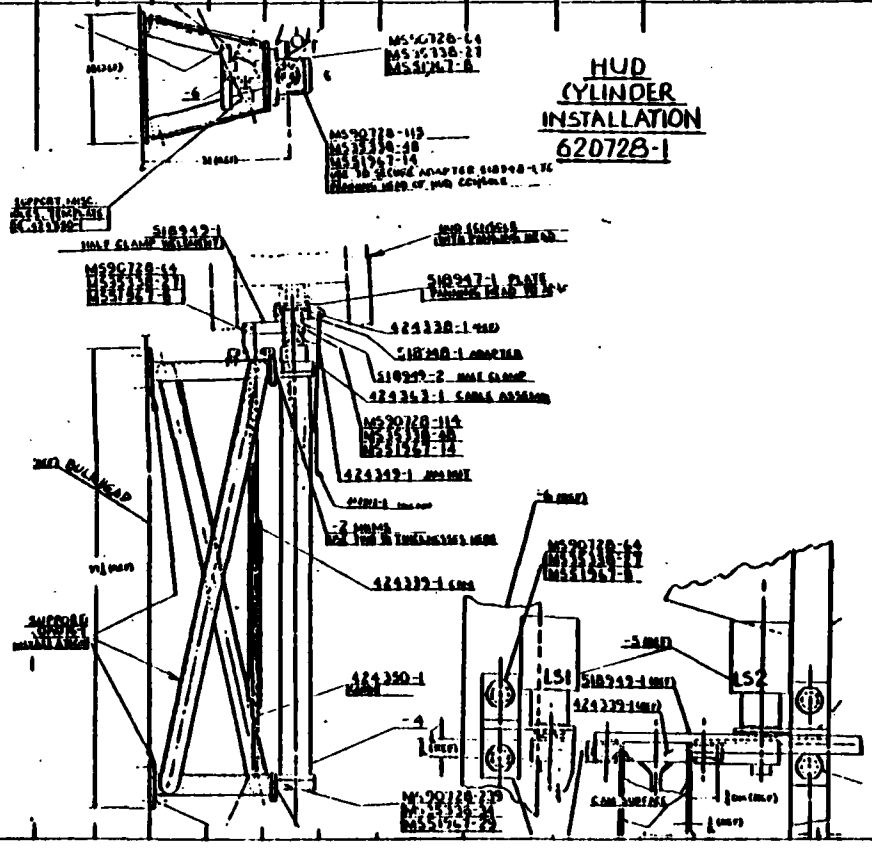
NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 3A1

NAME: (Sub-system) THE RETRACTABLE PEDESTAL

DWG. NO./REV.: _____

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.1.0	PEDESTAL ASSEMBLY (Unit 3A1), dwg. 620740-1, composed of "non-rotating cylinder/piston" attached to the bulkhead according to "HUD CYLINDER INSTALLATION," dwg. 620728-1, serves to lift or retract the Heads-Up-Display (HUD) Console. The Up/Down movements are enabled by the hydraulic liquid being introduced on one side of the non-rotating piston in the cylinder and relieved from its other side. The ends of these movements are controlled by the two LIMIT SWITCHES, LS1 and LS2. See sketch at right.											



NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 3A1

NAME: (Sub-system) THE RETRACTABLE PEDESTAL

DWG. NO./REV.: _____

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.1.1	SUPPORT, CYLINDER, misc. dwg. No. 0A076, provides the attachment of the Hydraulic Cylinder to the Bulkhead.	Cylinder support is not a part of the LSO-HUD SYSTEM therefore, no analysis provided.										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

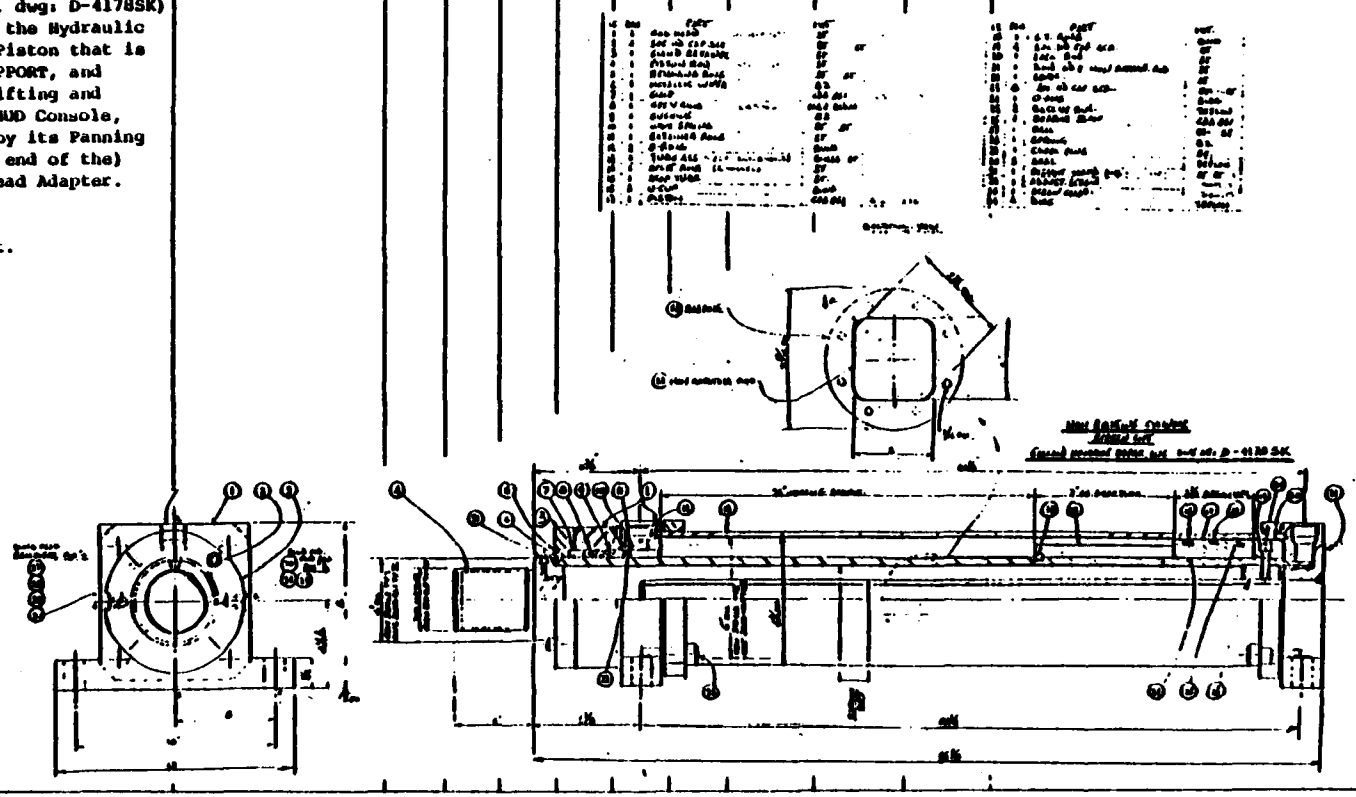
NAEC-91-7958

TABLE: UNIT 3A1

NAME: (Sub-system) THE RETRACTABLE PEDESTAL

DWG. NO./REV.: _____

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.1.2	CYLINDER, dwg. 620728-4 (Gallano Henning Nopak, Inc. dwg: D-4178SK) is the assembly of the Hydraulic Cylinder with its Piston that is attached to the SUPPORT, and provides for the lifting and retracting of the HUD Console, which is attached by its Panning Head to the (upper end of the) Piston's Panning Head Adapter. See sketch at right.											



NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

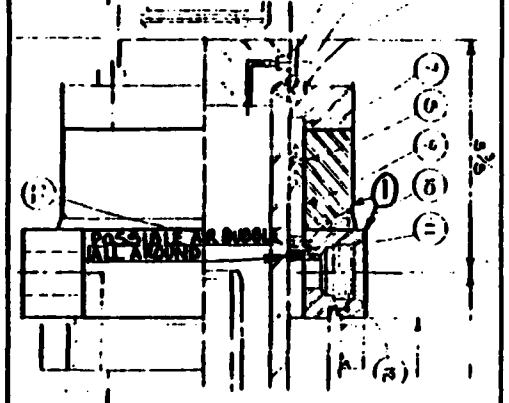
TABLE: UNIT 3A1

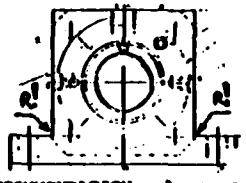
NAME: (Sub-system) THE RETRACTABLE PEDESTAL

DWG. NO./REV.: _____

NAEC-91-7958

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	EFFECT ON: PERSONNEL INJURY	EFFECT ON: SYSTEM LOSS	EFFECT ON: SYSTEM DAMAGE	EFFECT ON: MISSION LOSS	EFFECT ON: MISSION POTENTIAL LOSS	FAILURE - HAZARD DETECTABLE BY OPERATOR?	FAILURE - HAZARD CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.1.2.1	ROD HEAD WELDMENT, item No. 1 of the CYLINDER, vendor's dwg. D-4178SK, serves as the upper attachment of the CYLINDER to its SUPPORT, and also provides a hydraulic closure at the upper end of the CYLINDER. See sketch:	a) Possibility of injury by the sharp corners.		x					Yes	III	C	• RECOMMENDATION: Arrange with the vendor (Galland Henning Nopak, Inc. 1025 S. 4th St., Milwaukee, Wisc. 53215) to provide round and smooth corners and edges to avoid personal injury, on their dwg. C-22026CY.
		b) Possibility of cracks from the stress concentration in the two corners for lack of round fillet.		x		x	x	x	?	II	D	• RECOMMENDATION: Arrange with the vendor to provide ample Radii to form round fillets between the attaching feet and the body of this part:
		c) Possibility of entrapped air in the Hydraulic System, due to the lack of air purging just below the Gland (see sketch at left)				x			Yes	III	B	• RECOMMENDATION: Arrange with the vendor to incorporate an air purging or other means to get rid of the upper air bubble, to assure the gland to be always bathed in the hydraulic liquid.





1424A-126)

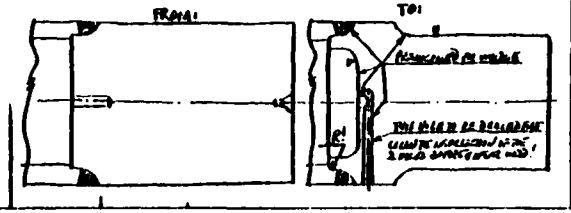
NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 3A1

NAME: (Sub-system) THE RETRACTABLE PEDESTAL

DWG. NO./REV.: _____

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.1.2.2	PISTON ROD, item 4 of the CYLINDER 620728-4, vendor's dwg. C-22024CY, provides the attachment for the PANNING HEAD at its upper end and the smooth surface on its OD and attachment of PISTON on its lower OD and BEARING SLIDE at its lower end, inside. The pressure of the hydraulic fluid will move this Piston Rod up or down when the other side will be connected to the pressure relief, and the BEARING SLIDE will prevent its rotation.	a) Danger of cracks in the weld or in the Tubing next to the weld, due to: i) Grossly unequal cross sections of the two pieces to weld. ii) Lack of a Radius specified in the fillet in the Tubing next to the weld.		(X)		x		x	No	III	D	• RECOMMENDATION: Arrange with the vendor (G.H. Nopak, Inc.) to specify ample Radii in all fillets, especially those that could cause stress concentration, and to premachine the Round Stock to prepare it better for the welding to the tubing. See sketch below (end of this page).
		b) Possibility of contamination of the hydraulic fluid by burrs created by the intersecting drilling of the air purging hole(s).				x		x	No	III	D	• RECOMMENDATION: Arrange with the vendor to drill the perpendicular hole first and the axial hole second. See sketch:



NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

NAEC-91-7958

TABLE: UNIT 3A1

NAME: (Sub-system) THE RETRACTABLE PEDESTAL

DWG. NO./REV.: _____

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON:						FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			PERSONNEL		SYSTEM		MISSION					
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.1.2.3	TUBE WELDMENT, item 13 of the CYLINDER 620728-4, vendor's dwg. C-22025CY, provides the connection between the lower and upper Heads-Attachments to the SUPPORT, and forms the cylinder, in which slides the PISTON. The inside of this carbon steel material (C1026) is electro-Nickel plated (0.002 Cu, 0.001N_i) and chrome-plated (0.00025Cr).	No safety problem found originating in/from this part.										COMMENT: This part will be stretched, perhaps even in shocks, by the STOP TUBE hitting the upper ROD HEAD at the end of the lifting stroke, if that would not be dampened. That could cause cracks and eventual flaking of the chrome plating. See our RECOMMENDATION in the item 1.1.2.4, next page.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

NAEC-91-7958

TABLE: UNIT 3A1

NAME: (Sub-system) THE RETRACTABLE PEDESTAL

DWG. NO./REV.: _____

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.1.2.4	STOP TUBE, item 15 of the CYLINDER 620728-4, vendor's dwg. A22029CY, serves as a stop for the uplift: its upper face will get in contact with the lower face of the ROD HEAD WELDMENT.	Possible "hard" stop when the STOP TUBE "hits" the ROD HEAD, particularly with the hydraulic liquid above the piston missing. This could result in cracks and peeling in/of the Chrome plating of the TUBE (cylinder).				x		x	Yes	III	C	• RECOMMENDATION: Arrange with the vendor to provide an assured "soft touch" for the upper limit of the stroke, and the hydraulic pressure release under the PISTON at reaching the upper limit of the stroke, derived from the movement of the PISTON.

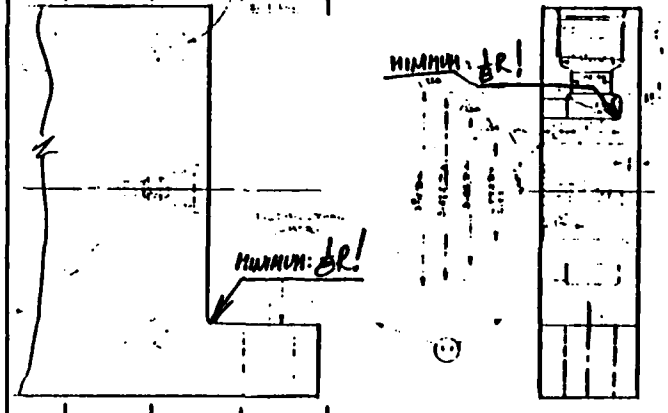
NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 3A1

NAME: (Sub-system) THE RETRACTABLE PEDESTAL

DWG. NO./REV.: _____

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.1.2.5	BLIND HEAD WELDMENT & ROD, item 21 of the CYLINDER 620728-4, vendor's dwg. C-22022CY, serves as the lower attachment to the SUPPORT and the ROD serves as the non-rotating base for the PISTON movements.	a) Possibility of injury by the sharp corners of the PLATE.		x					Yes	III	C	• RECOMMENDATION: Arrange with the vendor to provide round/smooth corners and edges that can be expected to be handled/ touched by the Navy personnel.
		b) Possible crack due to stress concentration in the sharp fillet (no Radius specified, even though it is drawn as round).				x		x	No	III	D	• RECOMMENDATION: Arrange with the vendor to specify Radii for the important fillets! See sketch:



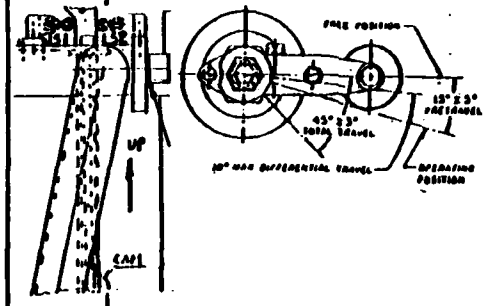
NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

NAEC-91-7958

TABLE: UNIT 3A1

NAME: (Sub-system) THE RETRACTABLE PEDESTAL

DWG. NO./REV.: _____

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	EFFECT ON: PERSONNEL INJURY	EFFECT ON: SYSTEM LOSS	EFFECT ON: SYSTEM DAMAGE	EFFECT ON: MISSION LOSS	EFFECT ON: MISSION POTENTIAL LOSS	FAILURE - HAZARD: DETECTABLE BY OPERATOR?	FAILURE - HAZARD: CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD: PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.1.3	LIMIT SWITCH, dwg. 620728-5, provided by MICRO SWITCH, their dwg. 34BN11-6 (CW). Two of these switches are used, LS1 and LS2 for the lower and upper end of the Piston strokes, limiting the lift and retraction of the Retractable Pedestal. See sketches below: 	a) Possibility of misadjustment due to accumulated debris interfering between the cam and the Roller of the Switch.						x	Yes	III	C	Periodic/frequent inspection and maintenance drills will diminish greatly the probability of this problem to develop.
		b) Possible danger of damage due to overstress in the Limit Switch's Arm due to forced overtravel beyond the 45° (interfering debris between the Roller and the Cam).				x		x	Yes	II	D	• RECOMMENDATION: i) Introduce the necessary pre-operational checks of the System to be performed before the intended use. ii) Provide a protection arrangement to keep the debris from falling between the Roller and the Cam.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

(FAILURE MODES & EFFECTS ANALYSIS - SYSTEM) SAFETY ANALYSIS MK1 MOD 0 LSO-HUD CONSOLE SYSTEM

NAEC-91-7958

TABLE: UNIT 3A1

NAME: (Sub-system) THE RETRACTABLE PEDESTAL

DWG. NO./REV.: _____

NAEC-91-7958

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.1.4	CABLE CLAMP ASSEMBLY 518987-1 provides the support of all electrical cables leading to the HUD Console.	Possible danger of the insulation of some of the electrical cables to be cut through by the sharp edges of the HALF CLAMPS 620757-1 and 620757-2, and the ensuing electrical shorts and/or shocks.		x		x		x	Yes	II	C	• RECOMMENDATION: Provide the two existing rubber inner pads 518987-2 to "overhang" the length of the Half Clamps; also, provide a 45° chamfer or round the inner edges of the Half Clamps.

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NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

(Failure Modes & Effects Analysis - System) Safety Analysis MK1 MOD 0 LSO-HUD Console System

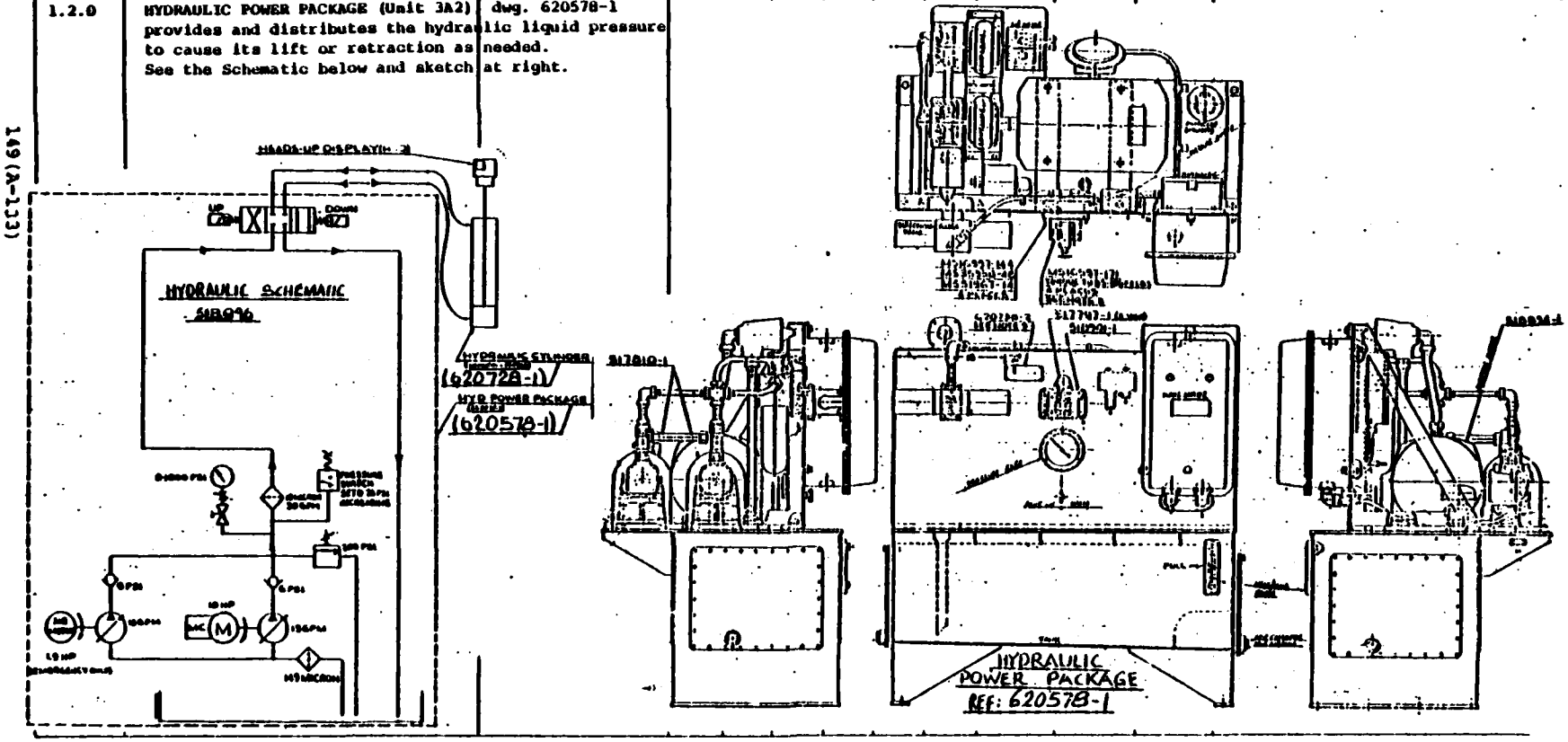
NAEC-91-7958

TABLE: UNIT 3A2

NAME: (Sub-system) THE HYDRAULIC POWER PACKAGE

DWG. NO./REV.: 620578-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2.0	HYDRAULIC POWER PACKAGE (Unit 3A2) dwg. 620578-1 provides and distributes the hydraulic liquid pressure to cause its lift or retraction as needed. See the Schematic below and sketch at right.											



NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

(Failure Modes & Effects Analysis - System) Safety Analysis MK1 MOD 0 LSO-HUD Console System

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TABLE: UNIT 3A2

NAME: (Sub-system) THE HYDRAULIC POWER PACKAGE

DWG. NO./REV.: 620578-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2.1	TANK 620579-1 provides not only the storage for the hydraulic liquid, but also serves as a frame basis for Hydraulic Power Package Assembly, which is assembled on top of the Tank. This arrangement explains the existence of the two Tank Covers on its sides.	a) Possibility of a discontinuity in the Suction column of the Pump, due to leaks. This might present a need for priming, causing a delay in the use of the System getting it to its lifted position.	(x)	(x)				x	Yes	III	C	Periodic checks on the operation of the System will indicate the incipient failures due to leaks. That in combination with the maintenance drills will keep the System in good operating condition. • However, it is always recommended (particularly for the new designs) to place the pump under the tank so that the Pump's suction column will be filled with a positive pressure. The need for priming will be avoided and the efficiency of the Pump will increase.
		b) Possibility of cracking of the Air Motor Pump piping due to "soft" support of Air Motor/ Pump Assy (gussets 620579-11 are welded to a large, 3/16 thick plate).				x			Too late	III	B	• RECOMMENDATION: Provide two gussets welded inside the Tank against the outside gussets 620579-11.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 3A2

NAME: (Sub-system) THE HYDRAULIC POWER PACKAGE

DWG. NO./REV.: 620578-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2.2	PUMP, 518893-1, rated 13GPM at 1200 RPM/8.8HP input, max-operating pressure 1,000 psi, provides the flow/pressure of the hydraulic fluid from the Tank to the Directional Control Valve and the lower or upper side of the Hydraulic Cylinder Piston to lift or retract the Heads-Up Display Console. Two redundant pumps are used, one driven by an Electric Motor, and the other one by an Air Motor.	Possible damage-failure of the Pump due to inadequate filtration of the hydraulic liquid in the suction: the Pump vendor (Vickers) recommends 10μ, Note 1F on the Pump dwg. 518893 specifies 25μ or less, but the Piping Ass'y, dwg. 620582-6 specifies Filter element Vickers P/N 361739, which is 70μ according to Vickers' info, but 149μ according to Hydraulic Schematic dwg. 518896.				x			Yes	III	C	• RECOMMENDATION: Re-evaluate the filtering arrangement and specify the correct filter element for 620582-6.

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NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 3A2

NAME: (Sub-system) THE HYDRAULIC POWER PACKAGE

DWG. NO./REV.: 620578-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2.3	MOTOR, AIR, dwg. 518913-1, with the Hydraulic Pump connected by the Flexible Coupling form the redundant arrangement to supply the necessary Hydraulic Fluid flow and pressure to the Hydraulic Cylinder, in case the main Hydraulic Pump with its Electric Motor and Flexible Coupling would fail.	a) The Air Motor could be driven by the compressed air without a load from the Pump (in case the Pump could not suck the H. Fluid from the Tank), in which case the Air Motor could be damaged.				x		x	Yes	III	D	In a well-maintained System, this situation would not develop. However, we offer: • RECOMMENDATION: a) Mention in the Operation and Maintenance Manual the need to provide load to the Air Motor or otherwise limit its speed to 10% above that at maximum power. b) Provide an overspeed governor or shut-off arrangement.
		b) The air exhaust could get clogged by frozen condensed moisture.		x		x		x	Yes	III	E	The probability of this situation to develop is very low, because it would require first the failure of the Electric Motor/H. Pump and then the right condition for freezing the condensed moisture ($P=P_1 \times P_2$)! • RECOMMENDATION: Evaluate the test results and introduce the Corrective Action as necessary

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

NAEC-91-7958

TABLE: UNIT 3A2

NAME: (Sub-system) THE HYDRAULIC POWER PACKAGE

DWG. NO./REV.: 620578-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASTIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2.4	PRESSURE SWITCH, dwg. C403741-27 is a double pole, single throw electrical switch, actuated by a push rod from the power element (seamless phosphor bronze bellows), adjusted to close the NO contacts at 20 PSI pressure (increasing) in the Hydraulic Pump outlet. The closure of these contacts will light up the green light L1 "Pump Running" on the Panel.	a) Power element leaks - possible contamination of the contacts and of the Junction Box by the H. fluid.				x		x	No	III	D	Periodic inspection and maintenance drills will prevent this failure mode to develop.
		b) Power element torn - the Pressure Switch does not function.				x		x	Yes	III	E	
		c) Non-conductive contamination on (one of the) contacts.							Yes	IV	C	The green light L1 would not light up, at most, but the System would be functioning.
		d) A short between the contacts.							Yes	IV	D	The green light L1 would be "on" as long as the System is "on", but the System would be functioning.

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NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 3A2

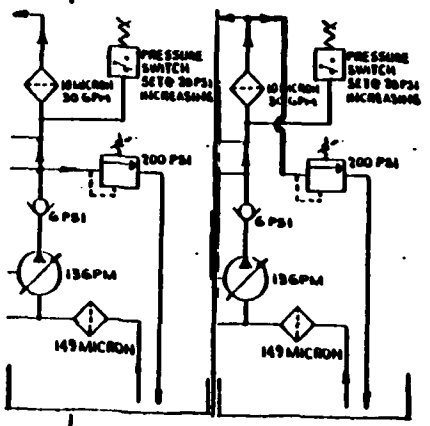
NAME: (Sub-system) THE HYDRAULIC POWER PACKAGE

DWG. NO./REV.: 620578-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2.5	VALVE, SHUT-OFF, dwg. 424336-1, provides the connection/dis-connection of the Hydraulic Liquid Pressure Gage 620578-2.	a) Inner leak b) Blocked closed							Yes	IV	D	No real problem present. The fact that the (soft) seat will get worn and will leak will be handled by the maintenance, and the fact that the closing of the Valve will be hardly noticed on the Pressure Gage will be of little consequence.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

NAEC-91-7958

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	EFFECT ON: PERSONNEL INJURY	EFFECT ON: SYSTEM LOSS	EFFECT ON: SYSTEM DAMAGE	EFFECT ON: MISSION LOSS	EFFECT ON: MISSION POTENTIAL LOSS	FAILURE - HAZARD DETECTABLE BY OPERATOR?	FAILURE - HAZARD CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2.6	RELIEF VALVE 517792-1, on the Panel above the Pressure gage, enables the adjustment of the operating pressure of the Hydraulic Fluid in the System (200 PSI).	a) Contamination entering the Relief Valve with the Hydraulic Fluid; the *unit* requires filtration 25 micron or less (note 1.g of the dwg. 517792-1), but it receives the H. Fluid filtered to 149 micron (according to Hydraulic Schematic 518096).				x		x	Yes	III	B	• RECOMMENDATION: Provide filtration of the Hydraulic Fluid to 25 micron or better, as required. One possible way could be by changing the connection as shown in the following HYDRAULIC schematic: FROM: TO: 

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 3A2

NAME: (Sub-system) THE HYDRAULIC POWER PACKAGE

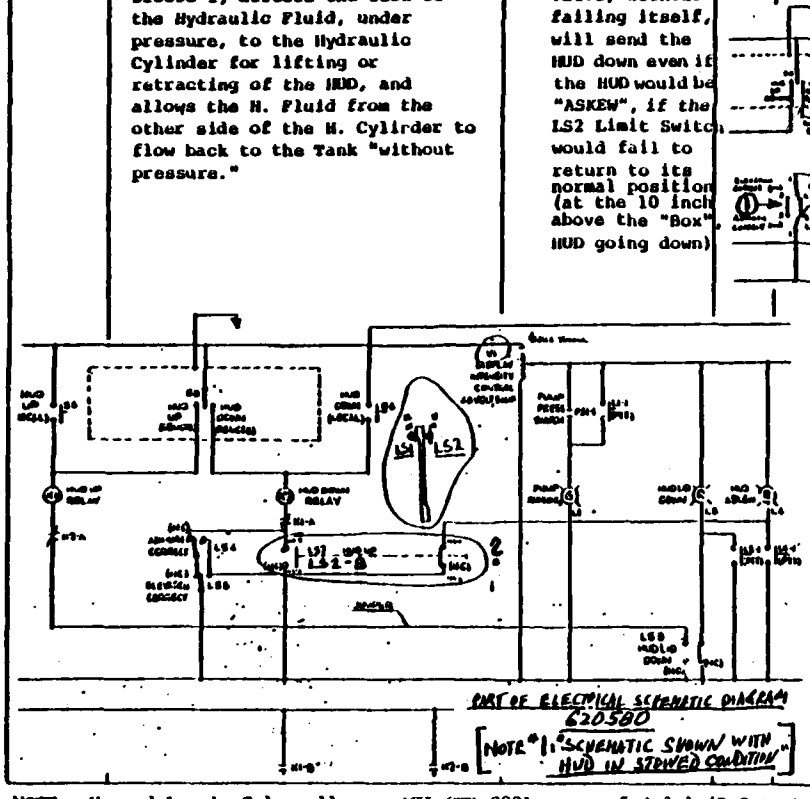
DWG. NO./REV.: 620578-1

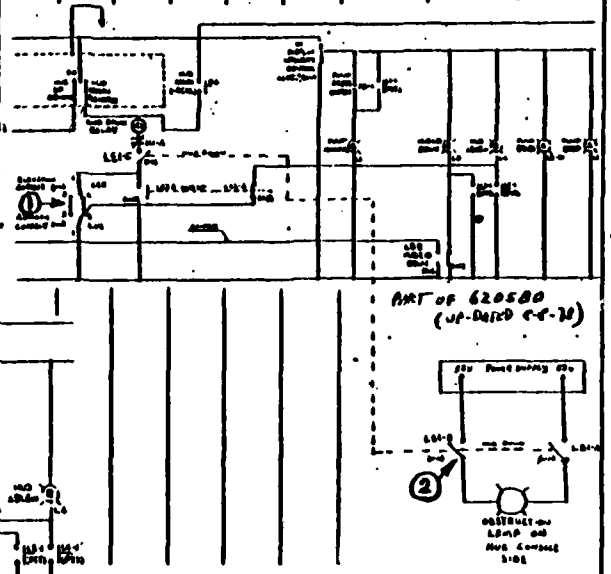
ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON:						FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			PERSONNEL		SYSTEM		MISSION					
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2.6	(cont'd) RELIEF VALVE	b) Contamination, entering the Relief Valve through its open Vent opening.				x		x	Yes	III	C	• RECOMMENDATION: Provide a connection (tube) between the Vent opening and the top of the Tank, or plug the vent connection in the valve.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

NAEC-91-7958

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2.7	DIRECTIONAL CONTROL VALVE, 518898-1, directs the flow of the Hydraulic Fluid, under pressure, to the Hydraulic Cylinder for lifting or retracting of the HUD, and allows the H. Fluid from the other side of the H. Cylinder to flow back to the Tank "without pressure."	a) The Control Valve, without failing itself, will send the HUD down even if the HUD would be "ASKEW", if the LS2 Limit Switch would fail to return to its normal position (at the 10 inch above the "Box" HUD going down)				x		(x)	Yes	II	C,D	a) The contemplated hazardous situation will be always present any time the HUD Azimuth and/or Elevation will not be in "correct" (aligned) position, and the LS2 would fail to return to its normal position. With this failure of LS2, there is no red light L4 warning available! For that, we present the following: • RECOMMENDATION: Provide the connections in such a way that there will be an automatic interlocking, or an automatic return of Azimuth and Elevation to their aligned positions upon activating the HUD-Down switch(es), before the HUD would start moving down, or keep the LS2-B contacts always open(1)





NOTES: ① There should be no connection between pins LS4-2 and LS5-21

② For better reliability of the observation light to be "on", eliminate the LS1-B!

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NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 3A2

NAME: (Sub-system) THE HYDRAULIC POWER PACKAGE

DWG. NO./REV.: 620578-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2.7	(cont'd) DIRECTIONAL CONTROL VALVE	b) No further hazardous modes detected in the normally maintained system.							Yes	III	E	b) Periodic inspections, checks and maintenance drills will keep this component in good operational condition.
1.2.8	PIPING ASSEMBLY 620582-1 shows and specifies the pipes and tubings with their connections, filters, check valves and attaching parts, as needed for the Hydraulic Power Package.											
1.2.8.1	FILTER ELEMENT 620582-6, for filter enclosure 516965-1, is the Vickers' Part Number 361739 (Vickers Div. of SPERRY RAND). This filter is in the Hydraulic Pumps' Suction, good for 149 micron filtration according to 518896.	Possible damage to the H. Pumps due to inadequate filtering.				x		x	Yes	II	C	• RECOMMENDATION: Re-evaluate the filtering arrangement and specify the correct filter element for 620582-6. (Same recommendation as that in item 1.2.2).

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

NAEC-91-7958

TABLE: UNIT 3A2

NAME: (Sub-system) THE HYDRAULIC POWER PACKAGE

DWG. NO./REV.: 620578-1

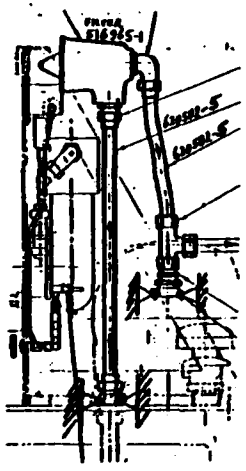
ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON:						FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			PERSONNEL		SYSTEM		MISSION					
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2.8.2	FILTER 518897-1 with its FILTER ELEMENT 424337-1 (possibly SCHROEDER BROS. CORP DF-30-1CC10) provides filtering of the Hydraulic Fluid to 10 microns, and has a by-pass valve and the pointer Dirt Alarm.	Possibility of the by-pass valve being open and letting some unfiltered H. Fluid to flow to the Directional Control Valve. NOTE: The visible Dirt Alarm pointer could be over-looked!				x		x	Yes	III	D	Periodic inspections, checks and maintenance drills will prevent this failure mode to develop (by replacing the Filter Element before opening the by-pass valve). However, we present the following, due to the possibility of the human forgetfulness: • RECOMMENDATIONS: a) Provide also electrical Dirt Alarm (available in this line of filters). b) Provide enough room for easy/quick replacement of the Filter Element. c) Show the Dirt Alarm pointer and scale of this Filter on the assembly drawings: 620582-1 (Piping Assy) & 620578-1 (Hydraulic Power Package).

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 3A2

NAME: (Sub-system) THE HYDRAULIC POWER PACKAGE

DWG. NO./REV.: 620578-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON:						FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			PERSONNEL		SYSTEM		MISSION					
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2.8.3	TUBING 620582-5 with the FILTER 516965-1 forms a relatively heavy and extended subassembly, held at two points. See sketch: 	Possibility of cracks at the lower end(s) of the tubings, due to induced vibrations -- the cracks would produce leaks (air into the H. Pump Suction while the Pump is running, and causing a discontinuity in the suction column when the Pump is not running).				x		x	Yes	II	B	• RECOMMENDATION: Provide a tie between the upper end (the Filter 516965-1) and the Support Frame 620581-1 to eliminate or greatly reduce the vibration of the Filter.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 3A2

NAME: (Sub-system) THE HYDRAULIC POWER PACKAGE

DWG. NO./REV.: 620578-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON:						FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			PERSONNEL		SYSTEM		MISSION					
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2.9.0	ELECTRICAL INSTALLATION, 620583-1 shows and specifies the electrical connections (cables), as well as it provides the wiring diagram for the Hydraulic Power Package 620578-1.											COMMENT: In the Note 5, the single tie intervals on the Harnesses are specified as 1 (one) inch, and in the wire break-outs even closer intervals. This seems to be too tight! It is believed that 3 to 6 inches could be all-right, and tighter in the wire break-outs.
1.2.9.1	ELECTRICAL MOTOR STARTER, 518910-1 provides the starting/stopping of the Electric Motor/H. Pump. It is equipped with protections (under-voltage, motor overload and pilot circuit) and a timer (set for three minutes - which is ample time, considering the HUD is lifted in about 60 seconds).	No problems expected in a reasonably-cared-for assembly.							Yes	III	D	There is a redundant arrangement: Air Motor + Hydraulic Pump.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

(Failure Modes & Effects Analysis - System) Safety Analysis MK1 MOD 0 LSO-HUD Console System

TABLE: UNIT 3A2

NAME: (Sub-system) THE HYDRAULIC POWER PACKAGE

DWG. NO./REV.: 620578-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2.9.2	ELECTRIC MOTOR, 518894-1, is a 440VAC, 60Hz, 3-phase, 10HP at 1160RPM full-load, 14 amp., motor for driving the H. Pump. It has an explosion-proof enclosure and class F insulation.								Yes	III	D	No problem detected that would develop in a normally well-maintained assembly.
1.2.9.3	JUNCTION BOX ASSEMBLY, 518918-1, provides the housing for terminal boards TB1 & TB2 and the entry/exit for the electrical harnesses/cables: 620583-3 (from the Directional Control Valve) and 620583-4 (from the pressure switch).	Possibility of the insulation of the cables to be cut by the edges of the 1.010 and 1.135 dia. openings. Also, the possibility of contamination entering through these openings around the cables (harnesses)		x		x		x	No	III-II	C	The stuffing arrangement (for the two openings of the Junction Box Assembly for the two cables/harnesses, to avoid the damage to the insulation and to keep the Box water-tight) is specified on interconnecting Cable Diagram 620754.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

NAEC-91-7958

(FAILURE MODES & EFFECTS ANALYSIS - SYSTEM) SAFETY ANALYSIS MK1 MOD 0 LSO-HUD CONSOLE SYSTEM

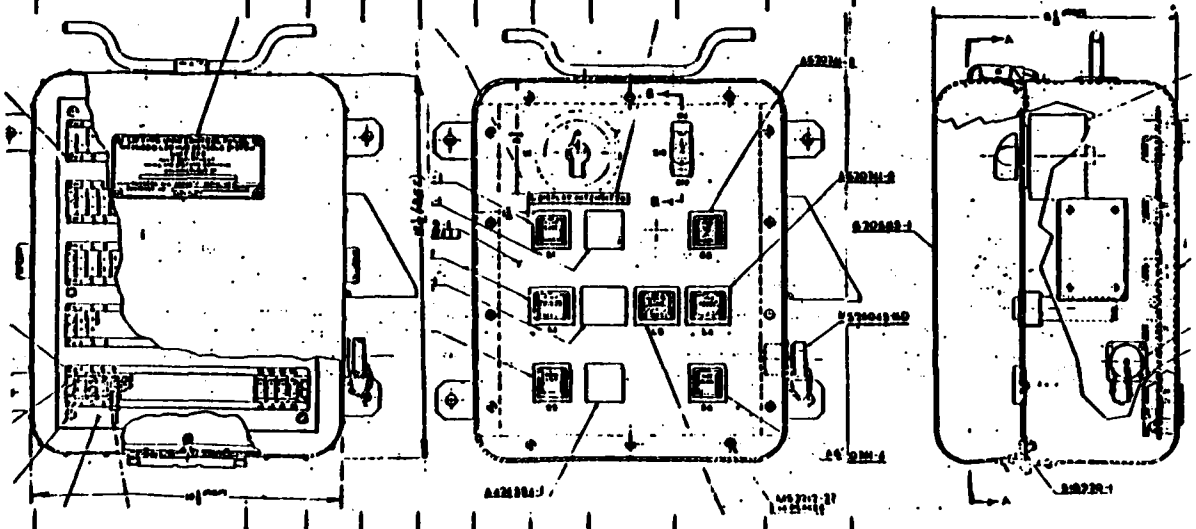
NAEC-91-7958

TABLE: UNIT 3A3

NAME: (Sub-system) CONTROL PANEL ASS'Y

DWG. NO./REV.: 620587-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.3.0	CONTROL PANEL ASSEMBLY (Unit 3A3), dwg. 620587-1, contains several Terminal Boards (five) inside and several Switch-Indicators on the Display Panel for the remote operating of the Console System. There is also a Display Intensity Transformer.											



NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

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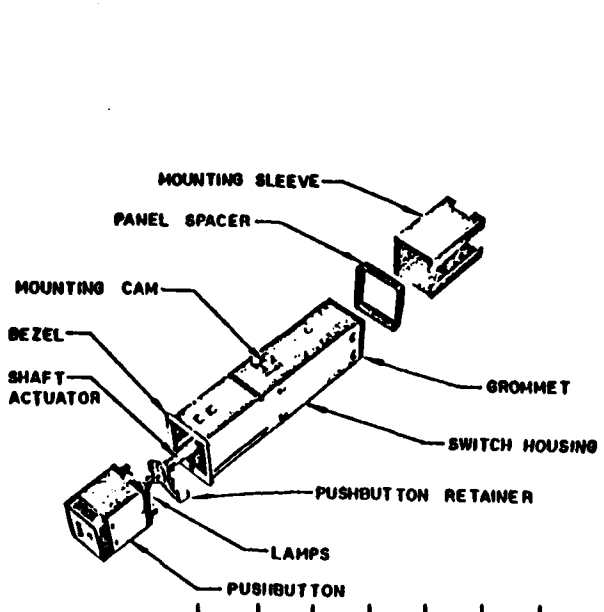
NAEC-91-7958

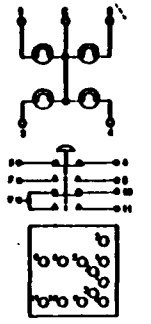
TABLE: UNIT 3A3

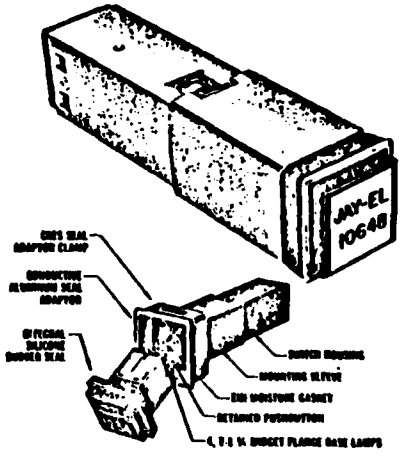
NAME: (Sub-system) CONTROL PANEL ASS'Y

DWG. NO./REV.: 620587-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	PERSONNEL INJURY	SYSTEM LOSS	SYSTEM DAMAGE	MISSION LOSS	MISSION POTENTIAL LOSS	FAILURE - HAZARD DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.3.1	VARIABLE TRANSFORMER 518917-1 (V1 on the Electrical Schematic Diagram 620580), mounted on the Control Panel Ass'y, serves to adjust, manually, the Display Intensity of the lights on the Control Panel.								Yes	III	D	No problems expected in a well-maintained System.
1.3.2.	SWITCH-INDICATOR(s) A620741-X, mounted individually on the Control Panel, are basically the JAY-EL P/N 10648 as shown in the sketches at the right, and serve to switch and indicate by light the various electrical circuits of the System. Refer to the ELECTRICAL SCHEMATIC DIAGRAM 620580, a reduced copy of which is on the next page.											







SPLASH PROOF INTEGRAL SEAL

Tested to Splash proof, MIL-STD 108. High Shock to MIL-S-901C. Seal is integral to the pushbutton. It does not cover face of pushbutton.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

NAEC-91-7958

(FAILURE MODES & EFFECTS ANALYSIS - SYSTEM) SAFETY ANALYSIS MK1 MOD 0 LSO-INUD CONSOLE SYSTEM

NAEC-91-7958

TABLE: UNIT 3A3

NAME: (Sub-system) CONTROL PANEL ASS'Y

DWG. NO./REV.: 620587-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.3.2	(cont'd) SWITCH-INDICATOR											

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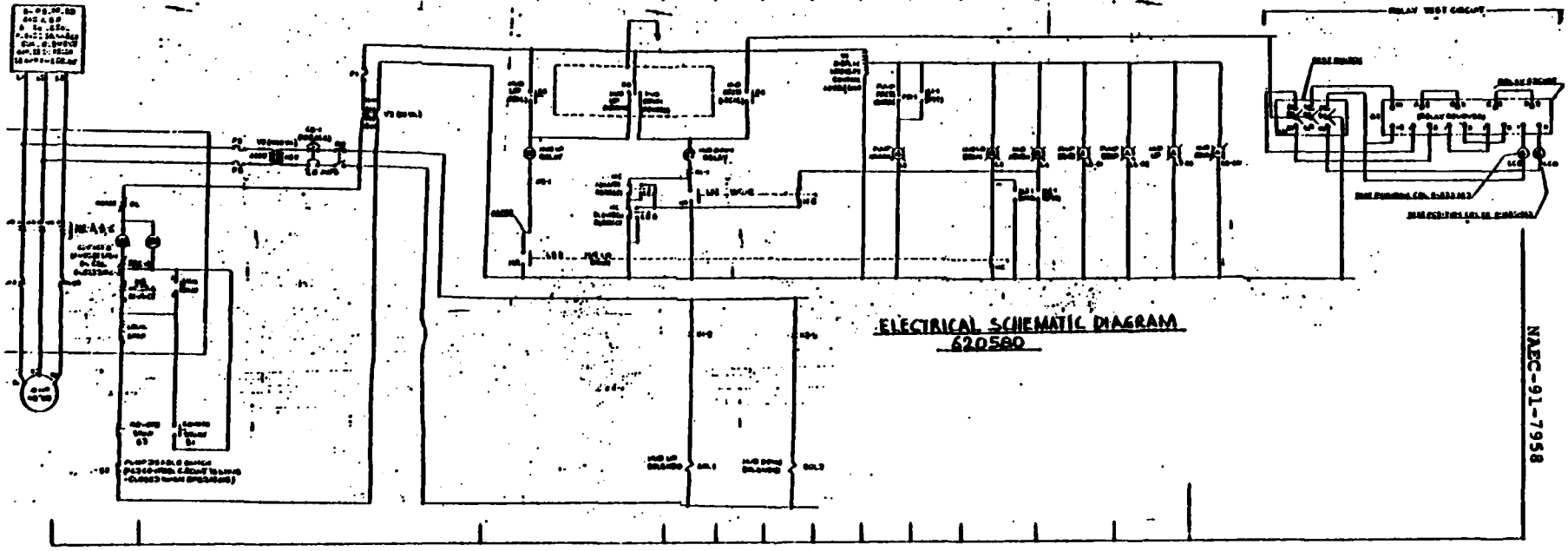
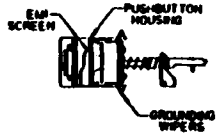


ELECTRICAL SCHEMATIC DIAGRAM
620580

NAEC-91-7958

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.3.2.0	(cont'd) SWITCH-INDICATOR A620741-x	Possibility of the static electricity discharges between the Push-Button and the Switch Housing (ground), that could cause "glitches" on the test screen or record tape. Some of these could cause a considerable time loss in the Failure verification/analysis effort.							Yes	IV	C	There is no real Safety Hazard in this possible "failure mode." However, it would seem reasonable to provide the grounding, using the Switch-Indicators with the EMI shielding, which the manufacturer can provide.  **EMI SHIELDING** Welded 302 stainless steel grounding wipers provide chassis ground for EMI.

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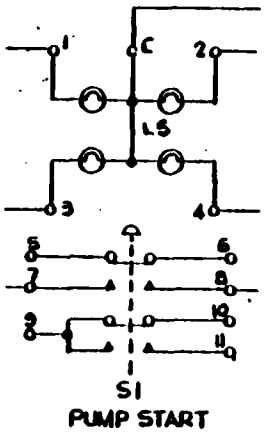
NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 3A3

NAME: (Sub-system) CONTROL PANEL ASS'Y

DWG. NO./REV.: 620587-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.3.2.1	SWITCH-INDICATOR A620741-1 (L5-S1) "Pump Start" has an Amber light. 	a) One lamp fails (burns out).							Yes	IV	C	No problem! There are four lamps, individually wired, which is a good arrangement. Also, the replacement of the lamp is a simple manner. Can be performed quickly without tools.
		b) One lamp fails (its electric connection opened).							Yes	IV	D	No real problem even if it does occur. Periodic checks and maintenance drills will prevent or repair these remote failures.
		c) All four lamps fail (open in the common line).							Yes	IV	D	Hardly any real problem, even if this failure occurred just before (during?) the actual operation, because the hydraulic pressure will indicate that the Pump is running. (Green light L1 "PUMP RUNNING") NOTE: This light is only for the switch button location.

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NAEC-91-7958

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 3A3

NAME: (Sub-system) CONTROL PANEL ASS'Y

DWG. NO./REV.: 620587-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.3.2.1	(cont'd) SWITCH-INDICATOR A620741-1 (L5-S1) "PUMP START"	d) Switch fails (open in the line of contacts 7-8) (non-conductive contamination between contacts).							Yes	III	C	There is a redundant arrangement to start the Pump: the local start. No problems are expected in a well-maintained/serviced System.
		e) Switch fails (short between contacts 7-8).							Yes	III	D	The Pump would momentarily stop when the PUMP STOP switch would be pressed (L6-S2), but it would restart immediately upon releasing the finger pressure on the L6-S2 switch. In short: the Pump could not be switched off by a normally-provided switch. However, it could be stopped by the main switch (S10). It is expected that the Operation Manual will have the emergency procedures, like this one, properly explained.

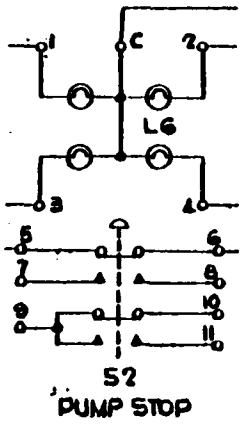
NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

NAEC-91-7958

TABLE: UNIT 3A3

NAME: (Sub-system) CONTROL PANEL ASS'Y

DWG. NO./REV.: 620587-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.3.2.2	SWITCH-INDICATOR A620741-2 (L6-S2) "PUMP STOP" has an Amber light. 	a) One Lamp fails (burns out).							Yes	IV	C	No problem! There are four Lamps, individually wired, which is a good arrangement. Also, the replacement of the Lamp is a simple manner, can be performed quickly without tools.
		b) One Lamp fails (its electric connection opened).							Yes	IV	D	No real problem even if it does occur. Periodic checks and maintenance drills will prevent or repair these remote failures.
		c) All four Lamps fail (open in the common line).							Yes	IV	D	Hardly any real problem, even if this failure occurred just before (during?) the actual operation, because the hydraulic pressure will indicate that the Pump is running or that it stoppdd. (Green light L1 "PUMP RUNNING") NOTE: See 1.3.2.1.c., column 13.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 3A3

NAME: (Sub-system) CONTROL PANEL ASS'Y

DWG. NO./REV.: 620587-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.3.2.2	(cont'd) SWITCH-INDICATOR A620741-2 (L6-S2) "PUMP STOP"	d) Switch fails (open in the 5-6 contacts or line).						x	Yes	III	C	The Pump cannot be started. There is the PUMP DISABLE SWITCH (S-7) that allows the checkout of the circuitry of the PUMP, and, therefore, it is expected that any such failure as contemplated would be quickly discovered, localized and corrected.
		e) Switch fails (short between contacts 5-6).							Yes	IV	D	No real problem, even though the Pump cannot be stopped by pressing on this Switch-Indicator while this failure is present. There are other means to stop the Pump running (the LOCAL STOP SWITCH and the MAIN SWITCH S-10).

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

HAEC-91-7958

TABLE: UNIT 3A3

NAME: (Sub-system) CONTROL PANEL ASS'Y

DWG. NO./REV.: 620587-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON:						FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			PERSONNEL		SYSTEM		MISSION		DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.3.2.3	SWITCH-INDICATOR A620741-3 (L7-S5) "HUD UP," has an Amber light and serves for diverting the hydraulic fluid flow under the Piston of the Hydraulic Cylinder and, therefore, for lifting the HUD up to its operational mode (contacts connections are typical to the L5-S1, see item 1.3.2.1).	a) One Lamp fails (burns out).							Yes	IV	C	No problem! There are four Lamps, individually wired, which is a good arrangement. Also, the replacement of the Lamp is a simple manner - can be performed quickly without tools.
		b) One Lamp fails (open in the electrical circuit).							Yes	IV	D	No real problem even if it does occur. Periodic checks and maintenance drills will prevent or repair these remote failures.
		c) All four Lamps fail (open in Common line).							Yes	IV	D	Hardly any real problem, even if this failure occurred just before (during?) the actual operation, because the HUD would be seen to be raising. NOTE: See 1.3.2.1.c, column 13.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 3A3

NAME: (Sub-system) CONTROL PANEL ASS'Y

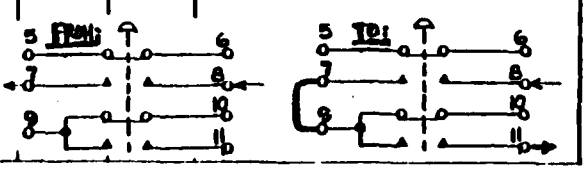
DWG. NO./REV.: 620587-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.3.2.3	(cont'd) SWITCH-INDICATOR A620741-3 (L7-S5) "HUD UP"	d) Switch fails (open in the 7-8 contacts on line).							Yes	III	C	The HUD cannot be raised by this local" switch. There is a redundant arrangement in the "remote" Switch S8, which could be used in such a case.
		e) Switch fails (short between contacts 7-8).							Yes	III	D	The HUD cannot be lowered. It is a remote probability that this failure would occur, and it would represent a hazard only if there would be another particular or unfavorable condition, as for instance a storm coming that would not allow the quick failure repair. It is believed that the probability of this to occur is low enough (to accept the risk) particularly in a well-maintained System.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

NAEC-91-7958

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.3.2.4	SWITCH-INDICATOR A620741-4 (L8-S6) "HUD DOWN," has an Amber light and serves for diverting the hydraulic fluid flow above the Piston and so to lower the HUD (contact connections are typical to the L5-S1 - see item 1.3.2.1).	a) One or up to all four Lamps failing to illuminate.							Yes	IV	C	No real problem, thanks to the redundancy built in. See the reasoning in item 1.3.2.3, a, b, and c, column 13.
		b) Switch fails (open in the 7-8 contacts or line).							Yes	III	C	The HUD cannot be stowed by this "local" switch. However, there is a redundant arrangement in the "remote" Switch S8, which could be used in such a case, or directional control valve can be manually operated.
		c) Switch fails (short between contacts 7-8).	x	x	x	x	x	x	Yes	III	D	The HUD cannot be raised with this failure. This would represent a problem if the HUD would be needed in a hurry, because the Air Motor and manual operation of Directional Control valve would have to be used with the electr. power off. • RECOMMENDATION: Provide a redundancy by connecting the contacts.



NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

(Failure Modes & Effects Analysis - System) Safety Analysis MK1 MOD 0 LSO-HUD Console System

TABLE: UNIT 3A3

NAEC-91-7958

NAME: (Sub-system) CONTROL PANEL ASS'Y

DWG. NO./REV.: 620587-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON:						FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			PERSONNEL		SYSTEM		MISSION		DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.3.2.5	SWITCH-INDICATOR A620741-7 (L1) "PUMP RUNNING," has a Green light and serves to indicate that the Pump is running. Really, this light indicates the closure of contacts in the Pressure Switch (item 1.2.4, Table "b"), which will close, normally, if the Pump is running and delivering the Hydraulic Fluid which would be under pressure. The switch is wired identically to the A620741-1 (L5-S1), and serves to check on the L1 light (PTT-L1): "Press to Test the L1."	a) One or up to all four Lamps failing to illuminate.							Yes	IV	C	No real problem, thanks to the redundancy built in. In case of all four Lamps failing, the Pump's delivered pressure can be read on the Pressure Gauge.
		b) Switch fails (open in the 7-8 contacts or line).							Yes	IV	C	No real problem. There is a redundant arrangement to check on the Pump's functioning: the Pressure Gauge on the Panel of the Hydraulic Power Package.
		c) Switch fails (short between the contacts 7-8).							Yes	III	D	The Green light would come on as soon as the System is turned on, even before the Pump would start working. This inconvenient (failing) situation would be quickly repaired.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.3.2.6	SWITCH-INDICATOR A620741-8 (L3) "HUD LID DOWN," has a Red light and serves to indicate that the HUD LID is down, and, therefore, the HUD Ass'y cannot be raised. The Switch is wired identically to the A620741-1 (L5-S1), see item 1.3.2.1, and serves to check on the L3 light (PTT-L3): "Press to Test the L3."	a) One or up to all four Lamps failing to illuminate.							Yes	IV III	C D	No problem with up to three Lamps failing, due to the four-fold redundancy. In case of all four Lamps failing, again there would be no danger that the HUD Ass'y could be raised, thanks to the interlock (LS3).
		b) Switch fails (open in the 7-8 contacts or line).							Yes	IV	C	Normally, there is no need to check on this light, since it is "on" when the System is "on" and the HUD Lid is down. This check would be needed in case the Normally Closed contacts of the LS3 "HUD LID DOWN" Switch would be failing open (troubleshooting). The probability of both of these failures at the same time is very remote).
		c) Switch fails (short between the contacts 7-8).							Yes	III	D	The warning Red light L3 would stay on even with the HUD LID raised, which would call for a quick failure isolation and repair.

175(A-LS9)

NAEC-91-7958

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 3A3

NAME: (Sub-system) CONTROL PANEL ASS'Y

DWG. NO./REV.: 620587-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.3.2.7	SWITCH-INDICATOR A620741-9 (L4) "HUD ASKEW," has a Red light and serves to indicate that the HUD Ass'y is not aligned for its lowering. The switch is wired identically to the A620741-1 (LS-S1) - see item 1.3.2.1, and serves to check on the L4 light (PTT-L4): "Press to Test the L4."	a) One or up to all four Lamps failing to illuminate.							Yes	IV	C	No problems with up to three Lamps failing, due to the four-fold redundancy.
										III	D	In case that all four Lamps would fail to illuminate, there would be no real danger to the assembly, thanks to the interlock built in the Limit Switch LS2.
		b) Switch fails (open in the 7-8 contacts or line).							Yes	III	C	This failure in the System check-out procedure would represent only a light delay.
						(x)		(x)	No	II - III	E	It might become of importance, but only in connection with other failures (LS2- Normally Closed contacts would open and LS2 - Normally Open contacts would be closed) - extremely improbable.
		c) Switch fails (short between the contacts 7-8).								III	D	The warning Red light L4 would stay on even with the HUD askew, which would call for a quick failure isolation and repair.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

NAEC-91-7958

TABLE: UNIT 3A3

NAME: (Sub-system) CONTROL PANEL ASS'Y

DWG. NO./REV.: 620587-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON:						FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			PERSONNEL		SYSTEM		MISSION					
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.3.3	TOGGLE SWITCH MS27735-22 (S10) is a two-pole switch that serves to switch the HUD Console System on and off. It is properly guarded with the Switch Guard MS25224-3.	No problems foreseen.							Yes	III	D	

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

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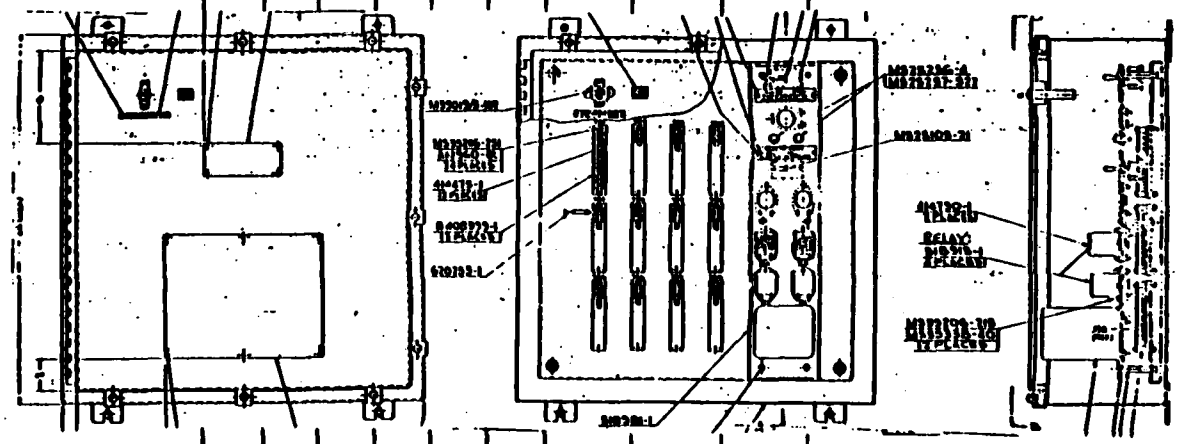
TABLE: UNIT 3A4

NAME: (Sub-system) CENTRAL JUNCTION BOX ASS'Y

DWG. NO./REV.: 620739-1

NAEC-91-7958

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.4.0	CENTRAL JUNCTION BOX ASSEMBLY (Unit 3A4), dwg. 620739-1, contains several Terminal Boards, Relays, Indicator Lights, the V2 Transformer, Circuit Breaker, Fuse and Toggle Switch. It provides the central interconnection of the six harnesses: W203 (Transformer, Unit 3A5); W204 and W216 (Junction Box, Unit 3A2A5); W208 and W217 (Control Panel, Unit 3A3); and W210 (Limit Switch Junction Box, Unit 3A6).											



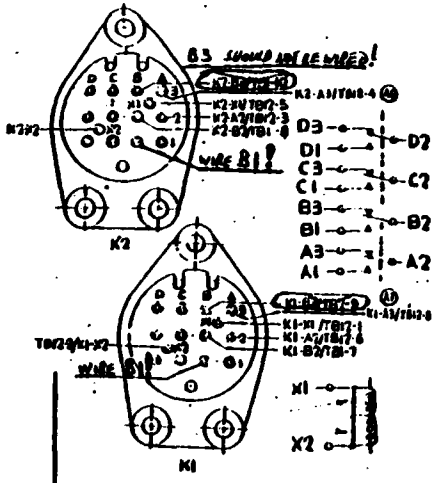
NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 3A4

NAME: (Sub-system) CENTRAL JUNCTION BOX ASS'Y

DWG. NO./REV.: 620739-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.4.1	RELAY 518915-1 (K1 & K2 and two spares plugged in: K3 & K4), with coil operating voltage: 28VAC, 60Hz, 1 phase; coil operating current: 0.55 Amperes max. Contact load rating per pole: 10 Amp. resistive, 6 Amp conductive at 120VAC, 60Hz. Minimum current: 0.04 Amp RMS, ½ wave rectified. See Electrical Schematic Diagram 620580 for connections.	K1-Head-Up-Relay: K2-Head-Down-Relay a) The coil (K1-X2) is interrupted ("an open").	This Relay serves to prevent the operation of the HUD Down Solenoid SOL2 by opening its Normally Closed contacts "A" (from A2/A3 to A2/A1) and to allow the operator of the HUD Up Solenoid SOL1 by closing its Normally Open Contacts: "B" (from B2/B1 to B2/B3), when HUD UP command is executed. Similarly, this Relay serves to prevent the operation of the HUD Up solenoid SOL1 by opening its NC contacts "A" (from A2/A3 to A2/A1) and to allow the operation of the HUD Down Solenoid SOL2 by closing its NO contacts "B" (from B2/B1 to B2/B3), when HUD DOWN command is executed.				(x)	Yes	III	D	There is a low probability that this would occur just when the HUD would have to be raised. And even for such a case, there is a clever design arrangement of having a spare Relay handy just above the failed one, and the replacement by plugging in is a matter of a moment. Similarly for lowering, except the time pressure would be somehow lower.



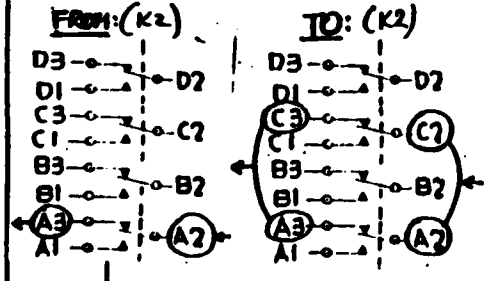
NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 3A4

NAME: (Sub-system) CENTRAL JUNCTION BOX ASS'Y

DWG. NO./REV.: 620739-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	PERSONNEL INJURY	SYSTEM LOSS	SYSTEM DAMAGE	MISSION LOSS	MISSION POTENTIAL LOSS	FAILURE - HAZARD DETECTABLE BY OPERATOR?	FAILURE - HAZARD CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.4.1	(cont'd) RELAY 518915-1	b) NC contacts A fail to make contact.										
		i) In K1: This would result in the failure to lower the HUD when needed.							Yes	III	C	The periodic inspections, maintenance drills and the ease of the replacement of the failed relay, designed in the System, will greatly reduce the probability of occurrence and the time to repair.
		ii) In K2: This would result in the failure to raise the HUD when needed.	(x)	(x)	(x)	(x)	(x)	(x)	Yes	(I-II)	C	This could result in a serious problem (signs in parentheses). However, it is expected that the Operational procedures (to raise the HUD with time to spare), together with the ease of the repair/replacement of the failed Relay, will result in a considerably reduced problem (signs without parentheses).
								x	Yes	III	C	But there is a simple, inexpensive way to produce a redundancy against this failure: • RECOMMENDATION: Wire the K2 Relay according to the circuit diagram at left.

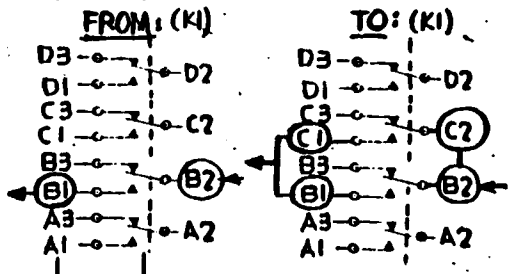


NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

NAEC-91-7958

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL: LIVES	EFFECT ON: PERSONNEL: INJURY	EFFECT ON: SYSTEM: LOSS	EFFECT ON: SYSTEM: DAMAGE	EFFECT ON: MISSION: LOSS	EFFECT ON: MISSION: POTENTIAL LOSS	FAILURE - HAZARD: DETECTABLE BY OPERATOR?	FAILURE - HAZARD: CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD: PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.4.1	(cont'd) RELAY 518915-1	c) NC contacts B fail to make contact in K1 and in K2: No problem, they are not wired.										No problem - these contacts are not wired. (What is not wired is the pin B3 in both Relays.) NOTE: There is an error on the sketch of the K1 and K2 pin connections in the dwg. 620753-1 "Wiring Ass'y," location 4 and 5-A. See corrected sketch in Item 1.4.1, page 2 of this Table.
		d) NO contacts A fail to make contact in K1 and in K2.										
		e) NO contacts B fail to make contact when needed.										
		i) In K1 - would result in failure to raise the HUD.	(x)	(x)	(x)	(x)	(x)	(x)	Yes	(I-II)	C	This could result in a serious problem. However, it is believed that the design and the Operation and Maintenance procedures will reduce this potential problem (signs in parentheses) into a practically and easily manageable task of raising the HUD ahead of time and, if needed, replacing the failing Relay. (signs without the parentheses). But there is a simple, inexpensive way to produce a redundancy against this failure:
								X	Yes	III	C	

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.4.1	(cont'd) RELAY 518915-1											• RECOMMENDATION: Wire the K1 Relay as follows: 
		ii) In K2: would result in failure to lower the HUD.							Yes	III	C	No real problem. When the HUD is commanded down, there is usually more time to localize the failure and to replace the failing Relay, which is nicely provided for in the design.
		f) Short between NC contacts A in K1 and in K2: this would result in a possibility of an inadvertent countercommand by pressing the local switch S5 or S6.							Yes	III	E	Extremely improbable: This situation would require two failures to occur simultaneously. (Failure in the Relay and a failure of someone pressing the "wrong" switch).

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.4.1	(cont'd) RELAY 518915-1											
		g) Short between NC contacts B, in K1 or K2.										No problem: the NC contacts B are not wired (what is not wired in the B3 pin).
		h) Short between NO contacts A.										No problem: the NO contacts A are not wired (A1 pins not wired).
		j) Short between NO contacts B										
		i) In K1: this would result in raising the HUD as soon as the Pump would start running, and it could not be lowered.				x			Yes	III	D	No real problem is expected to develop because of this possible failure mode, thanks to the anticipated timely check-out of the System and the ease with which the failed Relay would be localized and replaced.
		ii) In K2: this would result in the failure to raise the HUD.	(x)	(x)	(x)	(x)	(x)	(x)	Yes	(I-II)	D	This could result in a serious problem (signs in parentheses). However, it is expected that the System check-out procedures and the ease of finding and replacing the failing Relay will reduce the problem considerably (signs without parentheses). But, there is a simple and inexpensive way to design in a redundancy against this failure:
								x	Yes	III	D	

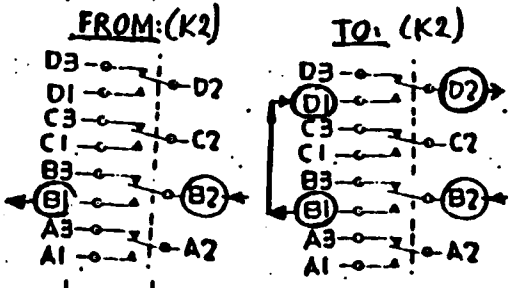
NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

NAEC-91-7958

TABLE: UNIT 3A4

NAME: (Sub-system) CENTRAL JUNCTION BOX ASS'Y

DWG. NO./REV.: 620739-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.4.1	(cont'd) RELAY 518915-1	j) ii) (cont'd)										• RECOMMENDATION: Wire the K2 Relay as shown in the sketch below: 

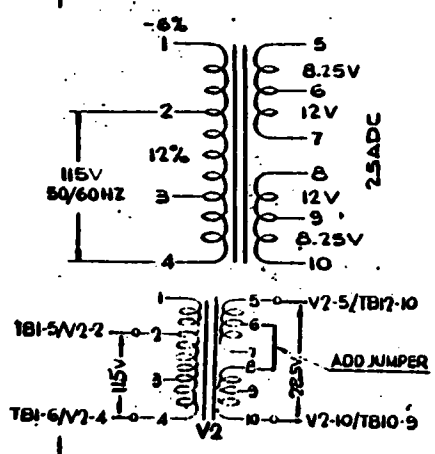
NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

NAEC-91-7958

TABLE: UNIT 3A4

NAME: (Sub-system) CENTRAL JUNCTION BOX ASS'Y

DWG. NO./REV.: 620739-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.4.2	TRANSFORMER 518984-1 (V2), with the primary and secondary windings as shown in the schematic diagrams shown here (the component and as wired in):  This V2 Transformer serves to provide the "28VAC" for the Switch-Indicators and the Relays.	No problem foreseen.									No problems foreseen, thanks to the designed-in protection.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 3A4

NAME: (Sub-system) CENTRAL JUNCTION BOX ASS'Y

DWG. NO./REV.: 620739-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON:						FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			PERSONNEL		SYSTEM		MISSION					
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.4.3	CIRCUIT BREAKER M39019/3-107 (CB1) provides the line protection between the V3 and V2 Transformers (the 115VAC side).	No problem foreseen.							Yes	III	E	No problems foreseen.
1.4.4	TOGGLE SWITCH MS25105-21 (SRT) is a three-pole switch used for the Relay Test Circuit switching on/off.								Yes	IV	D	
1.4.5	TOGGLE SWITCH MS25105-23 (S7) is a three-pole switch used for the Pump Disable function (for the testing purposes).								Yes	IV	D	
1.4.6	INDICATOR (Light) MS25256-4 (LCE, LCD), Green light, with two Lamps each, is used to check the Relay with the coil energized and de-energized.								Yes	IV	D	

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

NAEC-91-7958

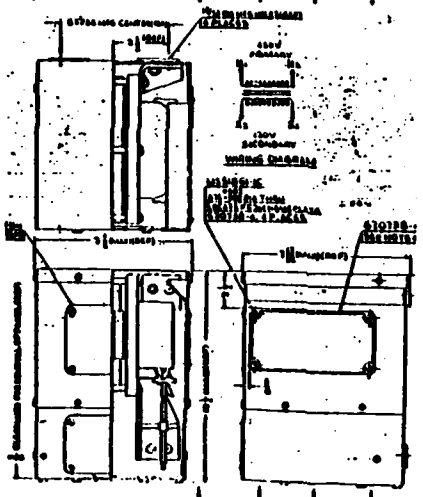
(FAILURE MODES & EFFECTS ANALYSIS - SYSTEM) SAFETY ANALYSIS MK1 MOD 0 LSO-HUD CONSOLE SYSTEM

TABLE: UNIT 3A5

NAEC-91-7958

NAME: (Sub-system) TRANSFORMER ENCLOSURE

DWG. NO./REV.: 518928-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.5.0	TRANSFORMER ENCLOSURE 518928-1 (Unit 3A5) contains the V3 Transformer 518928-2, which provides the step-down transformation of the ship's 440VAC to 115VAC used in the HUD System. It is a 1.0KVA, 60Hz unit, bulkhead mounted. See sketch at right.											
1.5.1	TRANSFORMER 518928-2 (V3). It is protected from both sides: on the primary side 440VAC, there are Fuses F2 & F3, and on the secondary 115VAC side, there is the Circuit Breaker CB1.	No problem foreseen.							Yes	III	E	No problem foreseen.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

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NAEC-91-7958

(Failure Modes & Effects Analysis - System) Safety Analysis MK1 MOD 0 LSO-HUD Console System

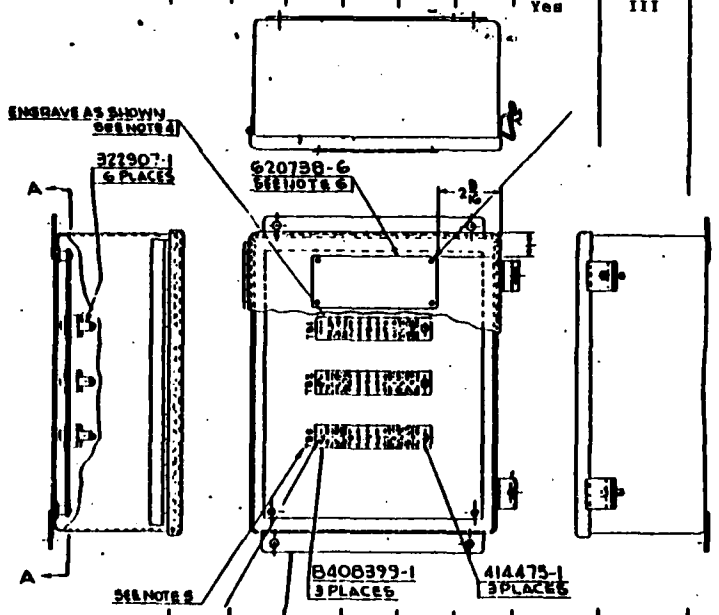
NAEC-91-7958

TABLE: UNIT 3A6

NAME: (Sub-system) LIMIT SWITCH JUNCTION BOX ASS'Y

DWG. NO./REV.: 518929-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.6.0	LIMIT SWITCHES JUNCTION BOX ASSEMBLY 518929-1 (Unit 3A6), contains three Terminal Boards for the connections of the ends of the Harnesses: W210 (from the Central Junction Box), W211 (Limit Switch LS1-HUD Down), W212 (LS2-HUD-Up), W213 (LS3-HUD Storage Lid On) and W214 (LS4 and LS5-HUD Align).								Yes	III	D	No problems foreseen in a well-assembled and checked-out assembly.



188(A-172)

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

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HAZARDS/FAILURE MODES AND EFFECTS ANALYSIS MK 1 MOD 0 LSO-HUD C--ETC(U)
MAR 80 F SEVCIK, G S FARBER, W S MANN N68335-78-C-2002
UNCLASSIFIED KTM-1327-01 NAEC-91-7958 NL

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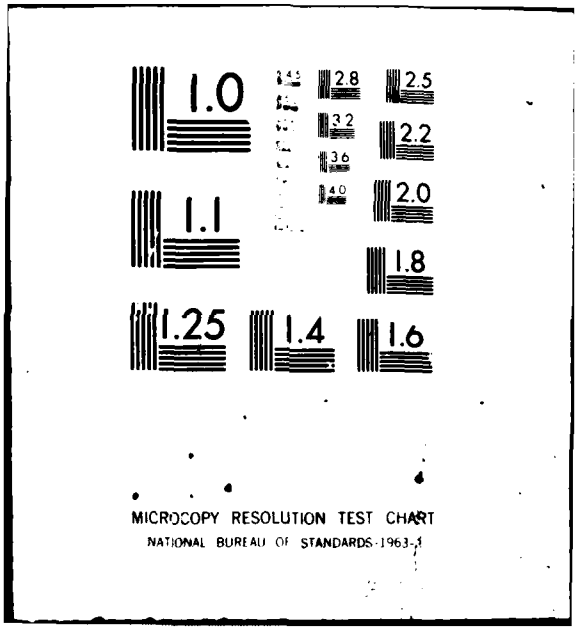
1.0
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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

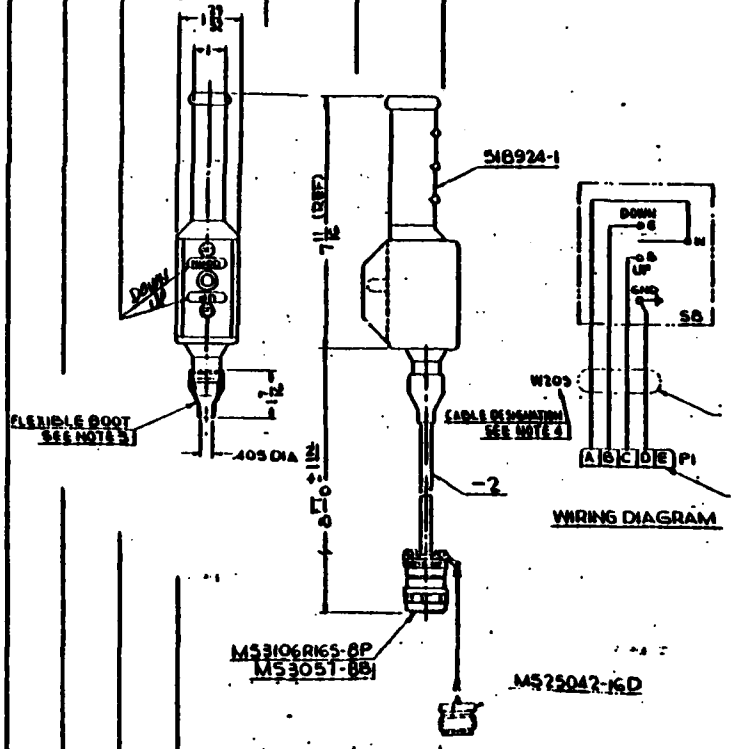
(Failure Modes & Effects Analysis - System) Safety Analysis MK1 MOD 0 LSO-HUD Console System

TABLE: UNIT 3A7 NAEC-91-7958

NAME: (Sub-system) PENDANT SWITCH ASS'Y

DWG. NO./REV.: 518925-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.7.0	PENDANT SWITCH ASSEMBLY 518925-1 (Unit 3A7), composed of the Pendant Switch 518924-1, cable, connector, etc., serves to operate the HUD Console System from a "remote" spot, enabling the operator the advantage of a freedom of movement and observation. This is the S8 switch on the Schematic Diagram 620580. It rests on the Pendant Switch Bracket 518926-1 (which is attached to the Enclosure Ass'y 620586-1 of the Control Panel Ass'y 620587-1 (Unit 3A3)) when not in use .											



1894(A-173)

NAEC-91-7958

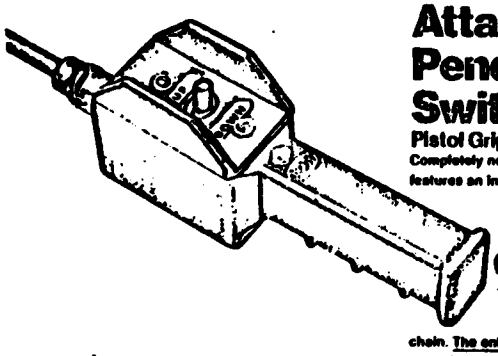
NOTES: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 3A7

NAME: (Sub-system) PENDANT SWITCH ASS'Y

DWG. NO./REV.: 518925-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.7.1	PENDANT SWITCH 518924-1 (S8) allows the operation (HUD UP and HUD DOWN) from a "remote" place.	a) "Open" in the switch - would result in the lack of response of the HUD Console System to raise/retract.							Yes	IV	C	A redundant provision is included in the design (the Switches S5 and S6). No problem would result.
		b) "Short" in the Switch (the contacts do not open when required) - would result in the HUD Console System "stuck" in the Up or Down position.	(x)	(x)	(x)	(x)	(x)	(x)	Yes	(I-II)	D	This could represent a serious problem, if the System would be needed to be raised (signs in the parentheses). However, it is expected that the raising of the System will be accomplished with some time before the actual need of it to allow for the check-out and a possible failure identification/localization and repair/replacement. (Operational and Maintenance Procedures.) Also, the Air Motor-H. Pump can be used!
								x	Yes	III	E	The problem then would be greatly reduced! (Signs without parentheses.)



Attachable Pendant Switches

Pistol Grip

Completely neoprene encased, this switch features an integral handle for easy one-hand operation of small hoists. The replaceable 250 Volt, 15 Amp., Up-Down-Off, toggle switch is available as either maintained or momentary contact. A reinforced eye on the switch cover permits attachment of an external strain chain. The entire assembly is weathertight and corrosion resistant for use anywhere.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

NAEC-91-7958

(Failure Modes & Effects Analysis - System) Safety Analysis MK1 MOD 0 LSO-HUD Console System

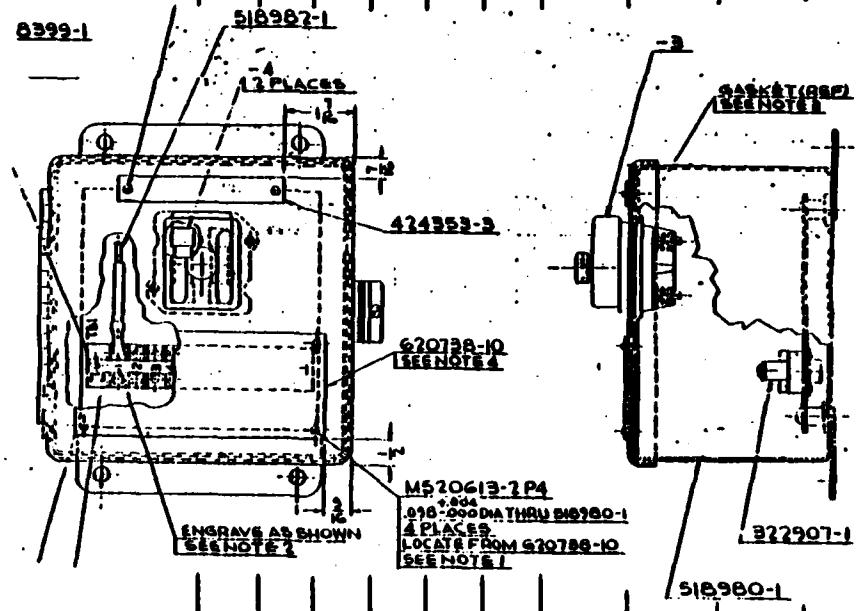
TABLE: UNIT 3A8

NAME: (Sub-system) FUSE BOX ASS'Y

DWG. NO./REV.: 620742-1

HAEC-91-7958

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.8.0	FUSE BOX ASSEMBLY 620742-1 (Unit 3A8), holds the two Fuses (F2 and F3) in the Fuseholder and contains a Terminal Board Ass'y; it is interconnected with: the Motor Starter (Harness W202), the Transformer Enclosure (W207), and the Central Junction Box (Harness W215).	No problems foreseen.							Yes	III	D	No problems foreseen in a well-maintained system.



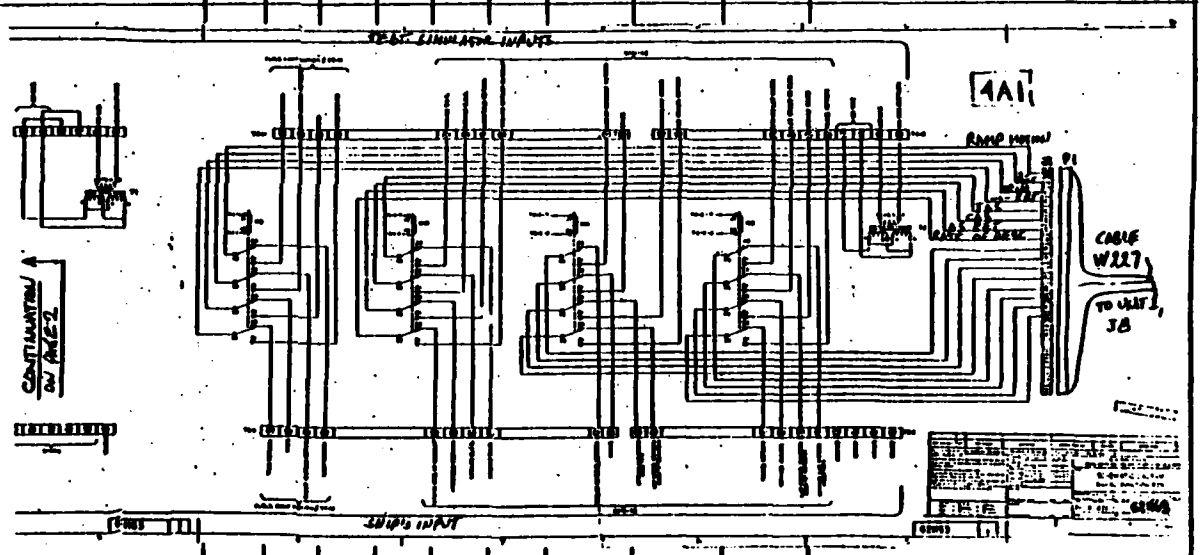
NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

(Failure Modes & Effects Analysis - System) Safety Analysis MK1 MOD 0 LSO-HUD Console System

TABLE: UNIT 4A1 NAEC-91-7958

NAME: (Sub-system) SIGNAL JUNCTION BOX

DWG. NO./REV.: 621173-1 (Schematic: 621163) (Wiring: 621164)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON:						FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			PERSONNEL		SYSTEM		MISSION					
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.0	The Signal Junction Box, located in the room area just below the console at the LSO platform, contains: 2 transformers for the Relay Power (115VAC to 28VAC), 12 Relays and a number of terminal strips. The Relays' Normally Closed Contacts (A3, B3, C3 and D3) are wired to the Ship's input signals. With the Test Simulator "plugged in" the Test Simulator Interface box (Unit 4A4) and the switch actuated, the 12 Relays of the Signal Junction Box will transfer to close the Normally Open contacts and thus the Test Simulator Inputs will be handled. See the Schematic Diagram at right (Relays in "Ship's Input Mode").											

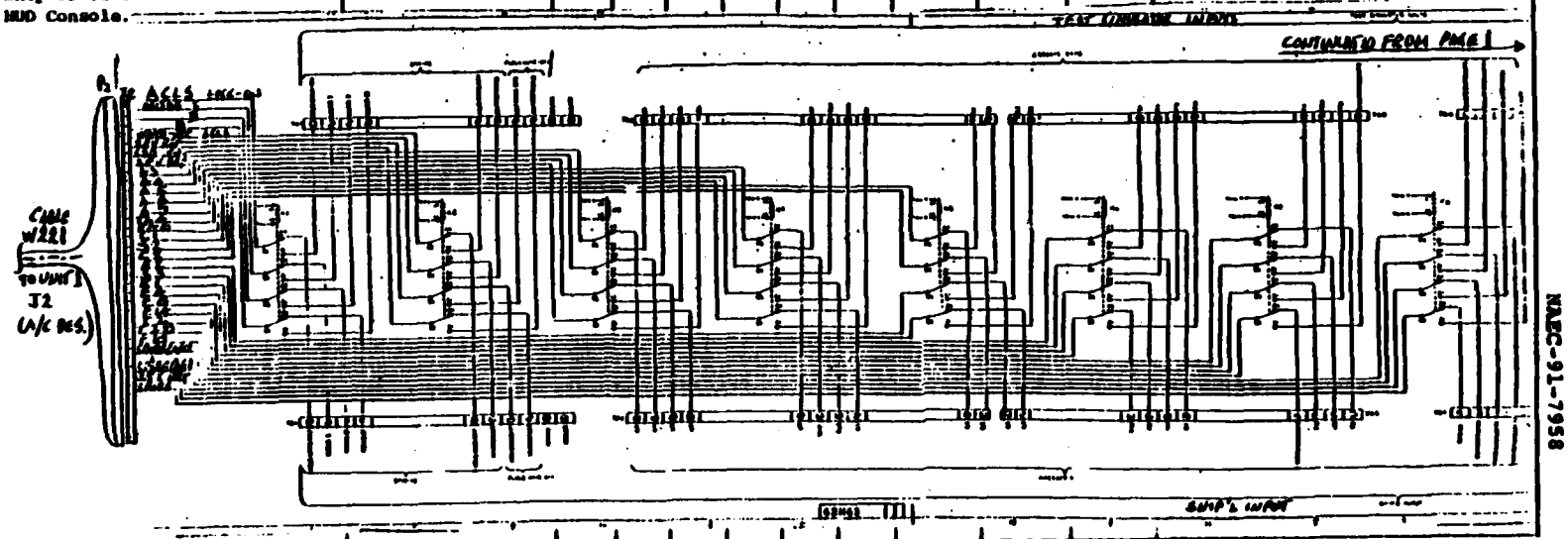
NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 4A1

NAME: (Sub-system) SIGNAL JUNCTION BOX

DWG. NO./REV.: 621173-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.0	(cont'd) The Signal Junction Box provides for the transfer of: • Aircraft type identification signals from the crosscheck system, • SPN-42 signals, • FLOLS wave-off signals, • Ramp motion and Ram trim signals from the FLOLS trim harmonization computer (all: Analogue or varying DC signals) from Ship or Test Simulator to the HUD Console.											



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NAEC-91-7958

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 4A1

NAME: (Sub-system) SIGNAL JUNCTION BOX

DWG. NO./REV.: 621173-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON:						FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			PERSONNEL		SYSTEM		MISSION		DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.1	Transformer 422977-1. Primary: 115VAC, 60Hz, 1 phase. Secondary: 28VAC, 5.00 Amp. Two of these provide the current to the coils of the 12 Relays of the Signal Junction Box: *Transformer T1 serves* the Relays K1 through K8; and Transformer T2 serves the Relays K9 through K12.	a) Transformer T1: i) Loss of the Primary power will cause the K1 through K8 reset to the ship's inputs modelosing the A/C designation for the Test Simulator input mode	-	-	-	-	-	-	Yes	III	D	Fail safe arrangement - good!
		ii) Loss of one of the two secondary windings function will cause the first eight Relays to return to, or stay in, the Normally Closed contacts that are in the Ship's mode.	-	-	-	-	-	-	Yes	III	D	

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

NAEC-91-7958

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.1	(cont'd) TRANSFORMER 422977-1	b) Transformer T2:										
		i) Loss of the Primary power will cause the Relays K9 through K12 to reset to the Ship's inputs mode-loosing the FLOLS Ramp Motion & Trim and the SPN-42 for the Test Simulator input mode.	-	-	-	-	-	-	Yes	III	D	Fail safe arrangement - good!
		ii) Loss of one of the two Secondary windings function will cause no apparent problem, since one winding will be enough to actuate the four Relays.	-	-	-	-	-	-	No	IV	D	Even if both of the Secondary windings' function would be lost, the result would be only to lose the Test Simulator input mode in the Ramp Motion & Trim and the SPN-42, returning the 4 Relays back to the Ship's input mode: fail safe arrangement.

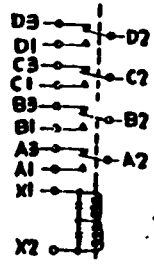
NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 4A1

NAME: (Sub-system) SIGNAL JUNCTION BOX

DWG. NO./REV.: 621173-1

HAEC-91-7958

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2	Relay 518915-1, socket mounted, 10 Amp, 4PDT; coil: 28VAC, 60Hz, Single phase, max-operating current 0.55 Amp; contact: max-10 Amp resistive, 6 Amp inductive load at 120 VAC, 60Hz. Minimum current to be 0.040 Amp RMS, ½ wave rectified. Twelve relays used for: SPN-42, FLOLS (W-off, Ramp Motion & Trim) & A/C Type Signals.  CIRCUIT DIAGRAM The Normally Closed (NC) contacts carry Ship's inputs, the Normally Open (NO) contacts are for the Test Simulator mode of operation.	a) K1											
		i) Open in the Coil - loss of ACLS Lock-On, Mode I, II & III Signals in the Test Simulator Mode.	-	-	-	-	-	-	Yes	III	C	GENERAL NOTE: Since the contacts of these Relays are assured for the minimum current of 40 m Amp, and 10 Amp max, there will be failures of the passage of the low current (40 mAmp or lower) after the 10A had gone through (in testing, for inst.). Considering that very low currents signals (30 micro/Amp!) will be handled in the System, the following is recommended: • RECOMMENDATION: Change the circuitry to assure the passage of the low current signals!!! (Current amplification?, solid state?)
		ii) Failure of the NO contacts to close upon actuation: A1- Loss of "ACLS Lock-On" in Test Sim. Mode	-	-	-	-	-	-	Yes	III	C	
		B1- Mode I Signal lost in T. Sim. Mode.	-	-	-	-	-	-	Yes	III	C	These are failures affecting check-out with the Test Simulator function. The easy fault identification and the part replacement will keep the System outage to the minimum.
		C1- Mode II Signal lost in T. Sim. Mode.	-	-	-	-	-	-	Yes	III	C	
		D1- Mode III Signal lost in T. Sim. Mode.	-	-	-	-	-	-	Yes	III	C	

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 411

NAME: (Sub-system) SIGNAL JUNCTION BOX

DWG. NO./REV.: 621173-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2	(cont'd) Relay 518915-1	a) K1 iii) Failure of the NC contacts to close upon deactuation:										
		A3- Loss of ACLS Lock-on in the ship's input mode.	-	-	-	-	-	-				
		B3- Loss of MODE I in the ship's input mode.	-	-	-	-	-	-	Yes	III	C	The Maintenance procedure will assure a quick restoration of these functions.
		C3- Loss of MODE II in the ship's input mode.	-	-	-	-	-	-				
		D3- Loss of MODE III in the ship's input mode.	-	-	-	-	-	-				

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 4A1

NAME: (Sub-system) SIGNAL JUNCTION BOX

DWG. NO./REV.: 621173-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2	(cont'd) Relay 518915-1	b) K2										
		i) Open in the Coil; loss of ACLS and LSO Wave-off in the Test Simulator Mode.	-	-	-	-	-	-	Yes	III	C	These are failures affecting check-out with the Test Simulator.
		ii) Failure of the NO Contacts to close upon actuation.										
		A1 or B1 - Loss of ACLS Wave-off.	-	-	-	-	-	-	Yes	III	C	
		C1 or D1 - Loss of LSO Wave-off, in the Test Simulator Mode.	-	-	-	-	-	-	Yes	III	C	

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

HAEC-91-7958

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2	(cont'd) Relay 518915-1	b) K2										
		iii) Failure of the NC contacts to close upon de-actuation:										
		A3 or B3 - Loss of ACLS Wave-off in the Ship's input Mode.	x	x	x	x	?	x	Yes	I-II	C	The serious results of this failure would be as indicated only if other, redundant channels of communications also failed, and this particular failure were not corrected as soon as observed, which is right after the Test Simulator Mode functions. It is expected that the Maintenance procedure will be efficient and quick in such repairs.
		C3 or D3 - Loss of LSO Wave-off in the Ship's input Mode.	x	x	x	x	?	x	Yes	I-II	C	

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 4A1

NAME: (Sub-system) SIGNAL JUNCTION BOX

DWG. NO./REV.: 621173-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2	(cont'd) Relay 518915-1	c) K3										
		i) Open in the Coil: Loss of signals for the A3, 4, 5 & 6 Aircraft in the Test Simulator Mode.	-	-	-	-	-	-	Yes	III	C	Test problem only.
		ii) Failure of the NO contacts to close upon actuation: A1, B1, C1, D1 - Loss of the corresponding signal (A3, A4, A5, A6) in the Test Simulator Mode.	-	-	-	-	-	-	Yes	III	C	
		iii) Failure of the NC contacts to close upon deactuation: A3, B3 C3, D3 - loss of the corresponding signal (A3, A4, A5, A6) in the Ship's Input Mode.	-	-	-	-	-	-	Yes	III	C	These failures would affect only the lights on the HUD Panel - easy and quick to repair.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

NAEC-91-7958

TABLE: UNIT 4A1

NAME: (Sub-system) SIGNAL JUNCTION BOX

DWG. NO./REV.: 621173-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	PERSONNEL INJURY	SYSTEM LOSS	SYSTEM DAMAGE	MISSION LOSS	MISSION POTENTIAL LOSS	FAILURE - HAZARD DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2	(cont'd) Relay 518915-1	d) K4										
		i) Open in the Coil: loss of Signals for the A7, TA4, EA6 and C1 aircraft in the Test Simulator Mode.	-	-	-	-	-	-	Yes	III	C	Test problem only.
		ii) Failure of the NO contacts to close upon actuation: A1, B1, C1, D1 - loss of the corresponding Signal (A7, TA4, EA6, C1) in the Test Simulator Mode.	-	-	-	-	-	-	Yes	III	C	
		iii) Failure of the NC contacts to close upon deactuation: A3,B3,C3,D3- loss of the corresponding signal (A7,TA4,EA6, C1) in the Ship's Input Mode	-	-	-	-	-	-	Yes	III	C	These failures would affect only the lights on the HUD Panel - easy and quick to repair.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 4A1

NAME: (Sub-system) SIGNAL JUNCTION BOX

DWG. NO./REV.: 621173-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	PERSONNEL INJURY	SYSTEM LOSS	SYSTEM DAMAGE	MISSION LOSS	MISSION POTENTIAL LOSS	FAILURE - HAZARD DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2	(cont'd) Relay 518915-1	e) K5										
		i) Open in the Coil - loss of Signals fo the S2, C2, E2, S3 Aircraft in the Test Simulator Mode.	-	-	-	-	-	-	Yes	III	C	Test problem only.
		ii) Failure of the NO contacts to close upon actuation: A1,B1,C1,D1-loss of the corresponding signal (S2,C2, E2,S3) in the Test Simulator Mode.	-	-	-	-	-	-	Yes	III	C	
		iii) Failure of the NC contacts to close upon deactuation: A3,B3,C3,D3-loss of the corresponding signal (S2, C2,E2,S3) in the Ship's Input Mode.	-	-	-	-	-	-	Yes	III	C	These failures would affect only the lights on the HUD Panel - easy and quick to repair.

202(A-186)

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 4A1

NAME: (Sub-system) SIGNAL JUNCTION BOX

DWG. NO./REV.: 621173-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON:						FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			PERSONNEL		SYSTEM		MISSION		DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2	(cont'd) Relay 518915-1	f) K6										
		i) Open in the Coil - loss of signals for the F14, F8, F4 & E1 Aircraft in the Test Simulator Mode.	-	-	-	-	-	-	Yes	III	C	Test problem only.
		ii) Failure of the NO contacts to close upon actuation: A1, B1, C1, D1 - loss of the corresponding Signal (E1, F4, F8, F14) in the Test Simulator Mode.	-	-	-	-	-	-	Yes	III	C	
		iii) Failure of the NC contacts to close upon deactuation: A3, B3, C3, D3 - loss of corresponding Signal (E1, F4 F8, F14) in the Ship' Input Mode.	-	-	-	-	-	-	Yes	III	C	These failures affect the lights on the HUD Panel - repair is quick and easy.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2	(cont'd) Relay 518915-1	g) K7										
		i) Open in the Coil - loss of Signals for the (T2,T28, F18 & "Spare") Aircraft in the Test Simulator Mode.	-	-	-	-	-	-	Yes	III	C	Test problem only.
		ii) Failure of the NO contacts to close upon actuation: A1,B1,C1,D1-loss of the corresponding Signal (T2, T28,F18 & "spare") in the Test Simulator Mode.	-	-	-	-	-	-	Yes	III	C	
		iii) Failure of the NC contacts to close upon deactuation: A3,B3, C3,D3-loss of the corresponding signal (T2,T28, F18 & "Spare") in the Ship's Input Mode.	-	-	-	-	-	-	Yes	III	C	These failures affect the lights on the HUD Panel only - repair is quick and easy.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable;
F [illegible]

TABLE: UNIT 4A1

NAME: (Sub-system) SIGNAL JUNCTION BOX

DWG. NO./REV.: 621173-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2	(cont'd) Relay 518915-1	h) K8										
		i) Open in the Coil - loss of Signals for the "3 future Aircraft designations" and all the Aircraft designations in the Test Simulator Mode (loss of 28V return!).	-	-	-	-	-	-	Yes	III	C	Test problem only.
		ii) Failure of the NO contacts to close upon actuation: A1,B1, C1,D1 - loss of the corresponding Signals ("spare", "spare", 28V return-all signals!!, "spare") in the Test Simulator Mode.	-	-	-	-	-	-	Yes	III	C	

205(A-189)

NAEC-91-7958

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 4A1

NAME: (Sub-system) SIGNAL JUNCTION BOX

DWG. NO./REV.: 621173-1

NAEC-91-7958

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2	(cont'd) Relay 518915-1	h) K8 iii) Failure of the NC contacts to close upon deactuation: A3,B3,C3,D3- loss of all Signals for the Aircraft Designation in the Ship's Input Mode (C3 carries the 28V return!!)	-	-	-	-	-	-	Yes	III	C	The failure of the C3 contact would affect (all) the lights of the A/C Designations on the HUD Panel - repair is quick and easy.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2	(cont'd) Relay 518915-1	j) K9										
		i) Open in the Coil - loss of the Ramp Motion and Trim Signals in the Test Simulator Mode.	-	-	-	-	-	-	Yes	Yes	C	Test problem only. However, due to the importance of this relay to work properly in the Ship's Input Mode, see the next entry below.
		ii) Failure of the NO contacts to close upon actuation: A1 or B1, C1 or D1-loss of the corresponding Signal (Ramp Motion, Trim in the Test Simulator Mode.	-	-	-	-	-	-	Yes	III	A	
		iii) Failure of the NC contacts to close upon deactuation: A3 or B3, C3 or D3-loss of the corresponding Signal (Ramp Motion, Trim	(x)	(x)	(x)	(x)	(x)	(x)	Yes	I	A	DANGER! According to the System design analysis, the Signals for the Ramp Motion and Trim will be 0-28 micro Amp currents! With the Relay's contacts rating of 40 milliAmp as minimum, this will not work and the circuit will have to be reworked. See the "General Note" & "RECOMMENDATION" in item 1.2.a (page 5).
		in the Ship's Input Mode.										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 4A1

NAME: (Sub-system) SIGNAL JUNCTION BOX

DWG. NO./REV.: 621173-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2	(cont'd) Relay 518915-1	k) K10										
		i) Open in the Coil-loss of the AirSpeed and Rate of Descent Signals in the Test Simulator Mode.	-	-	-	-	-	-	Yes	III	C	Test problem only, but due to the serious situation in the Ship's Input Mode (see below), an improvement will have to be provided.
		ii) Failure of the NO contacts to close upon actuation: A1 or C1, B1 or C1, D1 - loss of the corresponding signals (TAS, CAS, Rate of Descent) in the Test Simulator Mode.	-	-	-	-	-	-	Yes	III	A	
		iii) Failure of the NC contacts upon de-actuation: A3 or C3, B3 or C3, D3 - loss of the corresponding signals (TAS, CAS, Rate of Descent) in the Ship's Input Mode.	(x)	(x)	(x)	(x)	(x)	(x)	Yes	I	A	DANGER! According to the System design analysis, the signals for the Ramp Motion and Trim will be 0-28 micro-Amp currents! With the Relay's contacts rating of 40 milliAmp as minimum, this will not work and the circuit will have to be reworked. See the "General Note" & "RECOMMENDATION" in item 1.2.a (page 51

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

NAEC-91-7958

TABLE: UNIT 4A1

NAME: (Sub-system) SIGNAL JUNCTION BOX

DWG. NO./REV.: 621173-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL: LIVES	PERSONNEL: INJURY	SYSTEM: LOSS	SYSTEM: DAMAGE	MISSION: LOSS	MISSION: POTENTIAL LOSS	FAILURE - HAZARD: DETECTABLE BY OPERATOR?	FAILURE - HAZARD: CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD: PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2	(cont'd) Relay 518915-1	1) K11										
		i) Open in the Coil- loss of the Rate of Descent and the Alt. Error ("Bug Y") Signals in the Test Simulator Mode.	-	-	-	-	-	-	Yes	III	C	Test problem only, but it will have to be corrected - see below.
		ii) Failure of the N. contacts to close upon actuation A1,-,C1 or D1 -Loss of the corresponding Signals (Rate of Descent, Alt.Error) in the Test Simulator Mode.	-	-	-	-	-	-	Yes	III	A	
		iii) Failure of the NC contacts to close upon deactuation: A3,-,C3 or D3 -Loss of the corresponding Signals (Rate of Descent, Alt.Error) in the Ship's Input Mode.	(x)	(x)	(x)	(x)	(x)	(x)	Yes	I	A	DANGER! According to the System design analysis, the Signals for the Ramp Motion and Trim will be 0-28 microAmp currents! With the Relay's contacts rating of 40 milliAmp as minimum, this will not work and the circuit will have to be reworked. See the "General Note" & "RECOMMENDATION" in item 1.2.a (page 5).

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2	(cont'd) Relay 518915-1	m) K12										
		i) Open in the Coil-loss of the Latitude Error("BugX") & Range Signals in the Test Simulator Mode.	-	-	-	-	-	-	Yes	III	C	Test problem only, but will have to be corrected - see below.
		ii) Failure of the NO contacts to close upon actuation: A1 or B1,C1 or D1-loss of the corresponding Signals (Lat. Error,Range) in the Test Simulator Mode.	-	-	-	-	-	-	Yes	III	A	
		iii) Failure of the NC contacts to close upon deactuation: A3 or B3, C3 or D3-loss of the corresponding Signals (Lat. Error, Range) in the Ship's Input Mode.	(x)	(x)	(x)	(x)	(x)	(x)	Yes	I	A	DANGER! According to the System design analysis, the Signals for the Ramp Motion and Trim will be 0-20 microAmp currents! With the Relay's contacts rating of 40 milliAmp as minimum, this will not work and the circuit will have to be reworked. See the "General Note" & "RECOMMENDATION" in item 1.2.a (page 5).

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 4A1

NAME: (Sub-system) SIGNAL JUNCTION BOX

DWG. NO./REV.: 621173-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON:						FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			PERSONNEL		SYSTEM		MISSION		DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.3 1.4 1.5	Connector J1 & J2 Terminal Boards TB1-TB12 Inside Wiring	No problems are expected to develop in these components once the connections have been checked out, and the periodic check-out and Maintenance procedures are carried out - particularly after any accidental damage to the 4A1.							Yes	III-IV	E	

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 4A2

NAME: (Sub-system) SYNCHRO JUNCTION BOX

DWG. NO./REV.: 621187-1 (Schematic: 621120)
(Wiring: 621123)

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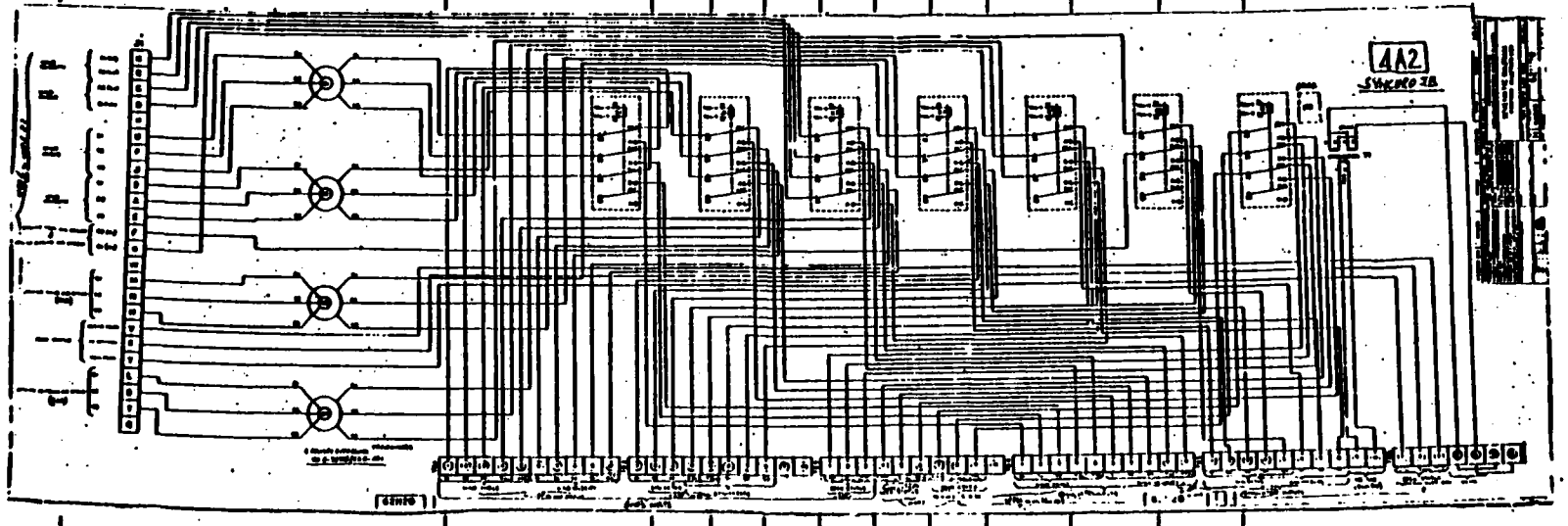
ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.0	The Synchro Junction Box, located in the room area just below the Console at the LSO platform, contains: One transformer (T1), four synchro differential transmitters (B1, B2, B3 & B4 in the schematic below), eight transfer relays (K1-K8. The K8 relay is a spare), and a number of terminal strips. The Synchro Junction Box provides for the electrical transfer of the following signals (either from the Ship or the Test Simulator) to the HUD Console: • Wind Direction and velocity • SPN-44 True Air Speed (TAS) and Closing Air Speed (CAS) • Deck status (clear deck, foul deck) of the AC.											



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NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 4A2

NAME: (Sub-system) SYNCHRO JUNCTION BOX

DWG. NO./REV.: 621187-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON:						FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			PERSONNEL		SYSTEM		MISSION		DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.1	Transformer 422977-1. Primary: 115VAC, 60Hz, 1 phase Secondary: 28VAC, 5.00Amp. The secondary winding provides the current to the coils of the seven active Relays of the Synchro Junction Box (the 8th Relay is a spare). The Transformer is marked T1 on the Schematic Diagram. The current is sent through the coils of the Relays upon their actuation by a switch on the Test Simulator, when the Test Simulator is properly connected: the System in the "Test Simulator Mode."	i) Loss of the Primary power will cause the K1 thru K7 reset to the Ship's Input Mode losing all the Signals through this Unit 4A2 in the Test Simulator Mode.	-	-	-	-	-	-	Yes	III	D	Fail safe arrangement - good!
		ii) Loss of one of the two secondary windings function will cause the seven Relays to return to or stay in the Normally Closed Contacts, which is in the Ship's Input Mode.	-	-	-	-	-	-	Yes	III	D	

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2	Relay 518915-1, Socket mounted, 10Amp 4PDT. coil: 28VAC, 60Hz, Single phase, max oper. current 0.55 Amp, contacts: max 10Amp resistive, 6Amp inductive load at 120VAC, 60Hz. Minimum current (contacts) to be 0.040Amp RMS, ½ wave rectified. There are seven Relays for the transfer of Signals (Wind Velocity & Angle, SPN-44 TAS & CAS, Deck Status) to the HUD Console. The Normally Closed Contacts (NC) carry the Ship's Inputs, and the Normally Open (NO) Contacts are for the Test Simulator Mode of Operation. NOTE: From the Design Analysis, the Signals that are being transferred in this Synchro Junction Box are 0-28 milliAmps strong.	a) K1 i) Open in the Coil-Loss of the Wind Angle Signals in the Test Simulator Mode.	-	-	-	-	-	-	Yes	III	C	This failure affects the Test check-out, not the Ship's Input Mode.
		ii) Failure of the NO contacts to close upon actuation: A1, B1, C1 (D1not wired) -Loss of the S1,S2 & S3 Wind Angle Signals in the Test Simulator Mode.	-	-	-	-	-	-	Yes	III	B	Even though these failures would affect only the Test procedures due to their high probability of occurrence, an improvement in the design is recommended. See below, item 1.2.a.iii.
		iii) Failure of the NC contacts to close upon deactuation A3,B3,C3(D3 not wired)- Loss of the Wind Angle Signals S1, S2 & S3 in the Ship's Input Mode.	(x)	(x)	(x)	(x)	(x)	(x)	Yes	I-II	A-B	DANGER! There is a certainty that the contacts, after their test in the 10Amp strong current, will not pass a weak current, even the 40 milliAmp is too weak! That means that the situation as it is right now will not work! • RECOMMENDATION: Introduce the necessary changes in the Design and procedures (test) to assure

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

NAEC-91-7958

TABLE: UNIT 4A2

NAME: (Sub-system) SYNCHRO JUNCTION BOX

DWG. NO./REV.: 621187-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2	(cont'd) Relay 518915-1	a) K1 iii)										the reliable passage of the low current signals through (the contacts).

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NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 4A2

NAME: (Sub-system) SYNCHRO JUNCTION BOX

DWG. NO./REV.: 621187-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL: LIVES	PERSONNEL: INJURY	SYSTEM: LOSS	SYSTEM: DAMAGE	MISSION: LOSS	MISSION: POTENTIAL LOSS	FAILURE - HAZARD: DETECTABLE BY OPERATOR?	FAILURE - HAZARD: CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD: PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2	(cont'd) Relay 518915-1	b) K2										
		i) Open in the Coil-Loss of the Wind Velocity Signals S1,S2 & S3 in the Test Simulator Mode.	-	-	-	-	-	-	Yes	III	C	This failure affects the Test check-out, not the Ship's Input mode.
		ii) Failure of the NO contacts to close upon actuation: A1,B1,C1(D1 not wired)-Loss of the S1,S2,S3 Wind Velocity Signals in the Test Simulator Mode.	-	-	-	-	-	-	Yes	III	B	Even though these failures would affect only the Test procedures due to their high probability of occurrence, an improvement in the design is recommended. See below and item 1.2.a.iii.
		iii) Failure of the NC contacts to close upon deactuation: A3,B3,C3(D3 not wired)-Loss of the S1,S2,S3 Wind Velocity Signals in the Ship's Input Mode.	(x)	(x)	(x)	(x)	(x)	(x)	Yes	I-II	A-B	DANGER! There is a certainty that the contacts, after their test in the 10Amp strong current, will not pass a weak current, even the 40 milliAmp is too weak! That means that the situation as it is right now will not work! • RECOMMENDATION: Introduce the necessary changes in the Design and procedures (test)

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

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TABLE: UNIT 4A2

NAME: (Sub-system) SYNCHRO JUNCTION BOX

DWG. NO./REV.: 621187-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON:						FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			PERSONNEL		SYSTEM		MISSION					
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2	(cont'd) Relay 518915-1	b) K2 iii)										to assure the reliable passage of the low current Signals through (the contacts).

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NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2	(cont'd) Relay 518915-1	c) K3										
		i) Open in the Coil-Loss of the Wind Angle & Wind Velocity Signals R1,R2 & R3, R1 in the Test Simulator Mode.	-	-	-	-	-	-	Yes	III	C	Test check-out and adjustment problem. Repair is quick and easy.
		ii) Failure of the NO contacts to close upon actuation: A1 B1,C1,D1-Loss of the R1, R2 Wind Angle and R2, R1 Wind Velocity Signals in the Test Simulator Mode.	-	-	-	-	-	-	Yes	III	B	Even though these failures would affect only the Test procedures, due to their high probability of occurrence, an improvement in the design is recommended. See below item 1.2.a.iii.
		iii) Failure of the NC contacts upon deactuation: A3,B3, C3,D3-Loss of the Wind Angle & Wind Velocity Signals R1,R2, R3, R1 in the Ship's Input Mode.	(x)	(x)	(x)	(x)	(x)	(x)	Yes	I-II	A-B	DANGER! There is a certainty that the contacts after their test in the 10Amp strong current, will not pass a weak current, even the 40 milliAmp is too weak! That means that the situation as it is right now will not work! • RECOMMENDATION: Introduce the necessary changes in the Design and procedures (test) to assure

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

(FAILURE MODES & EFFECTS ANALYSIS - SYSTEM) SAFETY ANALYSIS MK1 MOD 0 LSO-HUD CONSOLE SYSTEM

NAEC-91-7958

TABLE: UNIT 4A2

NAME: (Sub-system) SYNCHRO JUNCTION BOX

DWG. NO./REV.: 621187-1

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ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	EFFECT ON: PERSONNEL INJURY	EFFECT ON: SYSTEM LOSS	EFFECT ON: SYSTEM DAMAGE	EFFECT ON: MISSION LOSS	EFFECT ON: MISSION POTENTIAL LOSS	FAILURE - HAZARD: DETECTABLE BY OPERATOR?	FAILURE - HAZARD: CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD: PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2	(cont'd) Relay 518915-1	c) K3 iii)										the reliable passage of the low current Signals through (the contacts).

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 4A2

NAME: (Sub-system) SYNCHRO JUNCTION BOX

DWG. NO./REV.: 621187-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2	(cont'd) Relay 518915-1	d) K4										
		i) Open in the Coil-Loss of the SPN-42 True Air Speed Signals S1,S2,S3 in the Test Simulator Mode.	-	-	-	-	-	-	Yes	III	C	Test check-out problem.
		ii) Failure of the NO contacts to close upon actuation:A1, B1,C1 (D1 not wired)-Loss of the SPN-42 TAS Signals S1,S2,S3 in the Test Simulator Mode.	-	-	-	-	-	-	Yes	III	B	Even though these failures would affect only the Test procedures, due to their high probability of occurrence, an improvement in the design is recommended. See below and item 1.2.a.iii.
		iii) Failure of the NC contacts to close upon deactuation: A3,B3,C3(D3 not wired)-Loss of the SPN-44 TAS Signals S1, S2,S3 in the Ship's Input Mode.	(x)	(x)	(x)	(x)	(x)	(x)	Yes	I-II	A-B	DANGER! There is a certainty that the contacts, after their test in the 10Amp strong current, will not pass a weak current, even the 40 milliAmp is too weak! That means that the situation as it is right now will not work! • RECOMMENDATION: Introduce the necessary changes in the design and procedures (test) to assure the reliable passage of the low current Signals through (the contacts).

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 4A2

NAME: (Sub-system) SYNCHRO JUNCTION BOX

DWG. NO./REV.: 621187-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS, RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2	(cont'd) Relay 518915-1	e) K5										
		i) Open in the Coil - Loss of the SPN-44 closing Air Speed Signals S1,S2,S3 in the Test Simulation Mode.	-	-	-	-	-	-	Yes	III	C	Test check-out problem.
		ii) Failure of the NO contacts to close upon actuation:A1, B1,C1 (D1 not wired)- Loss of the SPN-44 CAS Signals S1, S2, S3 in the Test Simulator Mode.	-	-	-	-	-	-	Yes	III	B	Even though these failures would affect only the Test procedures due to their high probability of occurrence, an improvement in the design is recommended. See below and item 1.2.a.iii.
		iii) Failure of the NC contacts to close upon deactuation: A3,B3, C3(D3 not wired)-Loss of the SPN-44 CAS Signals S1,S2, S3 in the Ship's Input Mode.	(x)	(x)	(x)	(x)	(x)	(x)	Yes	I-II	A-B	DANGER! There is a certainty that the contacts, after their test in the 10Amp strong current, will not pass a weak current, even the 40 milliAmp is too weak! That means that the situation as it is right now will not work! • RECOMMENDATION: Introduce the necessary changes in the

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL: LIVES	EFFECT ON: PERSONNEL: INJURY	EFFECT ON: SYSTEM: LOSS	EFFECT ON: SYSTEM: DAMAGE	EFFECT ON: MISSION: LOSS	EFFECT ON: MISSION: POTENTIAL LOSS	FAILURE - HAZARD: DETECTABLE BY OPERATOR?	FAILURE - HAZARD: CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD: PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2	(cont'd) Relay 518915-1	e) K5 iii)										design and procedures (test) to assure the reliable passage of the low current Signals through (the contacts).

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

NAEC-91-7958

TABLE: UNIT 4A2

NAME: (Sub-system) SYNCHRO JUNCTION BOX

DWG. NO./REV.: 621187-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASTIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2	(cont'd) Relay 510915-1	f) K6										
		i) Open in the Coil-Loss of the SPN-44 TAS Signal R2 and CAS Signal R1 in the Test Simulator Mode.	-	-	-	-	-	-	Yes	III	C	Test check-out problem.
		ii) Failure of the NO contacts to close upon actuation: A1, B1(C1 & D1 not wired) -Loss of the SPN-44 CAS Signal R1 and /or TAS Signal R2 in the Test Sim. Mode.	-	-	-	-	-	-	Yes	III	B	Even though these failures would affect only the Test procedures due to their high probability of occurrence, an improvement in the design is recommended. See below and item 1.2.a.iii.
		iii) Failure of the NC contacts upon deactuation: A3,B3 (C3&D3 not wired)-Loss of the SPN-44 CAS Signal R1 and/or TAS Signal R2 in the Ship's Input Mode.	(x)	(x)	(x)	(x)	(x)	(x)	Yes	I-II	A-B	DANGER! There is a certainty that the contacts after their test in the 10Amp strong current, even the 40 milliAmp is too weak! That means that the situation as it is right now will not work! • RECOMMENDATION: Introduce the necessary changes in the Design and procedures (test) to assure the reliable passage of the

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 4A2

NAME: (Sub-system) SYNCHRO JUNCTION BOX

DWG. NO./REV.: 621187-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2	(cont'd) Relay 518915-1	f) K6 iii)										low current signals through (the contacts).

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

NAEC-91-7958

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	PERSONNEL INJURY	SYSTEM LOSS	SYSTEM DAMAGE	MISSION LOSS	MISSION POTENTIAL LOSS	FAILURE - HAZARD DETECTABLE BY OPERATOR?	FAILURE - HAZARD CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2	(cont'd) Relay 518915-1	g) K7										
		i) Open in the Coil-Loss of the Deck Status Signals in the Test Simulator Mode.	-	-	-	-	-	-	Yes	III	C	Test check-out problem.
		ii) Failure of the NO contacts upon actuation: A1,B1,C1(D1 not wired)-Loss of the Deck Status Signals in the Test Simulator Mode.	-	-	-	-	-	-	Yes	III	B	Even though these failures would affect only the test procedures due to their high probability of occurrence, an improvement in the design is recommended. See below and Item 1.2.a.iii.
		iii) Failure of the NC contacts to close upon deactuation: A3,B3,C3(D3 not wired)-Loss of the corresponding Deck Status Signal(s) in the Ship's Input Mode.	(x)	(x)	(x)	(x)	(x)	(x)	Yes	I	A-B	DANGER! There is a certainty that the contacts, after their test in the 10Amp strong current will not pass a weak current, even the 40 milliAmp is too weak! That means that the situation as it is right now will not work! • RECOMMENDATION: Introduce the necessary changes in the Design and procedures (test) to assure the reliable passage of the low current signals throug (the contacts).

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 4A2

NAME: (Sub-system) SYNCHRO JUNCTION BOX

DWG. NO./REV.: 621187-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON:						FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			PERSONNEL		SYSTEM		MISSION					
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2	(cont'd) Relay 518915-1	h) K8 NOTE: The K8 is a spare Relay, to be used when any of the seven "active" Relays would be failing and in need of replacement. The K8 Relay then would take place of that particular Relay, and its FMEA should be found under that one (page 3-14).										This is a spare.

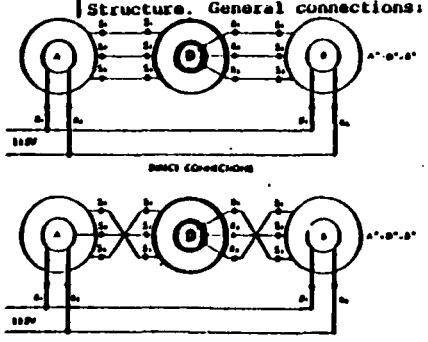
NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

NAEC-91-7958

TABLE: UNIT 4A2

NAME: (Sub-system) SYNCHRO JUNCTION BOX

DWG. NO./REV.: 621187-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.3	Synchro Differential Transmitter. MIL-S-20708/22C-001. Made by: Vernitron Control Components, San Diego, CA 92073 (contact: Ron Campbell, Sr. Sales Eng'r, (714)-428-5581). Vendor's P/N: VCDX15-6N2: Primary Winding: Stator Voltage: Primary / Second'y = 90/90 Primary Current: 38mAmp,60Hz. Four of these components are used (B1-B4) in this Unit 4A2, to adjust the nulls for the Wind Angle, Wind Velocity, SPN-44 True Air Speed and SPN-44 Closing Air Speed Signals, which are generated up in the Ship's Structure. General connections: 	a) B1 i) Increased friction inside of the Component will result in an increased inaccuracy of adjustment-and, therefore, increased inaccuracy of the Wind Angle Signals S1,S2, S3.	?	x	?	x	-	-	Yes	III	D	Periodic calibration and maintenance will keep the Component working within its intended limits.
		ii) Mechanical bind (jamming) of the Rotor against the Stator will cause the Wind Angle Signals S1,S2, S3 grossly inaccurate in the majority of the 360° scale.	(x)	(x)	(x)	(x)	(x)	(x)	Yes	I	E	This failure to occur within the short time after the check-out, during which time the function of this component is needed, is extremely improbable (in peacetime!).

NOTE: Hazard level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.3	(cont'd) Synchro Differential Transmitter MIL-S-20708/22C-001	b) B2 i) Increased friction inside of the Component will result in an increased inaccuracy of adjustment-and, therefore, increased inaccuracy of the Wind Velocity Signals S1, S2,S3.	?	x	?	x	-	-	Yes	III	D	Periodic calibration and Maintenance will keep the Component working within its intended limits.
		ii) Mechanical bind (jamming) of the Rotor ahainst the Stator will cause the Wind Velocity signals S1,S2, S3 to be grossly inaccurate.	(x)	(x)	(x)	(x)	(x)	(x)	Yes	I	E	The probability of occurrence of this failure is extremely remote (in peacetime). Also, the pilot has other channels to get accurate information on the Wind Velocity.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 4A2

NAME: (Sub-system) SYNCHRO JUNCTION BOX

DWG. NO./REV.: 621187-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.3	(cont'd) Synchro Differential Transmitter MIL-S-20708/22C-001	c) B3 i) Increased friction inside of the Component will result in an increased inaccuracy of adjustment-and, therefore, increased inaccuracy in the SPN-44 True Air Speed Signals S1,S2, S3.	-	?	-	?	-	?	Yes	III	D	Periodic calibration and Maintenance will keep the Component working within its intended limits.
		ii) Mechanical bind (jamming) of the Rotor against the Stator will cause the SPN-44 True Air Speed Signals S1,S2, S3 to be grossly inaccurate.	(x)	(x)	(x)	(x)	(x)	(x)	Yes	I	E	Extremely improbable to occur (in peacetime). Also, the pilot has other channels/means to get information on accurate True Air Speed.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 4A2

NAME: (Sub-system) SYNCHRO JUNCTION BOX

DWG. NO./REV.: 621187-1

NAEC-91-7958

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON:						FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			PERSONNEL		SYSTEM		MISSION		DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.3	(cont'd) Synchro Differential Transmitter MIL-S-20708/22C-001	d) B4 i) Increased friction inside of the Component will result in an increased inaccuracy of adjustment-and, therefore, increased inaccuracy in the SPN-44 Closing Air Speed Signals S1,S2,S3.	-	?	-	?	-	?	Yes	III	D	Periodic calibration and Maintenance will keep the Component working within its intended limits.
		ii) Mechanical bind (jamming) of the Rotor against the Stator will cause the SPN-44 Closing Air Speed Signals S1,S2, S3 to be grossly inaccurate.	(x)	(x)	(x)	(x)	(x)	(x)	Yes	I	E	Extremely improbable to occur (in peacetime). Also, the pilot has other channels/means to get information on accurate True Air Speed.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable;
F-Impossible)

TABLE: UNIT 4A2

NAME: (Sub-system) SYNCHRO JUNCTION BOX

DWG. NO./REV.: 621187-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON:						FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			PERSONNEL		SYSTEM		MISSION		DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.4	Synchro Dial Assembly 518420-1. Four of these are used, one each to "tune" one Synchro Differential Transmitter. Maker: Vemaline Products Div. of Ostby & Barton Co., Warwick, RI. Characteristics: . Zero backlash . Initial torque 15-20 oz. in. . Corrosion resistant . Ball driven planetary drive . ± 1 minute accuracy . Withstands 100g shock in all planes/axes.	No problems are anticipated with this Component in a well cared-for and maintained System.							Yes	III-IV	E	

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 4A2

NAME: (Sub-system) SYNCHRO JUNCTION BOX

DWG. NO./REV.: 621187-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.5	Connector J1 (MS17346R24C28S)	No problems are expected to develop in these components once the connections have been checked out and the periodic check-out and Maintenance procedures are carried out, particularly after any accidental damage to the 4A2.										
1.6	Terminal Boards TB1-TB6											
1.7	Relay Socket M12883/21-01 (for Relays K1-K8)											
1.8	Inside wiring								Yes	III-IV	D-E	

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

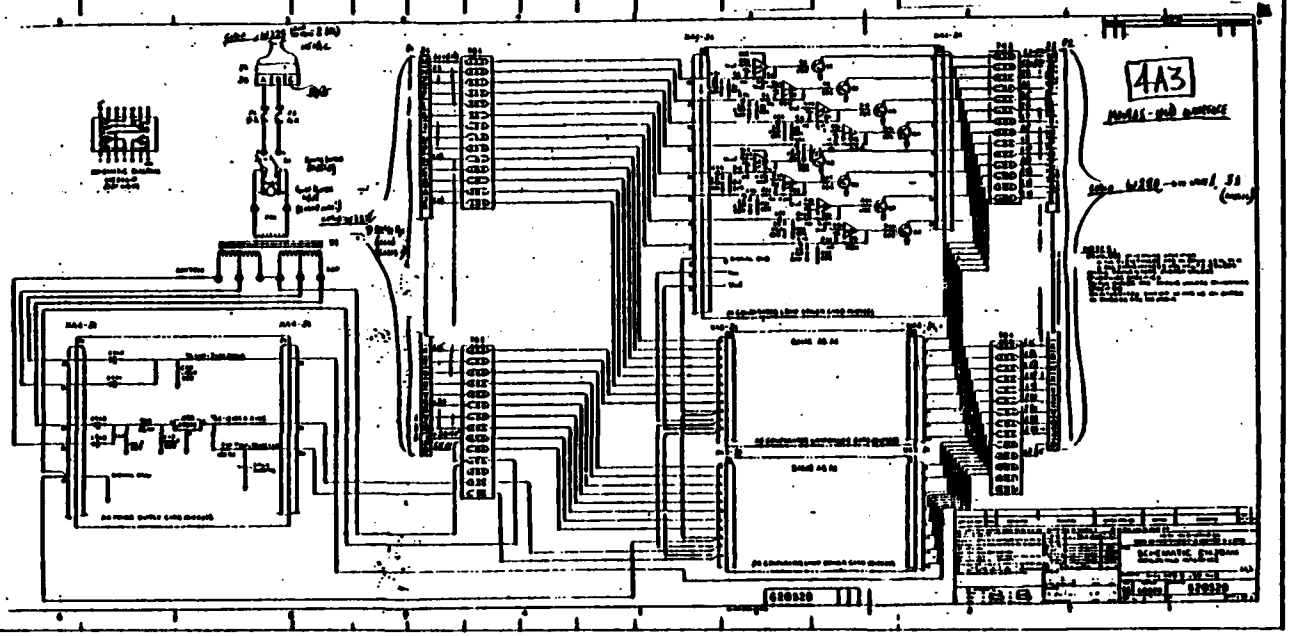
NAEC-91-7958

TABLE: UNIT 4A3

NAME: (Sub-system) MOVLAS-HUD INTERFACE ELECTRONICS BOX

DWG. NO./REV.: 620522-1 (Schematic: 620528) (Wiring: 620529)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.0	The HUD/MOVLAS Interface Electronics Box contains buffer electronics to electrically isolate the MOVLAS from the mini-MOVLAS display on the HUD console to allow independent intensity control. It contains a card cage assembly housing three lamp driver circuit boards, one power supply board, and an extender circuit board. It also contains an auxiliary transformer for its internal DC power supply. The front panel has a power switch, power monitor light and fuse holder assembly installed on it. 115VAC, 1ϕ 60 Hz power to operate the electronics comes from the auxiliary electronics box (Unit 2). Reduced copy of the Schematic Diagram 620528 is at right.											



NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 4A3

NAME: (Sub-system) MOVLAS-HUD INTERFACE ELECTRONICS BOX

DWG. NO./REV.: 620522-1 (Schematic: 620528)
(Wiring: 620529)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON:						FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			PERSONNEL		SYSTEM		MISSION					
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.1	Fuse F03A250V½AS, two used, one in each of the two Transformer's Primary Winding feed lines of the 115VAC.	One of the two Fuses burns out-that will interrupt the electrical power feeding the Unit 4A3, and that will extinguish the MOVLAS lights and their corresponding "monitors" on the HUD Console (on the left side of the LSO). It will also be seen on the Unit 4A3 itself: the Power Monitor Light XDS-1 will also go off.	(x)	(x)	(x)	(x)	(x)	(x)	Yes	I	E	The probability of the Fuse to burn out just in the moment of an aircraft approaching the landing strip and the Pilot depending only on the MOVLAS is extremely remote.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

NAEC-91-7958

TABLE: UNIT 4A3

NAME: (Sub-system) MOVLAS-HUD INTERFACE ELECTRONICS BOX

DWG. NO./REV.: 620522-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2	Power Monitor Light, one Lamp M15098/11-001; Provides information to the personnel that the Power Switch on the Unit 4A3 is switched "on" (the light is "on").	In case the Lamp burns out, the Power Monitor Light is "off" even if the switch is "on" - this can cause safety hazard to the personnel who might start working inside of the Unit 4A3 believing the Power is off.	-	x	-	x	-	-	Yes	II-III	D	• RECOMMENDATION: Include the necessary instruction (to observe the Power Monitor Light and switch off the Power Switch) for the Maintenance personnel before they would start working on this Unit 4A3.
1.3	Transformer 620522-2	No problem is foreseen for this component to fail (open winding) and thus to cause the function of the Unit 4A3 interrupted, once the check-out procedures have been satisfactorily performed before the landing activity.							Yes	III	D-E	
1.4	A4 Power Supply Card 518937-1 provides the DC power for: . the Lamps (V_{lamp} = 7VDC nom.) . the A1 cards (V_{CC}=12VDC±.5VDC) . the "Ref" for A1 Cards (V_{REF}=7.5VDC ±5%)	No problem is foreseen in this Card in a properly operated and maintained System.							Yes	III	E	
1.5	Comparator Lamp Driver Card 518932-1 (A1, A2 & A3), Schematic Diagram: 518931.	No problem is foreseen for these solid state circuits in a well-maintained System.							Yes	III	E	

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

(Failure Modes & Effects Analysis - System) Safety Analysis MK1 MOD 0 LSO-HUD Console System

TABLE: UNIT 4A4

NAEC-91-7958

NAME: (Sub-system) TEST SIMULATOR INTERFACE BOX

DWG. NO./REV.: 621189-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.0	The Test Simulator Interface Box is located in the LSO work station. It provides 115 VAC, 60 Hz, 1Ø power to operate the test simulator and the means to connect the simulator to the HUD console for in-circuit testing. It allows one man to troubleshoot or calibrate the display subsystem from the location of the HUD console. Refer to the Block Diagram at right to see the interconnections of the Unit 4A4 to all other units of the System and to the Test Simulator (which at one time was called "Unit 5").											

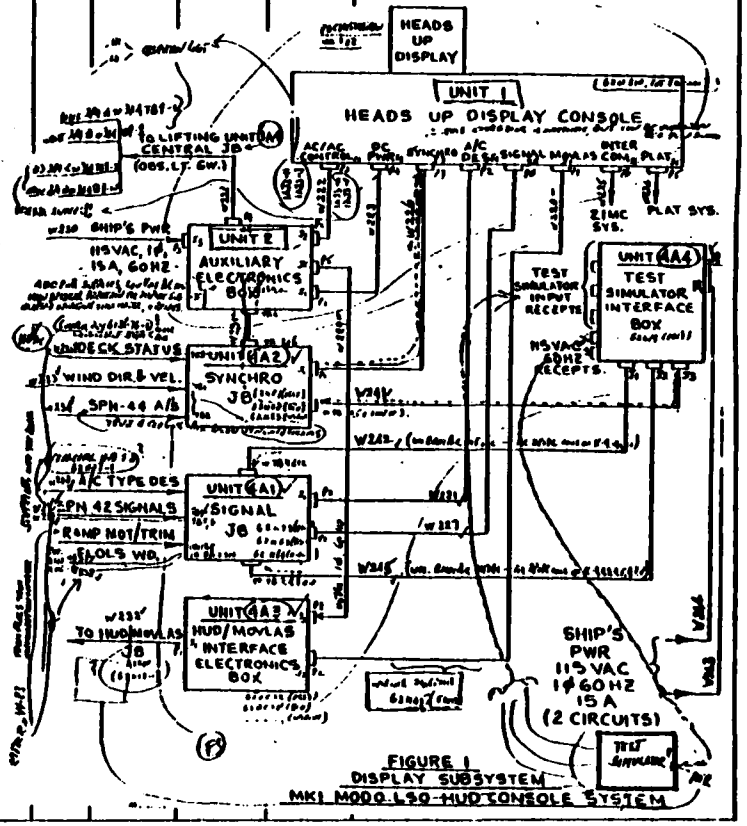


FIGURE 1
DISPLAY SUBSYSTEM
MK1 MOD0 LSO-HUD CONSOLE SYSTEM

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 4A4

NAME: (Sub-system) TEST SIMULATOR INTERFACE BOX

DWG. NO./REV.: 621189-1

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.1	NOTES: 1) Considering that inside of this Box there are only "hard wire connections," no problems are foreseen once the Box is installed and checked-out, provided the periodic inspections and maintenance operations are carried out. 2) It is expected that the matings and unmatings of the line connectors of the Test Simulator's Cables into the five Receptacles on the Unit 4A4 will be performed in such a way that no water (particularly the salt water) will contaminate the pins/sockets. 3) It should be born in mind that this Unit 4A4, as well as the HUD Console in the deployed condition, is not protected against the "flying objects" as the case may be during an enemy attack in a battle. However, the scope of this work does not permit us to go into that scenario.											

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

(Failure Modes & Effects Analysis - System) Safety Analysis MK1 MOD 0 LSO-HUD Console System

TABLE: CABLES

NAEC-91-7958

NAME: (Sub-system) INTERCONNECTING CABLES

DWG. NO./REV.: 621145

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	PERSONNEL INJURY	SYSTEM LOSS	SYSTEM DAMAGE	MISSION LOSS	MISSION POTENTIAL LOSS	FAILURE - HAZARD DETECTABLE BY OPERATOR?	FAILURE - HAZARD CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.0	The Interconnecting Cables, W220 through W245, provide the interconnections among the Ship and individual Units of the HUD Console System. Refer to the sketch at right, in which the 26 cables have been marked in the "Display Subsystem" block diagram.											

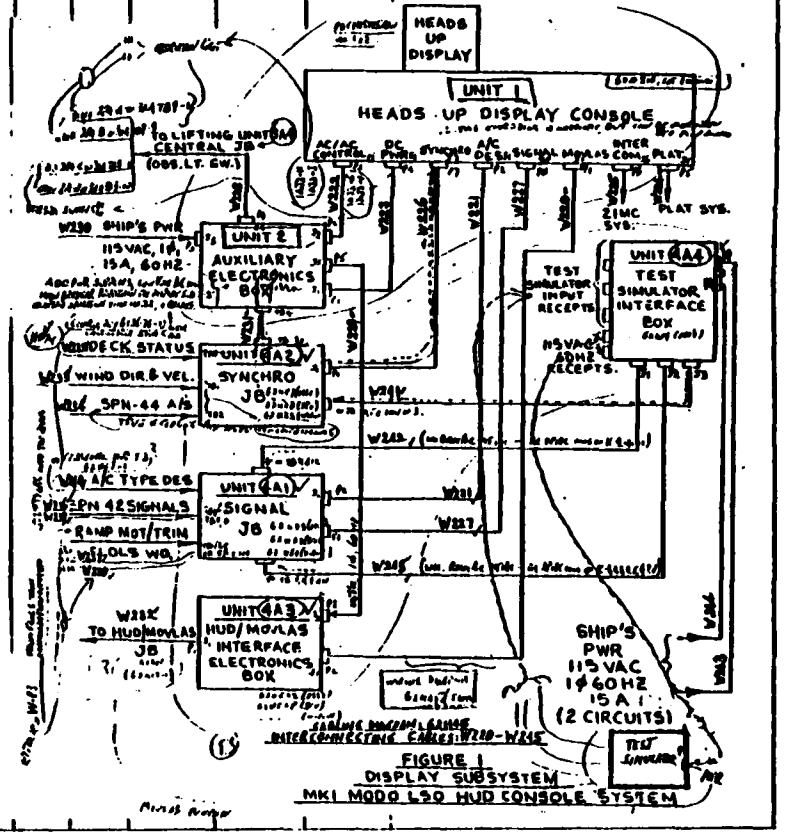


FIGURE
DISPLAY SUBSYSTEM
MK1 MOD0 LSO HUD CONSOLE SYSTEM

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: CABLES

NAME: (Sub-system) INTERCONNECTING CABLES

DWG. NO./REV.: 621145

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.1	Cable W220 (MOVLAS), carries the 23 Lamps' Signals (L1-L23) and the +5VDC return from Unit 1, Connector J1 (MOVLAS) to Unit 4A3, Connector J3.	a) An "open" in any of the 23 wires or connections ("Lamps' Signals") - Loss of the corresponding light on the Mini-MOVLAS on the HUD Console.	-	-	-	-	-	-	Yes	III	D	None of these failures would represent a problem. Besides, the periodic check-out and maintenance procedures will diminish greatly the probability of these failures to occur.
		b) An "open" in the +5VDC returr line - Loss of all the lights on the Mini-MOVLAS.	-	-	-	-	-	-	Yes	III	E	
		c) A "short" between any two of the 23 "Lamp" wires- The corresponding two lights will be on, instead of only one.	-	-	-	-	-	-	Yes	III	E	
		d) A "short" between any of the 23 "Lamp" wires and the ground-Loss of the corresponding light.	-	-	-	-	-	-	Yes	III	D	

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: CABLES

NAME: (Sub-system) INTERCONNECTING CABLES

DWG. NO./REV.: 621145

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.1	(cont'd) Cable W220	e) A "short" of the +5VDC return and ground - Loss of all the lights.	-	-	-	-	-	-	Yes	III	E	None of these failures would represent a problem. Besides, the periodic check-out and maintenance procedures will diminish greatly the probability of these failures to occur.
1.2	Cable W221 carries the Aircraft Designation and Wave-off signals from Unit 1, Connector J2, to Unit 4A1, Connector J2. Note: In the column 3, only important modes will be stated to avoid unnecessary length of the report.	An open in the LSO Wave-off or its return and in the ACLS Wave-off or its return will cause the loss of the Wave-off function.	x	x	x	x	x	x	Yes	I	E	Even though it is considered an extremely improbable situation, yet, because of the serious consequence it would create, the following is offered: • RECOMMENDATION: Route the two pairs of Wave-off Signals through two different Cables.
1.3	Cable W222 carries the AC/AC (Power/Control) from Unit 1, Connector J3 to Unit 2, Connector J2.	An open in the wires carrying Ship's AC and the Main AC power will result in the loss of the System's function.	(x)	(x)	(x)	(x)	(x)	(x)	Yes	I	D	The periodic check-out and maintenance procedures will keep the Cable in good working order. Once checked out before the operation, it is not expected that the Cable would suffer any damage (in peace time!).
1.4	Cable W223 carries the DC power from Unit 1, Connector J4 to Unit 2, Connector J1.	An open in a wire or connection - loss of that particular function of the System.	-	-	-	-	-	-	Yes	III	C	There are redundant channels of communication available.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

NAEC-91-7958

TABLE: CABLES

NAME: (Sub-system) INTERCONNECTING CABLES

DWG. NO./REV.: 621145

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.5	Cable W224 carries PLAT (Pilot Landing Aid Television) Signals from Unit 1, J5 to the PLAT System.	An open in the Wire or connection would cause a loss of the PLAT function.	(x)	(x)	(x)	(x)	(x)	(x)	Yes	II-III	D	The Hazard classification will depend on the need of the PLAT function: in good weather daylight, it could be as unimportant as a III, but at night or bad weather, it could easily be a II!
1.6	Cable W225 carries the 21MC Inter-Communication System Signals from Unit 1, J6 to the 21MC System.	An open in the Wires or connections will cause the loss of the 21MC System.	-	-	-	-	x	-	Yes	III	D	The Inter-Communication System is a redundant channel of communication between the LSO and (PRY FLY) Pilot.
1.7	Cable W226 carries the Wind (Angle & Velocity) and SPN-44 True Air Speed (TAS) and Closing Air Speed (CAS) Signals from Unit 1, J7 to Unit 4A2, J1.	An open in the Wires or connections will cause an error in the corresponding signal that it carries.	(x)	(x)	(x)	(x)	(x)	(x)	Yes	III	D	The lost signals are amongst the redundant information arrangement. It would take all redundant branches to fail to cause a problem.
1.8	Cable W227 carries the Ramp Motion, Trim, SPN-42: T.A.S. & C.A.S., Rate of Descent, Alt. Error, Lat. Error and Range Signals from Unit 1, J8 to Unit 4A1, J1.	An open in the Wires or connections will cause a loss of the corresponding signal.	(x)	(x)	(x)	(x)	(x)	(x)	Yes	III	D	
1.9	Cable W228 carries the Obstruction Light and the Pedestal Switch current from the Unit 2 to the Unit 3A4.	An open in the Wires or connections will cause a loss of:										
		. Obstruction Light	-	x	-	x	-	-	Yes	II	D	The periodic check-out and maintenance procedures will assure this Cable to be functioning when needed.
		. Pedestal Light Switch	(x)	(x)	(x)	(x)	(x)	(x)	Yes	(I)-III	D	

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: CABLES

NAME: (Sub-system) INTERCONNECTING CABLES

DWG. NO./REV.: 621145

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON:						FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			PERSONNEL		SYSTEM		MISSION		DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.10	Cable W229 carries the 115VAC power from Unit 2, J5 to Unit 4A3, J3.	An open in the wires or connections will cause a loss of the Unit 4A3 function (HUD-MOVLAS).	(x)	(x)	(x)	(x)	(x)	(x)	Yes	(I)-III	D	The detection and the repair is quick (the DS1 Light on the Unit 4A3) and easy (replace the Cable), which would take place at/during the periodic check-out procedure.
1.11	Cable W230 carries the Ship's power to the Unit 2, J3, and to the System.	An open in the wires or connections will render the HUD System inoperative.	(x)	(x)	(x)	(x)	(x)	(x)	Yes	(I)-III	D	Since the HUD System is an additional help to provide a save approach and arrest of the Aircraft on the A/C, this failure would cause a serious problem only if the Pilot had to depend on it only. However, the periodic inspections and maintenance will keep this Cable functioning. • RECOMMENDATION: Evaluate a possible redundant provision of power, and if it proves viable and advantageous, provide such design change.
1.12	Cable W231 carries the Deck Status Signals between Unit 2, TB4 and Unit 4A2, TB3 & 6.	An open in the "Foul" or the "Common" wire will cause a loss in the "Foul" Signal.	x	x	(x)	(x)	(x)	(x)	Yes	I	D	Unless there is another arrangement to indicate to the Pilot that there is an obstacle on the runway, a redundancy should be arranged to assure the safety of the pilot.

242(A-226)

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: CABLES

NAME: (Sub-system) INTERCONNECTING CABLES

DWG. NO./REV.: 621145

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.13	Cable W232 carries the 23 Lamps and their return Signals from the MOVLAS box A1200 to Unit 4A3.	i) An open in any of the 23 "Lamps" wires - Loss of one Light.	-	-	-	-	-	-	Yes	III	D	No real problem.
		ii) An open in the return wire.	(x)	(x)	(x)	(x)	(x)	(x)	Yes	(I)-III	E	
1.14	Cable W233 carries the Wind (Angle & Velocity) Signals from the Unit 4A2 to the Ship's Wind (Angle & Velocity) Synchros (or vice versa).	An open in any of the wires will cause an error in the Wind Angle or Wind Velocity display.	(x)	(x)	(x)	(x)	(x)	(x)	Yes	(I)-III	D	There are other means of communications to the pilot to guide him down.
1.15	Cable W234 carries the SPN-44 TAS & CAS Signals from Unit 4A2 to SPN-44 (or vice versa).	An open in any of the wires will cause an error or loss of the SPN-44 TAS or CAS displays.	(x)	(x)	(x)	(x)	(x)	(x)	Yes	(I)-III	D	
1.16	Cable W235 carries the Deck Status ("clear", "Common", "Foul") Signals from Unit 4A2, TB3 to the Control Box (ship's).	An open in the "Common" or "Foul" wire will cause the loss of the warning.	x	x	(x)	(x)	(x)	(x)	Yes	I-III	D	• RECOMMENDATION: If there is no redundancy in the warning arrangement, it is recommended to provide for it.
1.17	Cable W236 carries the SPN-42 Signals (ACLS Lock-on, Mode I, II, III, & ACLS Wave-off) their return from Unit 4A1, to SPN-42.	i) An open in the Signal Wires will cause the loss of that Signal.	(x)	(x)	-	-	(x)	(x)	Yes	(I)-III	D	This would represent a loss of one of redundant paths of information available to the pilot.

NOTE: Hazard Level, Colums. 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	PERSONNEL INJURY	SYSTEM LOSS	SYSTEM DAMAGE	MISSION LOSS	MISSION POTENTIAL LOSS	FAILURE - HAZARD DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.17	(cont'd) Cable W236	ii) An open in the return wire will cause the loss of all the Signals carried by the Cable W236.	(x)	(x)	-	-	(x)	(x)	Yes	(I)-III	E	This would represent a loss of one of the redundant paths of information available to the pilot.
1.18	Cable W237 carries the Signals LSO Wave-off and its return.	An open in either wire will cause the loss of the LSO Wave-off Signal.	(x)	(x)	(x)	(x)	(x)	(x)	Yes	(I)-III	D	
1.19	Cable W238 carries the Signals of Ramp Motion and Trim and their returns from Unit 4A1 to FLOLS (Harmonization Computer).	An open in a wire will cause the loss of the corresponding Signal (Ramp Motion or Trim).	(x)	(x)	(x)	(x)	(x)	(x)	Yes	(I)-III	D	
1.20	Cable W239 carries the Signals of SPN-42 (TAS, CAS, Rate of Descent, Alt. Error, Lat. Error, Range) and their returns from 4A1 to SPN-42.	An open in a wire will cause the loss of the corresponding Signal.	(x)	(x)	(x)	(x)	(x)	(x)	Yes	(I)-III	D	There are other paths of information available.
1.21	Cable W240 carries the Signals of the Aircraft Designations from the Cross Check J-B to 4A1.	An open in a wire will cause a loss of one AC Designation Signal.	-	-	-	-	-	-	Yes	III	D	

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable;

TABLE: CABLES

NAME: (Sub-system) INTERCONNECTING CABLES

DWG. NO./REV.: 621145

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON:						FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			PERSONNEL		SYSTEM		MISSION					
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.22	Cable W241	An open in a wire in these cables will cause the loss of that particular function in the Test Simulator Mode.	-	-	-	-	-	-	Yes	III	D	Test condition problem only.
1.23	Cable W242											
1.24	Cable W243											
1.25	Cable W244											
1.26	Cable W245											

Ship's Power → Signals for the Test Simulator Application

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 5

NAME: (Sub-system) TEST SIMULATOR ASS'Y

DWG. NO./REV.: 620598

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	PERSONNEL INJURY	SYSTEM LOSS	SYSTEM DAMAGE	MISSION LOSS	MISSION POTENTIAL LOSS	FAILURE - HAZARD DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)

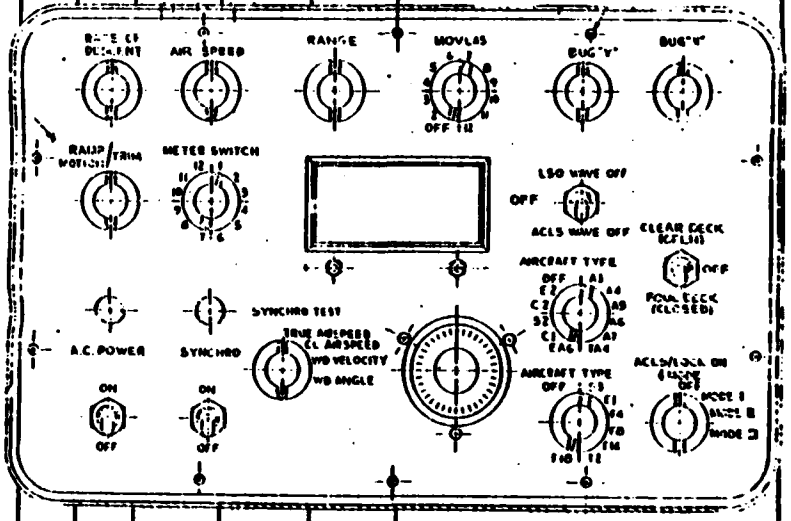
1.0 DESCRIPTION

The simulator (see Fig. 1) is a portable calibration and test device that synthesizes Signal and Synchro Junction Box inputs to calibrate the corresponding console displays or isolate a problem. The output signals incorporated in this simulator test box can be used to test the LSO Console operation without the SPN-42 ACLS system or other ship's source outputs. The simulator can be used to test all display console displays (except PLAT monitor) in place or in the shop. The potentiometer controls, toggle switches and rotary switches permit checking of the functions as indicated on the simulator box.

The simulator is self-contained. It only requires 115V AC 60Hz to operate. It contains DC power supplies to generate the required output signals and a digital voltmeter to indicate the required level of output for each check point. Check point voltage data is available on each electronic drawing corresponding to the display or scale being tested. The potentiometers on the box permit adjustment of the voltage to the circuit under test to cover the full operating range for analog input voltage signals.

Operation with the simulator causes the relays in the Signal Junction Box to energize, transferring input signals from the normal ship's source to the simulator input signals. This permits testing of the console operation by one person with the simulator at the LSO platform.

A standard 115V 60Hz test synchro is used to test the displays driven by the ship's synchro output. The test synchro is a three line (S1, S2, S3) unit having 115V, 60Hz two line (R1, R2) reference input with a 0° to 360° dial at its end to adjust the output related to degree rotation. The S1, S2, S3 and reference signals are applied to the synchro junction box through relays which are closed for the test synchro inputs and open for normal operation from the ship's input synchro information.



NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable;

NAEC-91-7958

(FAILURE MODES & EFFECTS ANALYSIS - SYSTEM) SAFETY ANALYSIS MK1 MOD 0 LSO-HUD CONSOLE SYSTEM

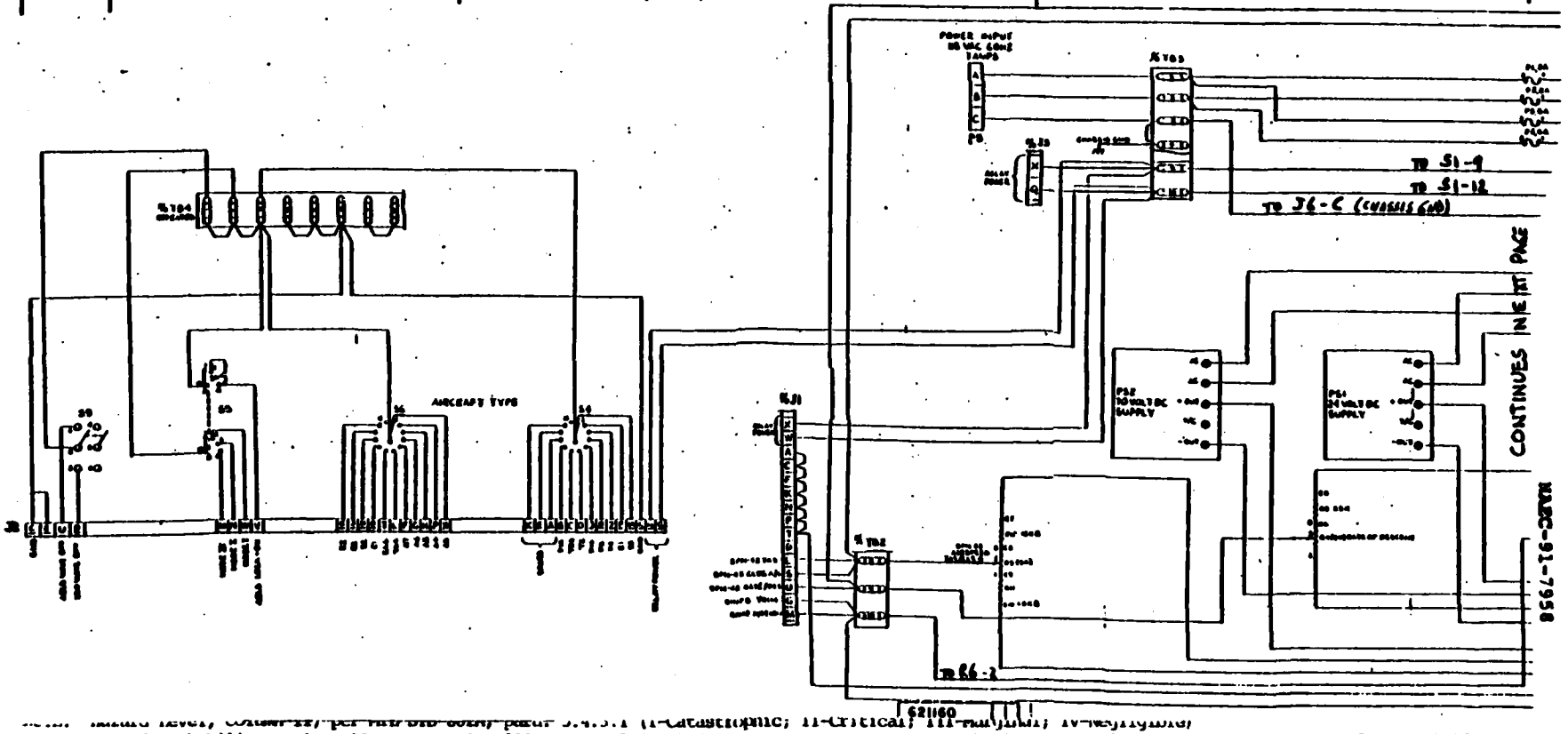
MASC-91-7958

TABLE: UNIT 5

NAME: (Sub-system) TEST SIMULATOR ASS'Y

DWG. NO./REV.: 620598

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON:						FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			PERSONNEL		SYSTEM		MISSION					
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	The following is a schematic of the test simulator circuitry.											



247(A-231)

Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)

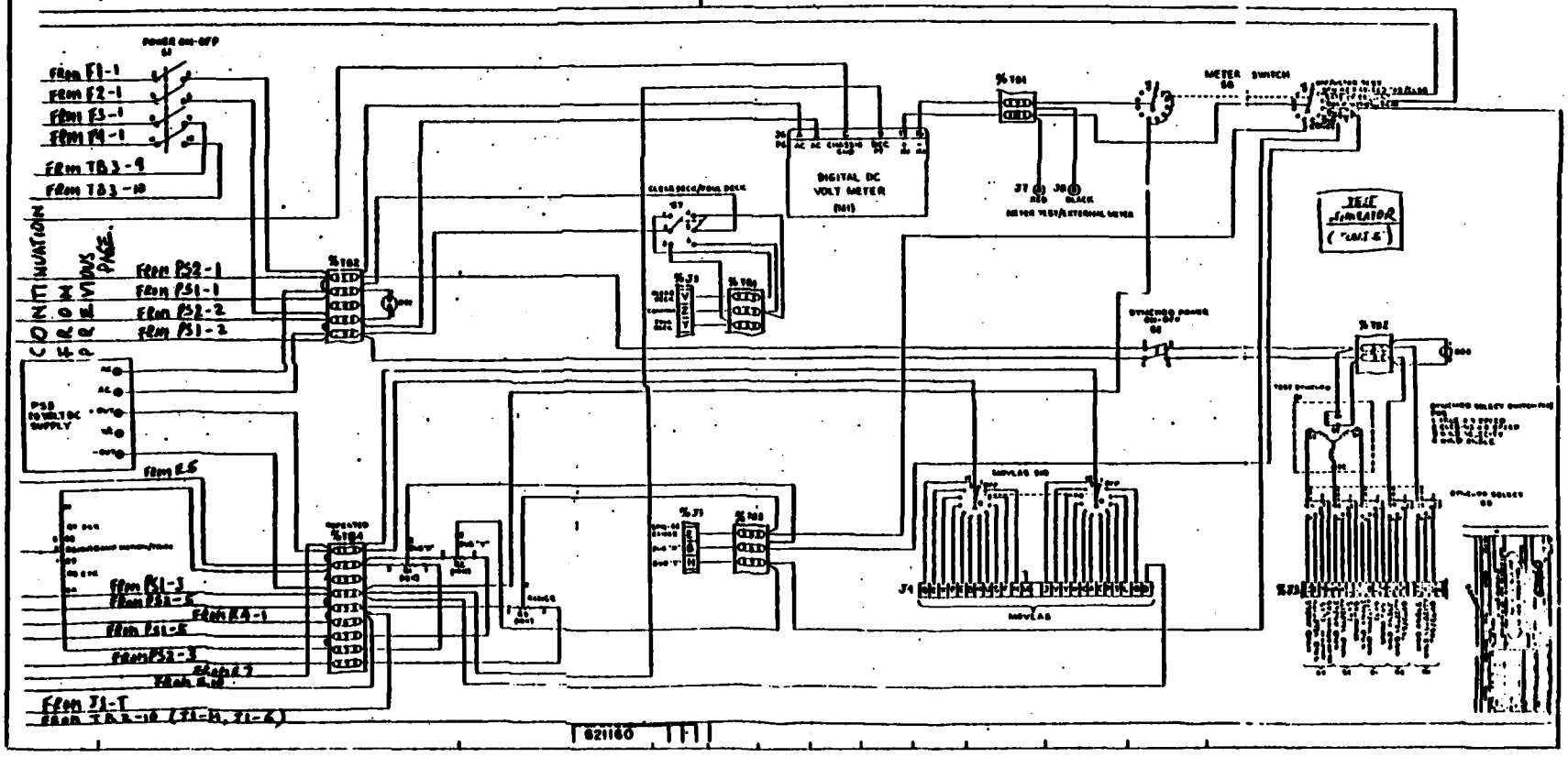
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 5

NAME: (Sub-system) TEST SIMULATOR ASS'Y

DWG. NO./REV.: 620598

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON:						FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			PERSONNEL		SYSTEM		MISSION					
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)



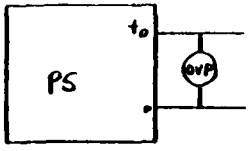
248 (A-232)

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 5

NAME: (Sub-system) TEST SIMULATOR ASS'Y

DWG. NO./REV.: 620598

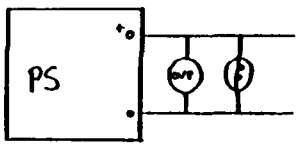
ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON:						FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			PERSONNEL		SYSTEM		MISSION		DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.1	System Circuitry Considerations a) Power Supplies PS1 (24 VDC) PS2 (70 VDC) PS3 (28 VDC) provide DC power	Failure of proper regulation - resulting in large transients or consistent overvoltage(s).	-	-	-	x	-	-	No	II	D	If the DC power supplies produce large transients or consistent overvoltages, there is a possibility that the HUD console input conditioning boards and/or the indicators will be damaged. • RECOMMENDATIONS: 1) Install overvoltage protection devices (OVP) across the power supply outputs.  When enough overvoltage is produced by the power supply, the OVP will short the power supply and the internal current limiting circuitry will shut the power supply down.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 5

NAME: (Sub-system) TEST SIMULATOR ASS'Y

DWG. NO./REV.: 620598

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.1	a) (cont'd)											2) Install power supply indicator lamps in parallel with the OVP. This lamp would inform the operator of a down power supply.  3) Utilize three additional positions on meter switch S8 to check the output of the power supplies on the DVM

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

NAEC-91-7958

TABLE: UNIT 5

NAME: (Sub-system) TEST SIMULATOR ASS'Y

DWG. NO./REV.: 620598

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON:						FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			PERSONNEL		SYSTEM		MISSION		DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.1	b) 115 VAC Relay power provides the power for the Relays in the Signal & Synchro J. boxes.	Failure in the 115 VAC Relay power.	-	-	-	-	-	-	Yes	III	D	If fuse F3 or F4 opens, the operator must deduce from secondary indications that the IHUD console has not switched to simulator inputs. • RECOMMENDATION: An indicator lamp be installed to inform the simulator operator that transfer relays are receiving AC power.
	c) Connectors: i) Multiple pin/socket connectors providing interface between the simulator and the IHUD console system: - MS17346R28C21S - MS17346R24C28SX - MS17346R24C28SW - MS17346R24C28S - MS17346R16C10P	1) Loss of circuit path i) Open crimp, ii) Foreign object blockage, iii) Bent pins	-	-	-	-	-	-	No	III	C	
		2) Incorrect circuit path i) Bent pins ii) Foreign object short	-	-	-	-	-	-	No	III	C	
	ii) Connectors for external test points for DVM Ml: - M39024/10-02 - M39024/10-03	Loss of circuit path i) Open crimp ii) Foreign object blockage iii) Bent pins	-	-	-	-	-	-	No	III	C	

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 5

NAME: (Sub-system) TEST SIMULATOR ASS'Y

DWG. NO./REV.: 620598

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.2	a) Silicone gaskets - DVM M1 drawing 424392 - Instrument panel drawing 519281 provide seals around the panel face and the DVM.	Seal breakdown resulting in water intrusion and possible simulator damage	-	-	-	x	-	-	No	III	E	If properly seated, there should be no problems with these gaskets.
	b) Rubber gaskets - MS51007-12 (1) - MS51007-10 (3) - MS51007-6 (1) provide seals around connectors J1 - J5.	Seal breakdown i) Rubber deteriorates due to environmental exposure (salt, water, etc.) ii) Rubber dry rots	-	-	-	x	-	-	No	III	D	
1.3	The simulator enclosure drawing 517921. Encases the test simulator circuitry and instruments. The simulator enclosure is equipped with one handle.	Enclosure failure - Dropping the simulator - Handle failure	-	-	-	x	-	-	N/A	II-III	C	The test simulator weight 25 lbs. and is somewhat bulky 11.5" x 16" x 10". • RECOMMENDATION: That a two-handled enclosure be considered for increased safety.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable;

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TABLE: UNIT 5

NAME: (Sub-system) TEST SIMULATOR ASS'Y

DWG. NO./REV.: 620598

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
2.0	Digital Voltmeter M1 and Meter Switch S8. Switch S8 is required to select the function under test. The functions controlled by this switch are: 1. off/meter test 2. SPM 42 Airspeed, TAS/CLSG 3. rate of descent 4. ramp motion/trim 5. bug "x" 6. bug "y" 7. range	No function selection: - Switch S8 opens or shorts.	-	-	-	-	-	-	Yes	III	D	• RECOMMENDATION: Arrange for a coincidence between the dwg. 620766, Section B-B, and the Schematic dwg. 621160, related to S8.
	The digital voltmeter (DVM) is required to adjust the analogue test voltages. Verification of HUD console outputs requires an operating DVM.	- Internal failure of DVM	-	-	-	-	-	-	yes	III	D	• RECOMMENDATION: That the DVM be externally tested when any unexpected output is observed. The DVM has overvoltage protection to 500V.
	The HUD functions controlled by meter switch S8 will be analyzed from the viewpoint of the HUD console display indicators. The DVM and meter switch S8 are assumed to be operational.											

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL: LIVES	EFFECT ON: PERSONNEL: INJURY	EFFECT ON: SYSTEM: LOSS	EFFECT ON: SYSTEM: DAMAGE	EFFECT ON: MISSION: LOSS	EFFECT ON: MISSION: POTENTIAL LOSS	FAILURE - HAZARD: DETECTABLE BY OPERATOR?	FAILURE - HAZARD: CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD: PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES, SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
2.1	SPN-42 airspeed TAS/CLSG. Meter switch S8 position 2	a) no indication i) loss of 115 VAC input power	-	-	-	-	-	-	yes	III	D	Detectable by lamp DS1 (AC power) off
		ii) loss of fuse F1, F2, F3, or F4 - loss of AC power - loss of relay switching power										
		iii) loss of PS3 (28 VDC) pwr. supply - internal failure										
		b) incorrect indication	-	-	-	-	-	-	yes	III	D	
		i) fixed resistor R10(12KΩ) opens or shorts										When operating properly the DVM will display voltages in the range 2.3 - 9.6 volts.
		ii) fixed resistor R11 (1.3KΩ) opens or shorts										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

NAEC-91-7958

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
2.1	(cont'd)	iii) potentiometer R5 wiper arm lifts off or shorts iv) power supply PS3 (28 VDC) becomes un-regulated										
2.2	Rate of Descent. Meter switch S8 position 3.	a) no indication i) loss of 115 VAC input power ii) loss of fuse F1, F2, F3, or F4 - loss of AC power - loss of relay switching power iii) loss of PS3 (28 VDC) power supply - internal failure	-	-	-	-	-	-	yes	III	D	

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

(Failure Modes & Effects Analysis - System) Safety Analysis MK1 MOD 0 LSO-HUD Console System

MAEC-91-7958

TABLE: UNIT 5

NAME: (Sub-system) TEST SIMULATOR ASS'Y

DWG. NO./REV.: 620598

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	PERSONNEL INJURY	SYSTEM LOSS	SYSTEM DAMAGE	MISSION LOSS	MISSION POTENTIAL LOSS	FAILURE - HAZARD DETECTABLE BY OPERATOR?	FAILURE - HAZARD CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
2.2	(con't)	b) incorrect indication i) fixed resistor R9 (7.5) KΩ opens or shorts ii) potentiometer R4 wiper arm lifts off or shorts iii) power supply Ps3 (28 VDC) becomes unregulated	-	-	-	-	-	-	yes	III	D	When operating properly the DVM will display voltages in the range 0 - 11.2 volts.
2.3	Ramp motion/trim. Meter switch S8 position 4.	a) no indication i) loss of 115 VAC input power ii) loss of fuse F1, F2, F3, or F4 - loss of AC power - loss of relay switching power iii) loss of PS3 (28 VDC) and PS1 (24 VDC) power supplies	-	-	-	-	-	-	yes	III	D	low probability of simultaneous failures.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

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MAEC-91-7958

TABLE: UNIT 5

NAME: (Sub-system) TEST SIMULATOR ASS'Y

DWG. NO./REV.: 620598

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
2.3	(cont'd)	b) incorrect indication i) fixed resistor R7(3.6kΩ) opens or shorts, ii) fixed resistor R8(2.7kΩ) opens or shorts, iii) potentiometer R6 wiper arm lifts off or shorts, iv) power supply PS3 (28 VDC) fails or becomes unregulated, v) power supply PS1 (24 VDC) fails or becomes unregulated	-	-	-	-	-	-	yes	III	D	When operating properly the DVM will display voltages in the range -11.6 to +11.4 volts.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

(Failure Modes & Effects Analysis - System) Safety Analysis MK 500 0 LSO-HUD Console System

NAEC-91-7958

TABLE: UNIT 5

NAME: (Sub-system) TEST SIMULATOR ASS'Y

DWG. NO./REV.: 620598

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
2.4	Bug "X".. Meter switch position 5.	a) no indication i) loss of 115 VAC input power ii) loss of fuse F1, F2, F3, or F4 - loss of AC power - loss of relay switching power iii) loss of PS3 (28 VDC) power supply - internal failure	-	-	-	-	-	-	yes	III	D	Detectable by lamp DS1 (AC power) off Low probability of simultaneous failures.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
2.4	(cont'd)	b) incorrect indication	-	-	-	-	-	-	yes	III	D	
		i) potentiometer R1 wiper arm lifts off or shorts,										When operating properly the DVM will display voltages in the range -24 to +28 volts.
		ii) power supply P3 (28 VDC) fails or becomes unregulated,										
		iii) power supply PS1 (24 VDC) fails or becomes unregulated.										
2.5	Bug "Y". Meter switch S8 position 6.	a) no indication	-	-	-	-	-	-	yes	III	D	
		i) loss of 115 VAC input power,										Detectable by lamp DS1 (AC power) off.
		ii) loss of fuse F1, F2, F3, or F4 - loss of AC power,										
		iii) loss of PS3 (28 VDC) and PS1 (24 VDC) power supplies - Internal failure										Low probability of simultaneous failures.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 5

NAME: (Sub-system) TEST SIMULATOR ASS'Y

DWG. NO./REV.: 620598

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
2.5	(con't)	b) Incorrect indication i) potentiometer R2 wiper arm lifts off or shorts, ii) power supply PS3 (28 VDC) fails or becomes unregulated, iii) power supply PS1 (24 VDC) fails or becomes unregulated.	-	-	-	-	-	-	yes	III	D	When operating properly the DVM will display voltages in the range +28 to -24 volts.
2.6	Range. Meter switch S8 position 7.	a) no indication i) loss of 115 VAC input power, ii) loss of fuse F1, F2, F3, or F4 - loss of AC power - loss of relay switching power, iii) Loss of PS2 (70 VDC)	-	-	-	-	-	-	yes	III	D	When operating properly the DVM will display voltages in the range 0 - 70 volts.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

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TABLE: UNIT 5

NAME: (Sub-system) TEST SIMULATOR ASS'Y

DWG. NO./REV.: 620598

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
2.6	(cont'd)	iii) power supply - Internal failure										
		b) Incorrect indication	-	-	-	-	-	-	Yes	III	D	When operating properly, the DVM will display voltages in the range 0-70 volts.
		i) Potentiometer R3 wiper arm lifts off or shorts.										
		ii) Power supply PS2 (70 VDC) becomes unregulated.										

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NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 5

NAME: (Sub-system) TEST SIMULATOR ASS'Y

DWG. NO./REV.: _____

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
3.0	Test synchro S1 and associated circuitry. The 115VAC 60Hz single phase synchro tester provides the capability to monitor and test the following HUD console functions: 1) True Airspeed; 2) Closing airspeed; 3) Wind velocity; 4) Wind angle. Two switches control operation of the test synchro. Switch S2 is the on-off synchro power switch and switch S3 is a four-position selector of the HUD console functions, above. The AC power circuitry is provided with an indicator lamp DS2 to show synchro power. The synchro select switch S3 is a five-deck waver switch controlling the synchro test functions.											
	Synchro select switch S3 positions 1, 2, 3, and 4.	a) No Indication	-	-	-	-	-	-	Yes	III	D	
		i) Loss of 115 VAC input power										Detectable by lamp DS2
		ii) Switch S2 fails open										Detectable by lamp DS2
		b) Incorrect indication	-	-	-	-	-	-	Yes	III	D	
		i) Synchro select switch S3 shorts or opens										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

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TABLE: UNIT 5

NAME: (Sub-system) TEST SIMULATOR ASS'Y

DWG. NO./REV.: 620598

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
4.0	MOVLAS - Manually Operated Visual Landing Aid System, Switch S10. The MOVLAS repeater duplicates, on the HUD console, the display of datum bar and meatball lights that the pilot observes.	a) no indication i) loss of 115 VAC input power ii) loss of fuse F1, F2, F3, or F4 - loss of AC power - loss of relay switching power iii) loss of P3 (28 VDC) power supply - internal failure iv) switch S10 opens	-	-	-	-	-	-	yes	III	D	In the schematic the MOVLAS switch, S10, is a 12 position switch. Position 1 is off and position 2 tests three lamps. The decal and photograph show a 12 position switch where pos. 1 tests Lamp 1 and pos. 2 tests Lamps 2 and 3. On off is controlled by a toggle switch which is not found in the schematic. Recommend these differences be resolved.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	PERSONNEL INJURY	SYSTEM LOSS	SYSTEM DAMAGE	MISSION LOSS	MISSION POTENTIAL LOSS	FAILURE - HAZARD DETECTABLE BY OPERATOR?	FAILURE - HAZARD CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
4.0	(cont'd)	b) incorrect indication i) power supply PS3 (28 VDC) becomes un-regulated ii) switch S10 shorts	-	-	-	-	-	-	yes	III	D	
5.0	Aircraft Type. Switches S6 and S4 select the aircraft type to be displayed on the HUD console.	a) no indication i) loss of 115 V.C input power ii) loss of fuse F1, F2, F3, or F4 - loss of AC power - loss of relay switching power iii) loss of PS3 (28 VDC) power supply - internal failure iv) switch S6 and/or S4 opens	-	-	-	-	-	-	yes	III	D	Detectable by lamp DS 1 (AC power) only.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

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TABLE: UNIT 5

NAME: (Sub-system) TEST SIMULATOR ASS'Y

DWG. NO./REV.: 620598

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON:						FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			PERSONNEL		SYSTEM		MISSION					
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
5.0	(cont'd)	b) Incorrect indication i) Power supply PS3 (28 VDC) becomes un-regulated. ii) Switch S6 and/or S4 short.	-	-	-	-	-	-	Yes	III	D	

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 5

NAME: (Sub-system) TEST SIMULATOR ASS'Y

DWG. NO./REV.: 620598

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON:						FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			PERSONNEL		SYSTEM		MISSION		DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
6.0	Automatic Carrier Landing System (ACLS) status. The ACLS indicates a lock-on and one of three modes of operation as follow: Mode I - Full ACLS landing Mode II - Instrument landing Mode III - "Talk Down" landing The ACLS indicators are powered by 28 VDC and testing is controlled by S5, a four position, double deck wafer switch.	a) No indication i) Loss of 115 VAC input power, ii) Loss of fuse F1, F2, F3, or F4 - Loss of AC power - Loss of relay switching power	-	-	-	-	-	-	Yes	III	D	Detectable by lamp DS1 (AC power) off.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable;
F-[illegible]

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL		SYSTEM		MISSION		FAILURE - HAZARD			COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
			LIVES	INJURY	LOSS	DAMAGE	LOSS	POTENTIAL LOSS	DETECTABLE BY OPERATOR?	CLASSIFICATION (HAZARD LEVEL)	PROBABILITY OF OCCURRENCE	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
6.0	(cont'd)	iii) loss of PS3 (28 VDC) power supply - internal failure iv) switch S5 opens b) incorrect indication i) power supply PS3 (28 VDC) fails or becomes unregulated ii) switch S5 shorts	-	-	-	-	-	-	yes	III	D	

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

(Failure Modes & Effects Analysis - System) Safety Analysis MK 1 MOD 0 LSO-HUD Console System

NAEC-91-7958

TABLE: UNIT 5

NAME: (Sub-system) TEST SIMULATOR ASS'Y

DWG. NO./REV.: 620598

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	EFFECT ON: PERSONNEL INJURY	EFFECT ON: SYSTEM LOSS	EFFECT ON: SYSTEM DAMAGE	EFFECT ON: MISSION LOSS	EFFECT ON: MISSION POTENTIAL LOSS	FAILURE - HAZARD: DETECTABLE BY OPERATOR?	FAILURE - HAZARD: CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD: PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
7.0	ACLS wave off and LSO wave off switch, S9. This is a three position toggle switch (forward = LSO wave off, center = off, back = ACLS wave off). The LSO wave off activates red flashing lamps (90 flashes/min.). The ACLS wave off activates a blue flashing light (180 flashes/min).	no indication i) loss of 115 VAC input power ii) loss of fuse F1, F2, F3, or F4 - loss of AC power - loss of relay switching power iii) loss of PS3 (28 VDC) power supply - internal failure iv) switch S9 opens or shorts	-	-	-	-	-	-	yes	III	D	Detectable by lamp DS1 (AC power) off.

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

TABLE: UNIT 5

NAME: (Sub-system) TEST SIMULATOR ASS'Y

DWG. NO./REV.: 620598

ITEM NO.	ITEM DESCRIPTION (COMPONENT, MODE OF OPERATION, FUNCTION)	HAZARDOUS-FUNCTIONAL FAILURE MODE (HAZARD RELEASE MECHANISM)	EFFECT ON: PERSONNEL LIVES	EFFECT ON: PERSONNEL INJURY	EFFECT ON: SYSTEM LOSS	EFFECT ON: SYSTEM DAMAGE	EFFECT ON: MISSION LOSS	EFFECT ON: MISSION POTENTIAL LOSS	FAILURE - HAZARD DETECTABLE BY OPERATOR?	FAILURE - HAZARD CLASSIFICATION (HAZARD LEVEL)	FAILURE - HAZARD PROBABILITY OF OCCURRENCE	COMMENTS; RECOMMENDATIONS; COMPENSATING PROVISIONS (ACCIDENT PREVENTION MEASURES; SAFETY CONTROLS)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
8.0	Clear deck/foul deck. The clear deck/foul deck indicators are controlled by a three pole, double throw switch, S7. A green light indicates a clear deck, while a red light indicates a fouled deck. These indicators are powered by 115 VAC.	a) no indication	-	-	-	-	-	-	yes	III	D	
		i) loss of 115 VAC input power										Detectable by lamp DS1 (AC power) off.
		ii) loss of fuse F1, F2, F3, or F4 - loss of AC power - loss of relay switching power										
		iii) switch S7 opens										
		b) incorrect indication	-	-	-	-	-	-	yes	III	D	
		i) switch S7 shorts										

NOTE: Hazard Level, Column 11, per MIL-STD-882A, para. 5.4.3.1 (I-Catastrophic; II-Critical; III-Marginal; IV-Negligible)
Hazard Probability, Column 12, per MIL-STD-882A, para. 5.4.3.2 (A-Frequent; B-Reasonably Probable; C-Occasional; D-Remote; E-Extremely Improbable; F-Impossible)

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APPENDIX B

H/FMEA RECOMMENDATIONS SUMMARY

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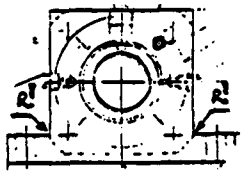
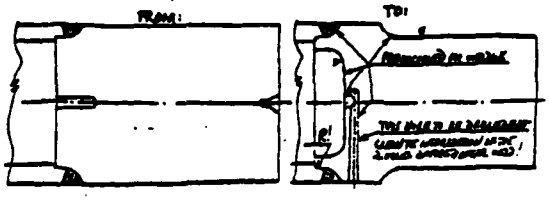
SUMMARY, SYSTEM SAFETY ANALYSIS

MK1 MOD O LSO-HUD CONSOLE SYSTEM NAEC-91-7958

NO.	RECOMMENDATION	SSA		RELATED TO:				FOR:	
		UNIT	ITEM NO.	a	b	c	d	e	f
1	It is recommended that the CRT and Yoke be enclosed by a protective cover if the only removal path is through the console front. The cover should be secured to the CRT envelope and provide access for the removal of the high voltage lead and connections to the CRT and yoke.	1	15.0.b		x	x	x	x	x
2	Place a wide wire mesh screen over the front face of the projection lamp to preclude accident during maintenance.	1	23.0.a		x	x	x	x	x
3	Create a sandwich of the combiner glass and a plastic neutral density filter on the observer side of the combiner glass.	1	24.0.a		x	x	x	x	x
4	Incorporate a compression pin locking device on the side of the mirror and support assembly base to lock and maintain the support arm in the vertical attitude regardless of knurled knob tension.	1	24.0.a		x	x	x	x	x
5	Incorporate a compression pin locking device on the spherical mirror hold-down latch.	1	24.0.a		x	x	x	x	x
6	Provide a warning circuit within the LSO Console (aural & visual) to warn the user that an excursion has occurred which may, or may not, have caused damage that requires the attention of maintenance personnel.	2	1.0.a	x	x	x		x	x
7	Provide individual indicators on the LSO console for each voltage as a confidence indicator ("GO"/"NO-GO").	2	1.0.a	x		x		x	x
8	Provide overvoltage protection for each power supply output to bar against damaging transients.	2	1.0.a		x	x	x	x	x
9	Replace the dependency of the main power control bus on the airflow switch - let loss of cooling airflow energize a warning indicator which coordinates with items 6 and 7 above.	2	1.0.a	x	x	x	x	x	x

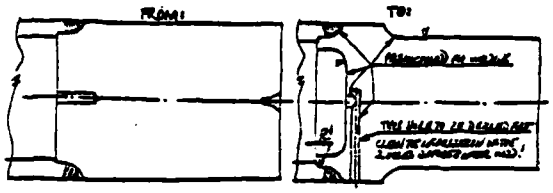
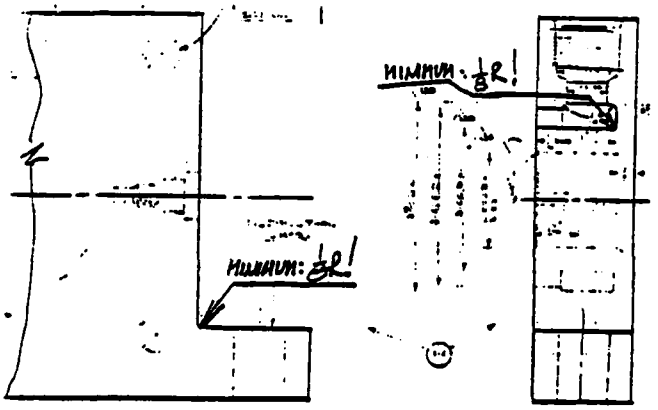
LEGEND:

- a — General Reliability, Simplification, Design Improvement
- b — Avoiding, Eliminating & Reducing Potential Hazards
- c — Controlling & Minimizing Potential Hazards
- d — Incorporation of Fail-Safe Principles
- e — Existing Design
- f — Future Design

NO.	RECOMMENDATION	SSA		RELATED TO:				FOR:	
		UNIT	ITEM NO.	a	b	c	d	e	f
10	Arrange with the vendor (Galland Henning Nopak, Inc. 1025 S. 4th St., Milwaukee, Wisc. 53215) to provide round and smooth corners and edges to avoid personal injury, on their dwg. C-22026CY.	3A1	1.1.2. 1.a	x	x	x		x	x
11	Arrange with the same vendor to provide ample raddi to form round fillets between the attaching feet and the body of this part:  (Vendor's dwg. D-417SK; applies to Nos. 10, 11, 12)	3A1	1.1.2. 1.b	x	x	x		x	x
12	Arrange with the same vendor to incorporate an air purging or other means to get rid of the upper air bubble, to assure the gland to be always bathed in the hydraulic liquid.	3A1	1.1.2. 1.c	x	x	x		x	x
13	Arrange with the vendor (G.H. Nopak, Inc.) to specify ample raddi in all fillets, especially those that could cause stress concentration, and to premachine the Round Stock to prepare it better for the welding to the tubing. See sketch below (Piston Rod, item 4 of Cylinder 620728-4) 	3A1	1.1.2. 2.a	x	x			x	x

LEGEND:

a — General Reliability, Simplification, Design Improvement
b — Avoiding, Eliminating & Reducing Potential Hazards
c — Controlling & Minimizing Potential Hazards
d — Incorporation of Fail-Safe Principles
e — Existing Design
f — Future Design

NO.	RECOMMENDATION	SSA UNIT	SSA ITEM NO.	RELATED TO: a	b	c	d	FOR: e	f
14	Arrange with the vendor to drill the perpendicular hole first and the axial hold second. See sketch: (Piston Rod, item 4 of Cylinder 620728-4) 	3A1	1.1.2.2.b	x	x			x	x
15	Arrange with the vendor to provide an assured "soft touch" for the upper limit of the stroke, and the hydraulic pressure release under the PISTON at reaching the upper limit of the stroke, derived from the movement of the PISTON.	3A1	1.1.2.4	x	x			x	x
16	Arrange with the vendor to provide round/ smooth corners and edges that can be expected to be handled/touched by the Navy personnel.	3A1	1.1.2.5.a	x	x	x		x	x
17	Arrange with the vendor to specify radii for the important fillets! See sketch: 	3A1	1.1.2.5.b	x	x	x		x	x
18	For the Limit Switches LS1 & LS2 (620728-5):	3A1	1.1.3.b	x	x	x		x	x

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NO.	RECOMMENDATION	SSA		RELATED TO:				FOR:	
		UNIT	ITEM NO.	a	b	c	d	e	f
18 (cont)	i) Introduce the necessary pre-operational checks of the System to be performed before the intended use. ii) Provide a protection arrangement to keep the debris from falling between the Roller and the Cam.								
19	Provide the two existing rubber inner pads 518987-2 to "overhang" the length of the Half Clamps; also, provide a 45° chamfer or round the inner edges of the Half Clamps.	3A1	1.1.4	x	x	x		x	x
20	It is always recommended (particularly for the new designs) to place the pump under the tank so that the Pump's suction column will be filled with a positive pressure. The need for priming will be avoided and the efficiency of the Pumps will increase.	3A2	1.2.1.a	x	x	x		x	x
21	Provide two gussets welded inside the Tank against the outside gussets 620579-11, to strengthen the support of the Air Motor/Pump Assembly.	3A2	1.2.1.b	x	x	x		x	x
22	Re-evaluate the filtering arrangement and specify the correct filter element for 620582-6.	3A2	1.2.2	x	x	x		x	x
23	For the Air Motor 518913-1: a) Mention in the Operation and Maintenance Manual the need to provide load to the Air Motor or otherwise limit its speed to 10% above that at maximum power. b) Provide an overspeed governor or shut-off arrangement.	3A2	1.2.3.a	x	x	x		x	x
24	Evaluate the test results in cold, humid weather and introduce the corrective action as necessary, to avoid the air exhaust to get clogged by frozen, condensed moisture.	3A2	1.2.3.b	x	x	x		x	x

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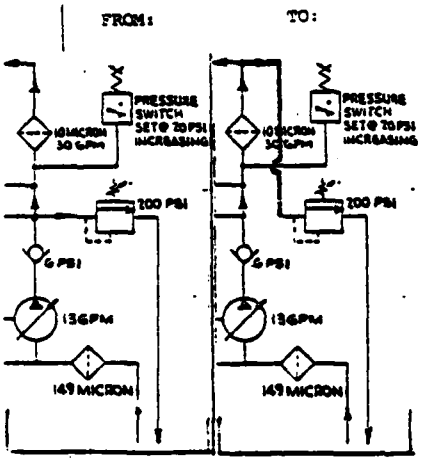
NO.	RECOMMENDATION	SSA UNIT	SSA ITEM NO.	RELATED TO: a	b	c	d	FOR: e	f
25	Provide filtration of the Hydraulic Fluid to 25 micron or better, as required (to avoid contamination of the Hydraulic Fluid and the Relief Valve 517792-1). One possible way could be by changing the connection as shown in the following HYDRAULIC schematic: 	3A2	1.2.6.a	x	x	x		x	x
26	Re: Schematic Diagram 620580: Provide the connections in such a way that there will be an automatic interlocking, or an automatic return of Azimuth and Elevation to their aligned positions upon activating the HUD-Down switch(es) before the HUD would start moving down, or keep the LS2-B contacts always open(!) NOTES: ① There should be no connection between pins LS4-2 and LS5-2! ② For better reliability of the observation light to be "on", eliminate the LS1-B! (Leave only LS1-A to switch the observation light "on".)	3A2	1.2.7.a	x	x	x		x	x

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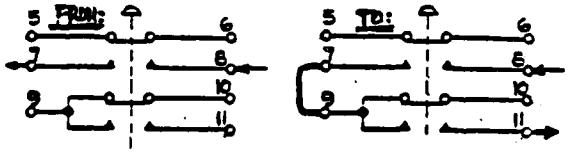
NO.	RECOMMENDATION	SSA		RELATED TO:				FOR:	
		UNIT	ITEM NO.	a	b	c	d	e	f
27	For the Filter 518897-1: a) Provide also electrical Dirt Alarm (available in this line of filters). b) Provide enough room for easy/quick replacement of the Filter Element. c) Show the Dirt Alarm pointer and scale of this Filter on the assembly drawings: 620582-1 (Piping Assy) & 620578-1 (Hydraulic Power Package).	3A2	1.2.8.2	x	x	x		x	x
28	Provide a tie between the upper end (the Filter 516965-1) and the Support Frame 620581-1 to eliminate or greatly reduce the vibration of the Filter.	3A2	1.2.8.3	x	x	x		x	x
29	To assure an increased reliability of the Switch-Inidcator A620741-4 (L8-S6) "HUD-DOWN" against short between contacts 7-8, provide a redundancy by connecting the contacts: 	3A3	1.3.2.4.c	x	x	x		x	x

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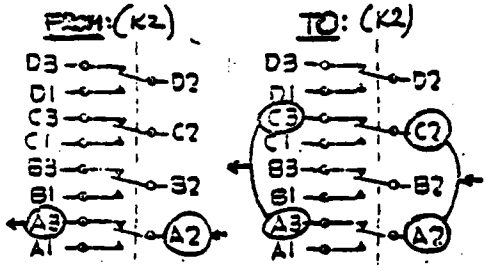
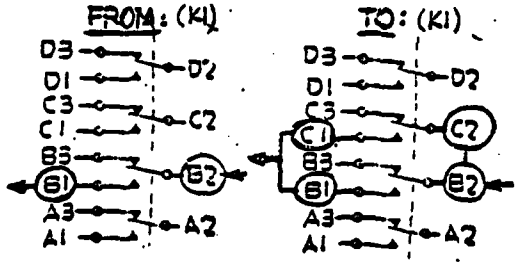
NO.	RECOMMENDATION	SSA UNIT	SSA ITEM NO.	RELATED TO: a	b	c	d	FOR: e	f
30	To increase the reliability in the K2 Relay 518915-1 against the NC contacts A failure to close, wire the K2 Relay according to the circuit diagram: 	3A4	1.4.1. b.ii	x	x	x		x	x
31	To increase the reliability in the K1 Relay 518915-1 against the NO conatcts B failure to close, wire the K1 Relay according to the diagram below: 	3A4	1.4.1. e.i	x	x	x		x	x

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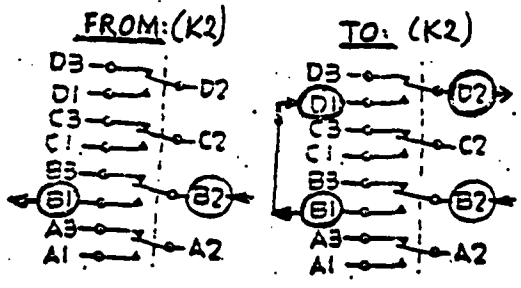
		UNIT	ITEM NO.	a	b	c	d	e	f
32	Wire the K2 Relay as shown to increase reliability against the short of the NO contacts B:  	3A4	1.4.1.j.ii	x	x	x		x	x
33	Relay 518915-1, maximum current through contacts: 10 Amp, minimum current through contacts: 40 milli-Amp (!) Considering that very low current signals (38 micro/Amp!) will be handled in the System, the following is recommended: Change the circuitry to assure passage of low current signals!!! (Current amplification?, solid state?)	4A1	1.2 1.2.j.iii 1.2.k.iii 1.2.l.iii 1.2.m.iii	x	x	x	x	x	x
34	Relay 518915-1, maximum current through contacts: 10 Amp, minimum current through contacts: 40 milli-Amp (!) Considering that very low current signals (38 micro/Amp!) will be handled in the System, the following is recommended: Change the circuitry to assure passage of low current signals!!! (current amplification? solid state?)	4A2	1.2.a.iii 1.2.b.iii 1.2.c.iii 1.2.d.iii 1.2.e.iii 1.2.f.iii 1.2.g.iii	x	x	x	x	x	x
35	Include the necessary instruction (to observe the Power Monitor Light and switch off the Power Switch) for Maintenance personnel before they start working on the Unit 4A3.	4A3	1.2	x	x	x		x	x

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SUMMARY, SYSTEM SAFETY ANALYSIS

MK1 MOD 0 LSO-HUD CONSOLE SYSTEM NAEC-91-7958

NO.	RECOMMENDATION	SSA		RELATED TO:				FOR:	
		UNIT	ITEM NO.	a	b	c	d	e	f
36	Route the two pair of Wave-off Signals through two different Cables.	CABLES	1.2	x	x	x		x	x
37	Evaluate a possible redundant provision of power and provide such design change if found viable and advantageous.	CABLES	1.11	x	x	x		x	x
38	Provide redundancy in the warning arrangement of the Deck Status (Cable W235 and W231).	CABLES	1.16 1.11	x	x	x		x	x
39	Provide overvoltage protection for three power supplies in the test simulator.	5	1.1a		x			x	x
40	Install power supply indicator lamps to show power supply status. (Suggest usage with No. 39) Expediting fault isolation.	5	1.1a	x				x	x
41	Utilize three additional positions on meter switch S8 to check power supply output on the DVM.	5	1.1a	x				x	x
42	Install an indicator lamp to show AC to the switching relays.	5	1.1b	x				x	x
43	Consider a two-handled simulator enclosure as the present one-handled enclosure is somewhat bulky. (11.5" x 16" x 10", 25lbs)	5	1.3			x		x	x
44	Recommend the DVM be externally tested as the first step in fault isolation (where the DVM is utilized)	5	2.0 Procedures						
45	Recommend the drawing package be inspected for consistency.	5	2.0 3.0 4.0	x				x	x

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