National Aeronautics and Space Administration

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Lyndon B. Johnson Space Center
Houston, Texas 77058

MSC-07652

STANDARD OPERATING PROCEDURES

WATER IMMERSION FACILITY

REVISION B

SPACECRAFT DESIGN DIVISION

CREW STATION BRANCH

MARCH 1979

STANDARD OPERATING PROCEDURES

Water Immersion Facility

Revised Mar. 1979

This document prepared under Contract NAS 9-13000, Spacecraft Design Laboratory Support Group, Northrop Services, Inc.

Comments and questions regarding this Document, or requests for copies, should be directed to A. F. Smith, EW5, Ext. 4468 or B. D. Pavig, NSI, Ext. 2561.

NORTHROP SERVICES, INC.

STANDARD OPERATING PROCEDURES MANUAL

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NORTHROP SERVICES, INC.

SDL SUPPORT GROUP

JOHNSON SPACE CENTER

HOUSTON, TEXAS

Rev. E

NSI-SDL SUPPORT GROUP Rev. E

EP-101

GENERAL GUIDELINE PROCEDURES

REVISION BLOCK

DATE	PREPARED BY	APPROVED BY	CONCUR	CONCUR	CONCUR	REVISION
2-16-70						Issued
3-23-72						A
3-23-72						B (Cover) P.4
8-4-72	BDP Reviewed 8-4-72	BDP 8-4-72	Reviewed JKS 8-10-72	Reviewed AFE 8/10/72	GCF 11/13/72	C
10-1-74	JKS 10-1-74	BDP 10-1-74	Reviewed W/FH 10-2-74	AFE 10/3/74	GCF 10/3/74	D
10-26-78	JAS 10-31-78 BDP 11-14-78	AFE 1-5-79	V CH 3-15-79	JC Mundt 3/16/79		E

NSI-SDL SUPPORT GROUP Rev. E

EP-101

GENERAL GUIDELINE PROCEDURES

1.0 GENERAL

1.1 Purpose Rev. E

The purpose of these general guideline procedures is to identify those factors that are common to all SDL Support Group Emergency Procedures and to establish the basic rescue plan. As a consequence, needless repetition of these fundamentals will be eliminated from the other, more specific procedures.

1.2 Applicability

It is in no way intended for these guideline procedures alone to be complete enough to serve any individual test. Specific Emergency Procedures for each different mockup configuration and/or different test plan will be developed through the analysis of simulated malfunctions underwater. Each will then be written in a standard format for briefing and training purposes.

2.0 APPLICABLE DOCUMENTS Rev. E

Documents available in support of all SDL Support Group Emergency Procedures are as follows:

2.1 Water Immersion Facility Operational Readiness Plan, Rev. A. (Partial Revision Sept. 1974)

2.2 JSC Safety Manual (JSCM 1700).

2.3 NSI Safety Manual

2.4 Test Plans for Specific Tests.

3.0 COMMON FACTORS Rev. E

3.1 Safety in General

Safety shall be the primary consideration in all SDL Support Group operations. Due to this philosophy, as stated in the WIF Operational Readiness Plan, the following ground rules are restated here and shall apply without exception.

3.1.1 Prior to any training exercise or evaluation, all equipment to be used will be thoroughly checked in accordance with the approved test director's checklists.

3.1.2 All new items of equipment or new procedures that are to be used underwater will be evaluated both on the surface and submerged by WIF safety divers prior to being used by any other personnel.

3.1.3 The main ballast weights will be equipped with a quick-release mechanism such that rapid removal may be accomplished in the event of a loss-of-buoyancy malfunction.

3.1.4 All other items to be attached to the test subject, excluding the ankle and wrist trim weights, will be equipped in such a manner that they will be released from the crewman when the main ballast weights are dumped.

3.1.5 A minimum of two safety divers will be in the water with each suit subject during a manned run.

3.2 Safety Diving in General

It will be incumbant on each safety diver to assume responsibility for the following:

3.2.1 To become fully acquainted with the specific Test Plan of the exercise in which he is to participate. This will include the Emergency Procedure for his duty station as well as those of all other safety divers;

3.2.2 To examine the pressure suit being used prior to water entry in order to assure himself that he can depressurize it and provide breathing air to the subject under emergency conditions;

3.2.3 To be alert for otherwise unnoticed hazardous conditions presented by the vehicle mockup and other underwater equipment;

3.2.4 To prevent the subject from entering any dangerous position while underwater;

3.2.5 To terminate the exercise at any time if, in his best judgment, safety is compromised;

3.2.6 To continuously monitor the integrity of ballast weights, pressure suits, and umbilicals during manned runs;

3.2.7 To escort the subject to the vehicle mockup after ballasting and prevent his ingress until the second safety diver is at his assigned duty station;

3.2.8 ABOVE ALL ELSE, to maintain a constant vigil on the subject's physical and emotional condition throughout the exercise. Rev. E

3.3 Mockup Installation in General Rev. E

The installation and removal of each mockup requires separate and individual techniques; however, the following general operating procedures will apply:

3.3.1 Insure that the high bay area is secure and clear of all transients.

3.3.2 Visually inspect all straps and slings to be used to insure that there are no visible defects and the proof test data has not expired. Attach the slings to the mockup lifting point. If no lifting point is available, attach the straps and/or slings to a point near the center of gravity. Secure the mockup to prevent tilting or swinging.

3.3.3 During mockup installation the hoist operator will direct the activities of all support personnel. All personnel will stand clear of the operation and assist the hoist operator as directed. During immersion of the mockup in the water tank, the hoist will be moved only on hand signals by divers in the water. NOTE: Verify that electric power to electric hoist is "OFF". Rev. E

3.3.4 Removal of mockup from the water tank will be accomplished in the same manner as installation. The hazardous nature of mockup installation and removal requires that all personnel will observe established safety practices and be on the alert for potential dangers.

3.4 Hyperbaric Chamber Use Rev. D

For hyperbaric chamber use see WIF "Standard Operating Procedure, EP-112, "Emergency Evacuation of Suit Subject from the Water Tank", dated November 1978.

4.0 BASIC RESCUE PLAN

4.1 General

Due to the possibility of injury to the suit subject, all emergency procedures must be developed with the intent to provide for a maximum surfacing time of 60 seconds. This allows for adequate medical attention to be administered when the subject is brought to the surface. The medical officer will assume control of all operations and will direct the activities of medical personnel and WIF personnel for the duration of any medical emergency situation.

4.2 Nonflooded Helmet

Should the pressure suit or other support equipment malfunction in such a manner that water is not entering the helmet, and is not limiting the subject's breathing, the safety divers will bring the subject to the surface by the most direct route. It is the responsibility of the first diver who reaches the subject to determine if the subject's breathing is impaired. It remains this diver's responsibility to monitor the condition of the subject until he is taken to the surface and either the malfunction is cleared or the test is terminated. The second safety diver will assist the first diver by helping to maneuver the subject and insuring that all umbilicals and other equipment is cleared to allow free passage. Only in those cases when buoyancy is lost should the main ballast weights be dumped. The air supply umbilicals should be disconnected only as a last resort.

4.3 Flooded Helmet

Should the pressure suit or other support equipment malfunction in such a manner that the helmet is flooded, the first safety diver to reach the subject will depressurize the suit if required, remove or open the helmet, and provide the subject with the emergency SCUBA regulator. It remains this diver's responsibility to monitor the condition of the subject until he is removed from the tank. The second diver

will be responsible for verifying that first diver is supplying emergency air, for clearing all obstructing equipment and umbilicals and for guiding the subject and the first safety diver to the surface. Under these conditions, the main ballast weights, umbilicals, and the bio-comm connector should be removed.

5.0 GENERAL COVERAGE DEFINITIONS

5.1 Normal Open-tank Coverage

In each specific Emergency Procedure, usage of the term "normal open-tank coverage" shall mean that the subject is not inside any mockup. The safety divers in this case shall remain nearby and exercise their own judgment on position and rescue route. All provisions of Section 4.0 shall be the basic rescue plan.

5.2 Floater position

In some cases there are more safety divers than there are duty stations around a given mockup. When this happens, the extra divers assume a floater position, which is behind and out of the way of a prime duty station. These divers will act as a backup for the prime divers and assist them in the event of a malfunction.

EMERGENCY PROCEDURE

EP-111

EMERGENCY EVACUATION OF SUIT SUBJECT FROM THE WATER TANK

NORTHROP SERVICES, INC.

SDL SUPPORT GROUP

JOHNSON SPACE CENTER

HOUSTON, TEXAS

EMERGENCY EVACUATION OF SUIT SUBJECT

FROM THE WATER TANK

EP-111

REVISION BLOCK

DATE	PREPARED BY	APPROVED BY	CONCUR	CONCUR	CONCUR	REVISION
9-17-74						Issued
10-23-78	10-27-78 BDA 11-14-78	1-17-79	V.C.H 3-15-79	D.E. Zimmerman 3/16/79		A

NSI-SDL SUPPORT GROUP

EP-111

EMERGENCY EVACUATION OF SUIT SUBJECT FROM THE WATER TANK

1.0 GENERAL

The purpose of this document is to establish a step-by-step procedure for the removal of a potentially embolised subject from the water tank and for the transportation of the subject to the hyperbaric chamber in Building 32. This procedure will apply to all suited operations in the water tank. The emergency operations will be initiated and controlled by the Test Director should an incident occur which would expose the test subject to a possible embolism.

2.0 PRE-TEST

The top-side monitor will insure that the following items have been completed before the test begins:

1. Verify ambulance and hyperbaric chamber people are ready. Rev. A
2. Verify driveway clear and that "Test in Progress" sign is in proper position.
3. Verify evacuation path clear.
4. Verify High-Bay door is in operation.
5. Verify Bill-Pugh net is in proper configuration and connected to hook.
6. Verify hoist operational and in proper position.
7. Check facility air pressure for 80 psi. Rev. A
8. Verify electric hoist turned off.

3.0 EMERGENCY OPERATIONS

Should conditions develop which require the emergency evacuation of an injured subject from the tank to Building 32, the following steps will be performed.

1. When the Test Director declares an emergency, the top-side monitor will notify the chamber people.

2. The top-side monitor will proceed to the high-bay door and open it.

3. Hoist operator will insure Billy-Pugh net is in the water at correct position. Rev. A

4. Safety divers will remove the helmet and umbilicals.

5. Safety divers will place injured crewman into the net head-first-face-up.

6. A safety diver will enter the net and ride down with the crewman to the medical station. Rev. A

7. Hoist operator will lower the net to the medical station on the ground floor.

8. The medical officer will assume responsibility of the affected crewman as soon as the affected crewman reaches the medical station.

9. The hoist operator, safety divers, back-up safety divers, and top-side monitor will assist the medical monitor in removal of the affected crewman from the Billy-Pugh net to the ambulance.

4.0 POST TEST

4.1 Following the conclusion of the test, the top-side monitor will notify the hyperbaric chamber people that the test is over. Rev. A

4.2 Top-side monitor will insure that Billy-Pugh net is stored.

4.3 To-side monitor will stow the "Test in Progress" sign.

EMERGENCY PROCEDURE

EP-112

SHUTTLE AIRLOCK HORIZONTAL

NORTHROP SERVICES, INC.

SDL SUPPORT GROUP

JOHNSON SPACE CENTER

HOUSTON, TEXAS

NSI-SDL SUPPORT GROUP

SHUTTLE AIRLOCK HORIZONTAL

EP-112

REVISION BLOCK

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NSI-SDL SUPPORT GROUP

EP-112 Rev. A

SHUTTLE AIRLOCK HORIZONTAL

1.0 GENERAL

When the Shuttle Airlock is horizontal, there are four possible escape routes. These are the FWD-Crew Station Hatch, the AFT Payload Bay Hatch, the Up-Bulkhead, and the Down-Bulkhead.

2.0 ONE SUBJECT COVERAGE

2.1 Mockup Ingress/Egress

One safety diver will be stationed at the airlock up-bulkhead and the other diver will be stationed at the hatch (forward or aft) the crewman is passing through.

2.2 Inside the Airlock

One safety diver will be at the hatch of crewman entry, and the other safety diver will be at the up-bulkhead.

3.0 TWO SUBJECT COVERAGE

3.1 Mockup Ingress/Egress

When the first crewman ingresses, the first safety diver will be stationed at the airlock up-bulkhead and the second diver will be stationed at the hatch being ingressed.

Upon completion of the ingress, the second safety diver will then move to the down-bulkhead position, these divers will remain at these stations throughout the normal duration of the exercise.

When the second crewman ingresses, the third and fourth safety divers will be stationed at the hatch being ingressed. Upon completion of this ingress, the third diver will take up a floater position behind the first diver at the up bulkhead. The fourth diver will remain at the hatch of ingress.

Upon egress of the airlock by either the first or second crewman, the third and fourth safety divers will take up stations at the hatch being egressed, and will cover that maneuver.

When the remaining crewman egresses, the first and second safety divers will take up stations at the hatch being egressed and will cover that maneuver.

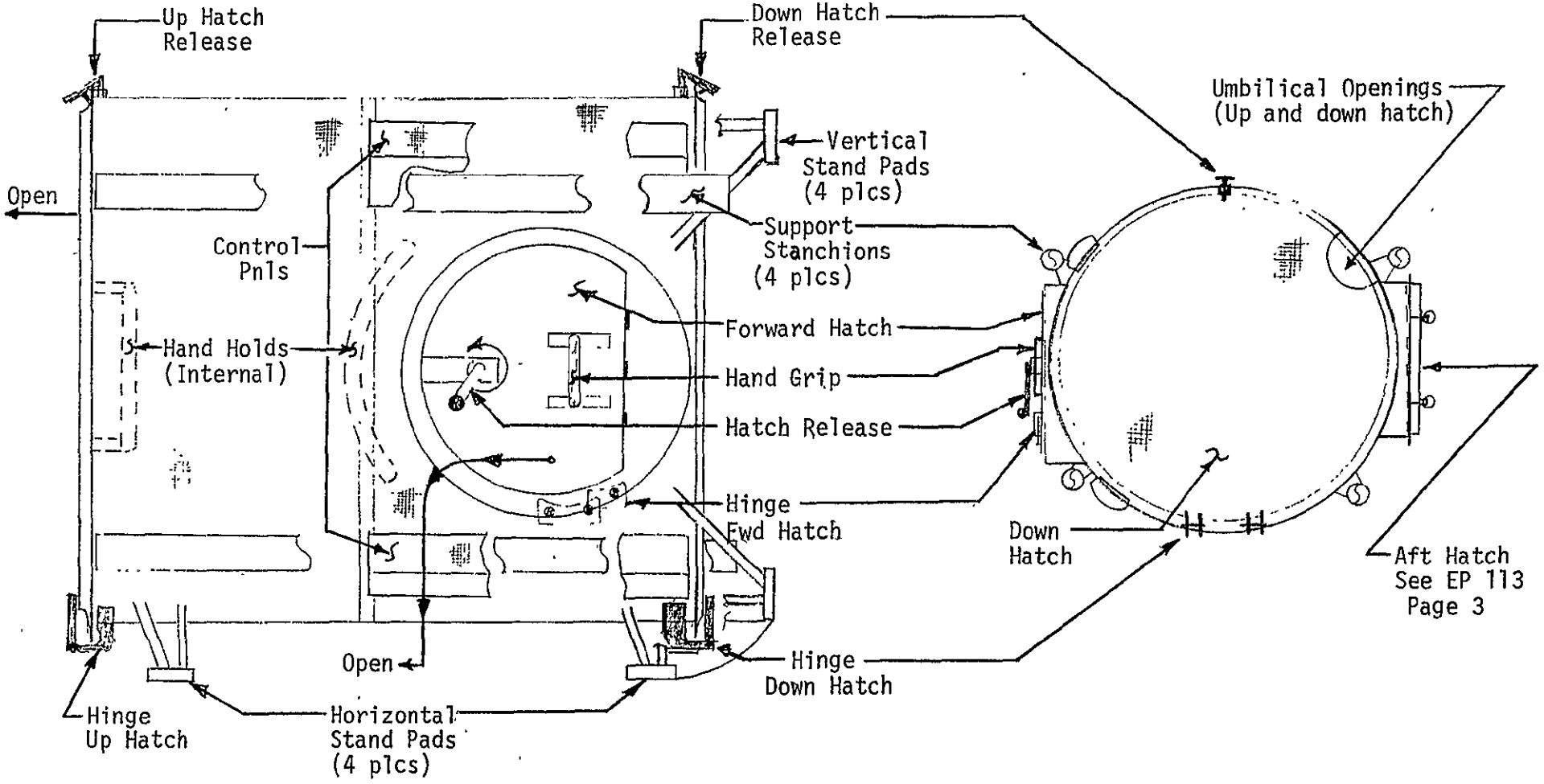
3.2 Inside Mockup

One safety diver will be stationed at each of the following four positions: (1) At the Up-Bulkhead; (2) At the Down-Bulkhead; (3) At the Up-Bulkhead floater position behind (1), (4) At the hatch of crewman ingress.

4.0 SAFETY DIVER INITIATIVE

The procedures listed herein reflect preparations for all known or anticipated malfunctions and problems. In the event unforeseen conditions present themselves, the safety divers involved may exercise their best judgment in preventing dangerous situations and may deviate from rigid adherence to these procedures. Also see EMERGENCY PROCEDURE EP-101, "GENERAL GUIDELINE PROCEDURES".

EP-112



Shuttle Airlock (Horiz. Position)
Fig. 1

EMERGENCY PROCEDURE

EP-113

SHUTTLE AIRLOCK VERTICAL

NORTHROP SERVICES, INC.

SDL SUPPORT GROUP

JOHNSON SPACE CENTER

HOUSTON, TEXAS

NSI-SDL SUPPORT GROUP

EP-113

SHUTTLE AIRLOCK VERTICAL

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NSI-SDL SUPPORT GROUP

Rev. A

EP-113

SHUTTLE AIRLOCK VERTICAL

1.0 GENERAL

When the Shuttle Airlock is vertical, there are three possible escape routes. These are the AFT Payload Hatch, the FWD-Crew Station Hatch and the UP-Bulkhead. In the event the Airlock is positioned upside down, the Down Bulkhead would then become the third escape route.

2.0 ONE SUBJECT COVERAGE

2.1 Mockup Ingress/Egress

One safety diver will be stationed at the airlock up-bulkhead and the other diver will be stationed at the hatch (forward or aft) the crewman is passing through.

2.2 Inside the Airlock

One safety diver will be at the hatch of crewman entry, and the other safety diver will be at the up-bulkhead.

3.0 TWO SUBJECT COVERAGE

3.1 Mockup Ingress/Egress

When the first crewman ingresses, the first safety diver will be stationed at the airlock up-bulkhead and the second diver will be stationed at the hatch being ingressed.

Upon completion of the ingress, the second safety diver will then move to the up-bulkhead position. These divers will remain at that station throughout the normal duration of the exercise.

When the second crewman ingresses, the third and fourth safety divers will be stationed at the hatch being ingressed. Upon completion of this

ingress, the fourth diver will be stationed at the hatch opposite the one ingressed. The third diver will remain at the hatch of ingress.

Upon egress of the airlock by either the first or second crewman, the third and fourth safety divers will take up stations at the hatch being egressed and will cover that maneuver.

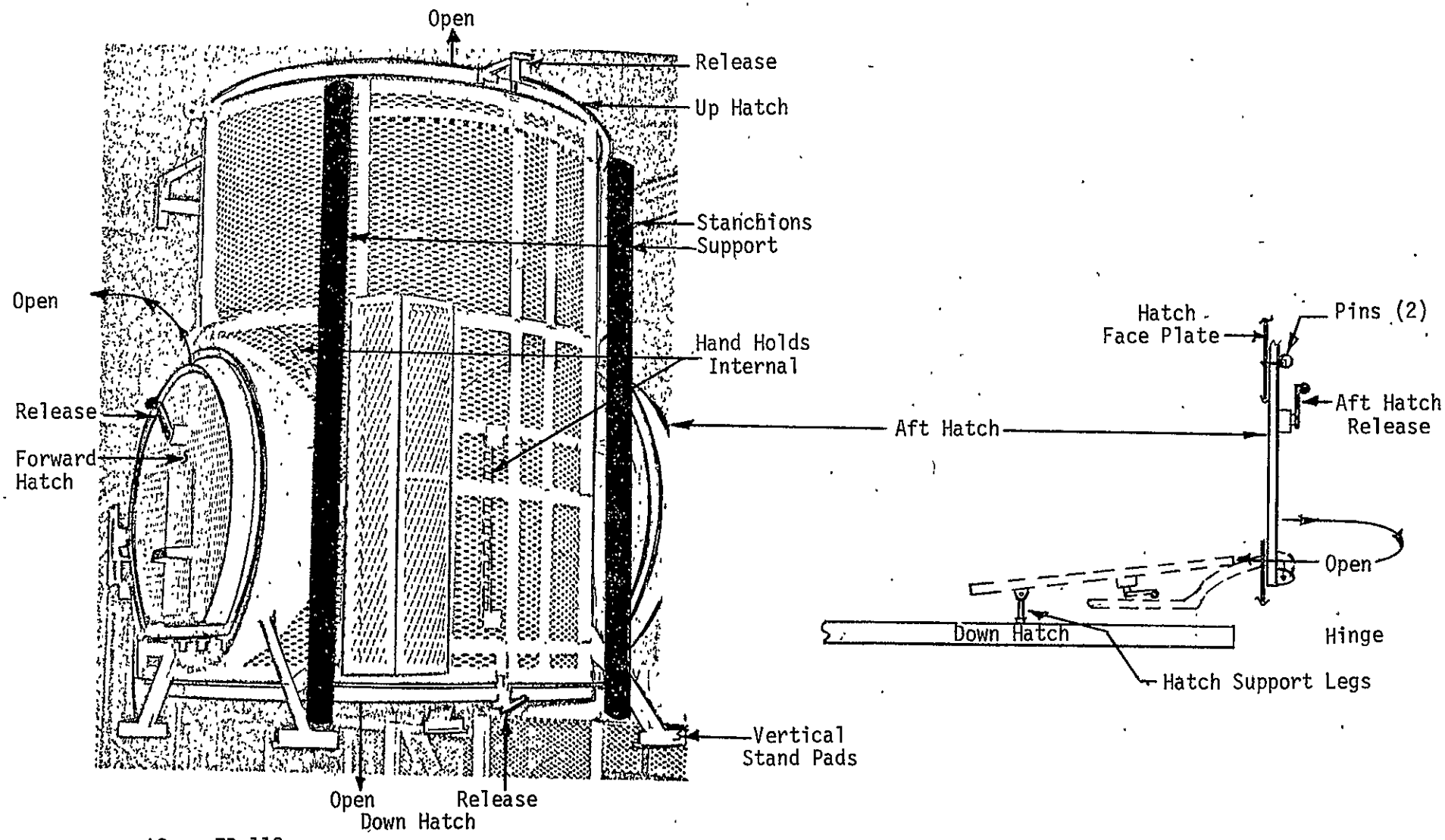
When the remaining crewman egresses, the first and second safety divers will take up stations at the hatch being egressed and will cover that maneuver.

3.2 Inside Mockup

When the crewmen have completed their ingresses, the first and second safety divers will be positioned at the up-bulkhead and the third and fourth safety divers will be positioned at the FWD-Crew Station Hatch and at the AFT-Payload Bay Hatch.

4.0 SAFETY DIVER INITIATIVE

The procedures listed herein reflect preparations for all known or anticipated malfunctions and problems. In the event unforeseen conditions present themselves, the safety divers involved may exercise their best judgment in preventing dangerous situations and may deviate from rigid adherence to these procedures. Also see EMERGENCY PROCEDURE EP-101, "GENERAL GUIDELINE PROCEDURES".



*See EP-112
Page 3

Shuttle Airlock Vertical

Fig. 1

EMERGENCY PROCEDURE

EP-114

SHUTTLE FLIGHT DECK

NORTHROP SERVICES, INC.
SDL SUPPORT GROUP
JOHNSON SPACE CENTER
HOUSTON, TEXAS

Rev. A

NSI-SDL SUPPORT GROUP Rev. A.

EP-114

SHUTTLE FLIGHT DECK

REVISION BLOCK

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10-19-78	F.A.D. 10-24-78 BW 11-14-78	APS 1-5-79	VCH 3-15-79	G.C. Franklin 3/16/79		A

EP-114

SHUTTLE FLIGHT DECK

1.0 GENERAL

When the Shuttle Flight Deck is in the water, there is only one escape route and that is through the forward section of the mockup. (NOTE: This procedure is to be used when and where it is applicable to the particular test being run.)

2.0 ONE SUBJECT COVERAGE

Both safety divers will be stationed at the forward section of the mockup for ingress/egress and throughout the duration of the exercise.

3.0 TWO SUBJECT COVERAGE

3.1 Mockup Ingress/Egress

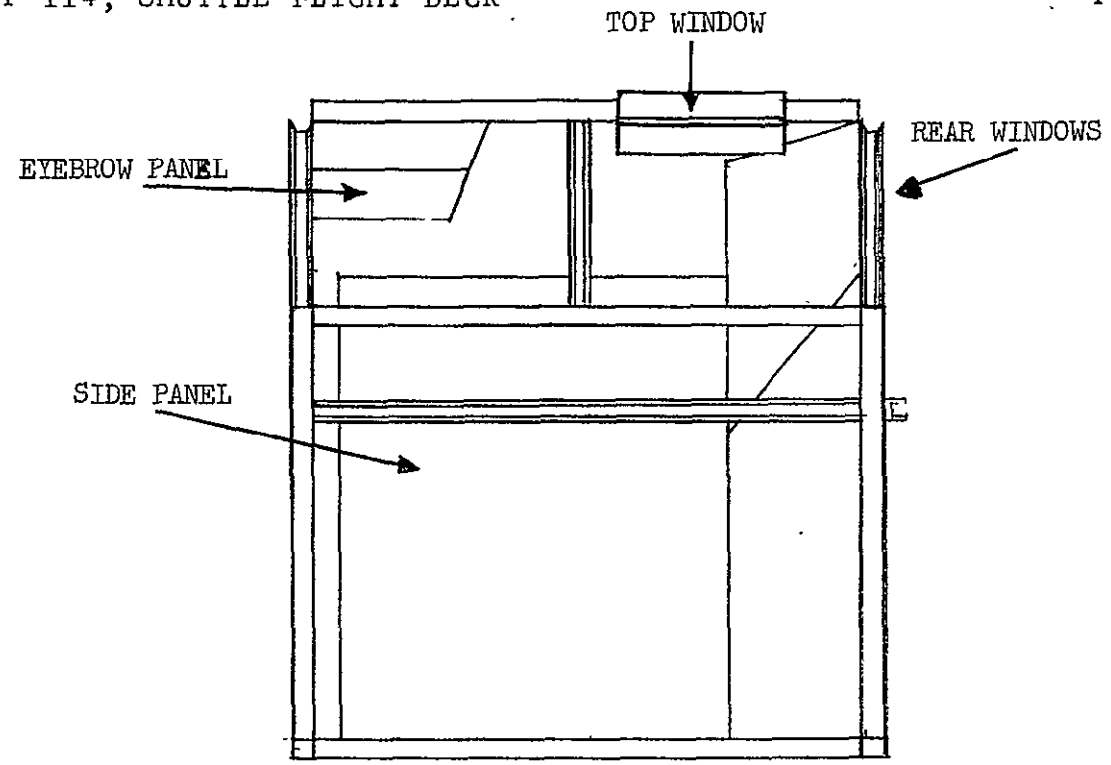
When the first crewman ingresses the mockup, the safety divers will be stationed at the forward section of the mockup.

When the second crewman enters the mockup, the safety divers for the first crewman will move away from the mockup and take up floater position behind the second crewman's safety divers. These positions will remain the same throughout the duration of the exercise.

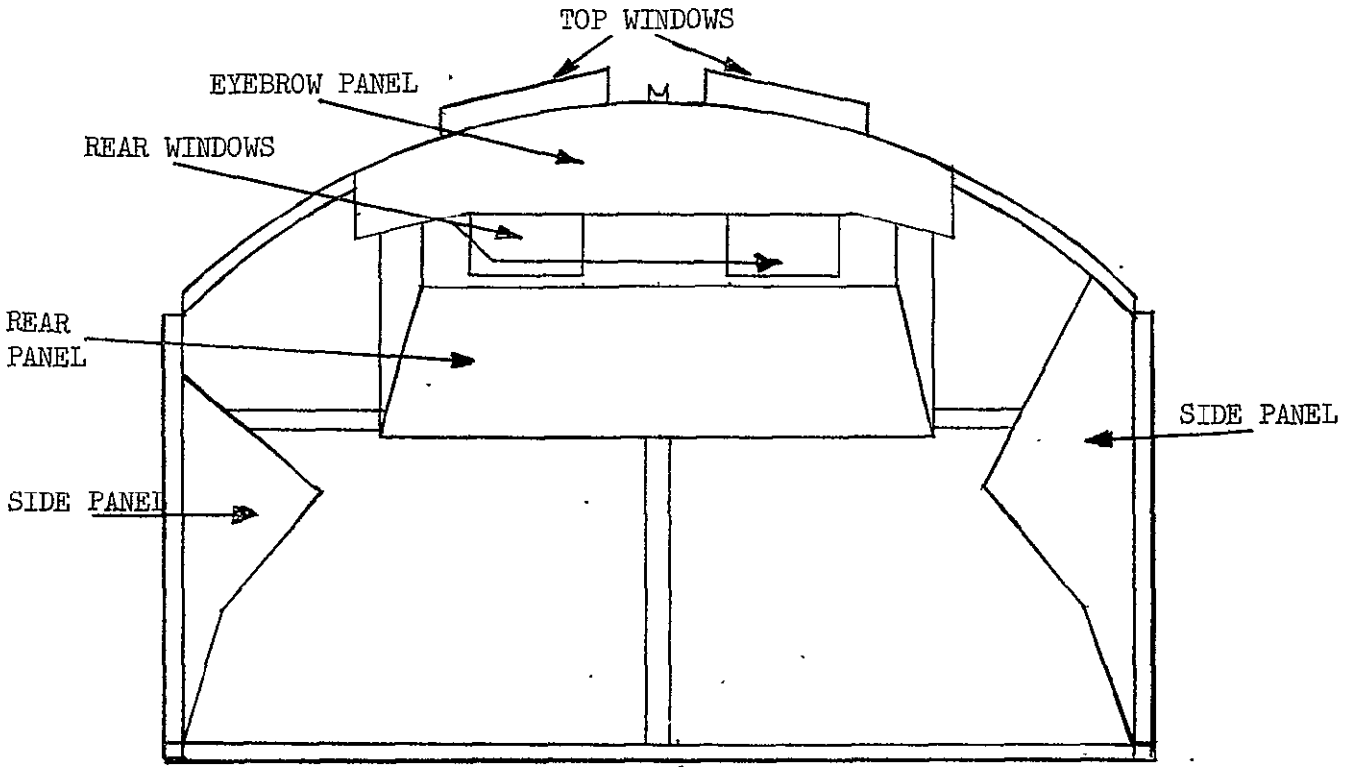
When the first subject egresses the mockup, the safety divers stationed at the forward section will cover the subject. The safety divers in the floater positions will then move to the forward section of the mockup to cover the egress of the second subject.

4.0 SAFETY DIVER INITIATIVE

The procedures listed herein reflect preparations for all known or anticipated malfunctions and problems. In the event unforeseen conditions present themselves, the safety divers involved may exercise their best judgment in preventing dangerous situations and may deviate from rigid adherence to these procedures. See also EMERGENCY PROCEDURE EP-101, "GENERAL GUIDELINE PROCEDURES".



SIDE VIEW



FRONT VIEW

STANDARD OPERATING PROCEDURES

EP-1T6

SHUTTLE LOWER PAYLOAD BAY

NORTHROP SERVICES, INC.
SDL SUPPORT GROUP
JOHNSON SPACE CENTER
HOUSTON, TEXAS

SDL SUPPORT GROUP

EP-116

SHUTTLE LOWER PAYLOAD BAY

REVISION BLOCK

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STANDARD OPERATING PROCEDURE

EP-116

SHUTTLE LOWER PAYLOAD BAY

1.0 General

When the Shuttle Lower Payload Bay is in the water, there is only one escape route and that is through the upper portion of the Payload Bay. The Payload Bay is an open mockup and should be covered with standard open-water procedures.

2.0 One Subject Coverage

Both safety divers will remain as close to the crewman as possible, but should allow him freedom of movement throughout bay.

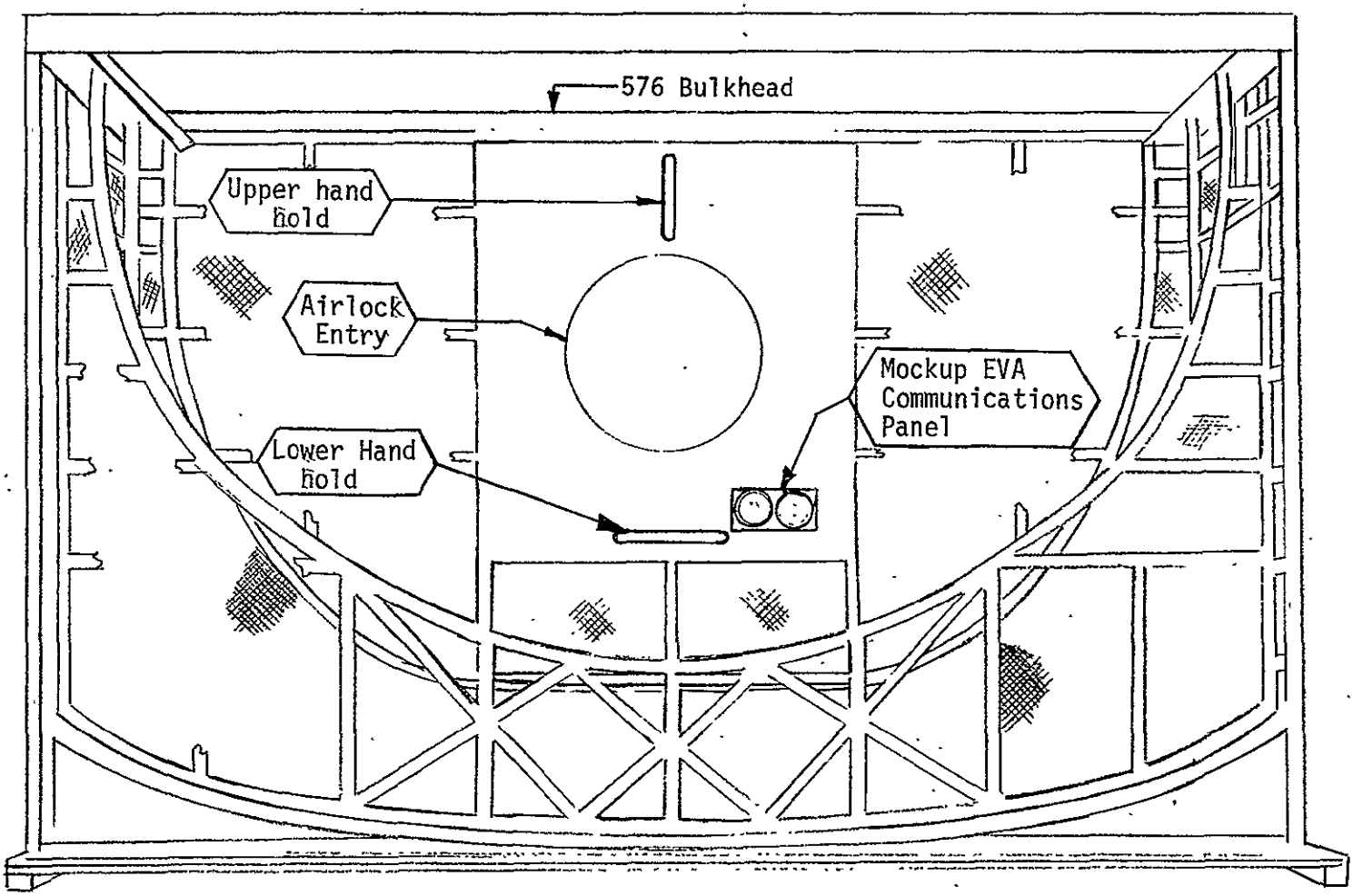
3.0 Two Subject Coverage

With two crewmen in the Payload Bay, the first crewman's safety divers will stay as close as possible to the two crewmen while the second crewman's safety divers will station themselves just outside of the mockup in an area that will allow them easy access to other crewmen in the event they are needed.

4.0 Safety Diver Initiative

The procedures listed herein reflect preparations for all known or anticipated malfunctions and problems. In the event unforeseen conditions present themselves, the safety divers involved may exercise their best judgment in preventing dangerous situations and may deviate from rigid adherence to these procedures. See also EMERGENCY PROCEDURE EP-101, "GENERAL GUIDELINE PROCEDURES".

EP-116, SHUTTLE LOWER PAYLOAD BAY



View - Airlock Hatch - Looking from Aft to Forward

STANDARD OPERATING PROCEDURE

A-101

PROCEDURES PREPARATION, CONTROL, AND DISTRIBUTION

NORTHROP SERVICES, INC.

SDL SUPPORT GROUP

JOHNSON SPACE CENTER

HOUSTON, TEXAS

NSI-SDL SUPPORT GROUP

Rev. D

A-101

PROCEDURES PREPARATION, CONTROL, AND DISTRIBUTION

REVISION BLOCK

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3-13-70						Issued
5-23-72						A (Reviewed)
7-31-72	BDP 8-4-72	BDP 8-4-72	JRS 8-10-72	RFE 8-7-72	GCF 11/13/72	B
10-11-74	BDP 10/14/74	BDP 10/14/74	VPH 10/21/74	RFE 10/25/74	GCF 10/30/74	C (Format)
10-24-78	~~B.A.D. 11-3-78~~ ~~BDP 11-13-78~~	RFE 1/5/79	V C H 3-15-79	GCF 3/16/79		D

NSI-SDL SUPPORT GROUP

A-101 Rev. D

PROCEDURES PREPARATION, CONTROL, AND DISTRIBUTION

1.0 INTRODUCTION

This procedure establishes guidelines for the format, contents, and distribution of Standard Operating Procedures generated by Northrop Services, Inc. in the SDL Support Group. It is written in step-by-step form in order to serve as a working document and is written in accordance with the format herein presented.

2.0 COVER SHEET (See cover sheet of this procedure)

2.1 Format

The cover sheet shall contain a title block, signature block, and facility identification.

2.2 Title Block

The title block shall consist of three capitalized lines as follows:

2.2.1 "STANDARD OPERATING PROCEDURE"

2.2.2 Procedure number, where

"A" is Administrative

"T" is Training

"M" is Maintenance

"P" is Procedures (equipment operation)

"EP" is Emergency Procedures

In each of the categories above, the first procedure written shall be -101 and numbering shall proceed sequentially thereafter. For example, T-109 shall be the ninth training procedure written. Rev. D

2.2.3 Title

This should be a short, precise description of the contents and purpose of the procedure.

2.3 Facility Identification Rev. D

The facility identification shall consist of four lines as follows:

2.3.1 "NORTHROP SERVICES, INC."

2.3.2 "SDL SUPPORT GROUP"

2.3.3 "JOHNSON SPACE CENTER" Rev. C

2.3.4 "HOUSTON, TEXAS"

2.4 Revision Block Rev. D

The revision block shall consist of seven columns, on a separate page (i) immediately behind the cover sheet. The format for page i will be the same as page 1. See paragraph 3.1, and will be headed as follows:

2.4.1 "DATE". This is the date of issue or revision.

2.4.2 "REVISION". The word "BASIC" will be entered when the procedure is issued and revisions will proceed alphabetically thereafter beginning with "A".

2.4.3 "SIGNATURE BLOCKS". The signature blocks will be initialed and dated by a responsible representative. Rev. D

Each revision will add one line to the revision block in order to maintain a history of changes to the procedure on the cover sheet. Additionally, the revision letter shall be entered in the body of the procedure as close as possible to the affected portion. Rev. D

3.0 BODY OF THE PROCEDURE Rev. C

3.1 Format for Page 1

The heading on page 1 shall consist of three capitalized lines as follows:

3.1.1 "NSI-SDL SUPPORT GROUP" Rev. D

3.1.2 The Procedure Number

3.1.3 The Title

Page 1 shall not be numbered.

3.2 Format for Page 2 and subsequent pages

The heading on Page 2 and subsequent pages shall consist of one capitalized line as follows:

3.2.1 In the upper left-hand corner, (,) followed by the title. (A shortened version of the title may be substituted if lengthy.)

3.2.2 In the upper right-hand corner, and on the same line as the title, the page number shall appear as Page___.

3.3 General format

3.3.1 All typing shall be single spaced except between paragraphs.

3.3.2 Paragraphs shall be numbered by use of the decimal system as shown below:

1.0

1.1

1.1.1

3.3.3 The introductory title at the beginning of each section (1.0, 2.0, 3.0, etc.) shall be capitalized, otherwise mixed capitals and lower case shall be used except for occasional important words.

4.0 DISTRIBUTION AND CONTROL

Rev. D

4.1 A file of original procedures will be maintained by the SDL Support Group and they will be updated periodically. All organizations and individuals listed in paragraph 4.2 will receive these revisions as they are issued.

4.2 Distribution list Rev. C

EC4/B. Pavig	NSI/Group Supervisor	11
EC4/C. J. Montera	NSI/Section Supervisor	1
Beta/R. Randall	NSI/Safety	1
EW5/L. G. Richard	NASA/Crew Station Branch, Chief	1

EW55/W. Moran	NASA/	1
EW55/A. F. Smith	NASA/	3
EW55/W. P. Henry	NASA/	1
SE6/C. K. LaPinta	NASA/Health Services Division	2
NS3/J. H. Chappee	NASA/Safety	2
EW55/V. C. Hammerlsey	NASA/Mockup & Trainer Sec. Chief	1

STANDARD OPERATING PROCEDURE

A-102

WAIVER REQUEST

NORTHROP SERVICES, INC.

SDL SUPPORT GROUP

JOHNSON SPACE CENTER

HOUSTON, TEXAS

NSI-SDL SUPPORT GROUP

A-102

WAIVER REQUEST

REVISION BLOCK

DATE	PREPARED BY	APPROVED BY	CONCUR	CONCUR	CONCUR	REVISION
1-1976		Wm Brown				Issued
10-26-78	~~11-3-78~~ 11-3-78	11/5/79	VCH 3-15-79	3/16/79		A

NSI-SDL SUPPORT GROUP Rev. A

A-102

WAIVER REQUEST

1.0 PURPOSE

The purpose of this document is to establish a procedure and a standard format for use in properly documenting any waiver/deviation occurring at any time other than during testing.

2.0 SCOPE Rev. A

This procedure applies to all organizational elements of the SDL Support Group, the supporting contractor, and elements involved in the operation and testing functions of the Water Immersion Facility.

3.0 RESPONSIBILITIES

It is the responsibility of the Facility Manager or the Test Director to prepare the waiver request.

4.0 PROCEDURE

A waiver/deviation request shall be prepared in memo form when a condition or test limitation exists. (As defined in 4.1, 4.2, or 4.3 below.) The memo format shall be the same for all deviations and include a description of the problem, a justification for the waiver/deviation, and specify a period of time.

4.1 JSC - Any procedure or activity that does not fully comply with JSC instructions or JSC Safety Manual 1700.

Address to - NA/Director of Safety, Reliability and Quality Assurance.

Signature - EA/Director of Engineering and Development.

Approval - NADirector of Safety, Reliability and Quality Assurance.

4.2 Any deviation from Standard Operational Procedures as defined or recorded by the SDL Support Group. Rev. A

Address to - Chairman, Test Readiness Review Board.

Signature - Test Director TD SDL Support Group.

Approval - Chairman, Test Readiness Review Board.

4.3 Medical problems as a result of physical or mental examination or other test conditions providing for physiological limits deviation.

Address to - DD/Chief Health Services Division.

Signature - EW/Chief Spacecraft Design Division.

Approval - DD/Chief Health Services Division.

STANDARD OPERATING PROCEDURE

T-101

SCUBA QUALIFICATION FOR NON-ASSIGNED PERSONNEL

NORTHROP SERVICES, INC.

SDL SUPPORT GROUP

JOHNSON SPACE CENTER

HOUSTON, TEXAS

NSI-SDL SUPPORT GROUP Rev. F

T-101

SCUBA QUALIFICATION FOR NON-ASSIGNED PERSONNEL

REVISION BLOCK

DATE	PREPARED BY	APPROVED BY	CONCUR	CONCUR	CONCUR	REVISION
11-27-68						Issued
7-17-69						A (Rev.Cover)
3-2-70						B (See body)
5-23-72						C (Reviewed)
8-4-72	Reviewed by BDP 8-8-72	BDP 8-8-72	Reviewed JRS 8-10-72	Reviewed AFE 8/11/72	DCF 11/13/72	D (Format)
10-15-74	BDP 10-17-74	BDP 10-17-74	WRH 10-18-74	DCF 12-13-74 AFE 12/13/74	DCF 1/7/75	E
10-20-78	JRS 10-24-78 BDP 10-13-78	AFE 1-5-79	VCH 3-15-79	DC Hamrick 3/16/79		F

NSI-SDL SUPPORT GROUP Rev. F

T-101

SCUBA QUALIFICATION FOR
NON-ASSIGNED PERSONNEL

1.0 DESCRIPTION:

This checkout is designed to determine the qualifications and skill of non-assigned personnel who may be required to use the WIF for a specific test and who have had previous SCUBA training. This checkout does not qualify the individual as a safety diver or suit subject in the WIF.

2.0 PREREQUISITE:

Individual must have a certificate or card showing he has completed an approved SCUBA course and verification of a SCUBA (A.F. Class III or equivalent) physical examination within the past year.

3.0 CHECKOUT CONTENT: Rev. E

3.1 Safety Indoctrination: Individual must answer questions on basic physiology and physics of diving.

3.1.1 Explain cause, symptons, and treatment of accidents caused by direct effects of pressure.

3.1.2 Explain cause, symptons and treatment of accidents caused by indirect effects of pressure.

3.1.3 Explain diving first aid, artificial respiration techniques, and hyperventilation.

3.2 WIF Rules (Explanation)

3.2.1 Tank may be used only by permission of the Project Manager.

3.2.2 No diving into tank with or without equipment on.

3.2.3 No walking around tank deck with SCUBA equipment on.

3.2.4 Buddy system diving only.

3.2.5 Do not stand SCUBA bottles upright on tank deck.

REV. E

3.3 Swimming Skills:

Individual must satisfactorily complete the following basic swimming skills:

3.3.1 Swim 30 feet underwater.

3.3.2 Swim five laps around tank demonstrating crawl, side, back and breast stroke.

3.3.3 Tread water six minutes (One minute holding hands above head).

3.3.4 Recover ten pound weight from bottom of tank.

3.3.5 Float motionless for five minutes.

3.4 Equipment familiarization:

Explanation of WIF equipment by WIF diver.

3.4.1 Regulator.

3.4.2 Back pack, bottle, and "J" valve.

3.4.3 Flippers and mask.

3.5 Use of SCUBA:

Safety diver and subject will don SCUBA mask and flippers and begin SCUBA checkout. The subject will perform the following:

3.5.1 Demonstrate clearing mask in different positions.

3.5.2 Valsalvo (clearing ears)

3.5.3 Clear regulator.

3.5.4 Safety diver and subject swim around tank while buddy breathing.

3.5.5 No mask swim.

3.5.6 Ditch and don (except flippers).

3.5.7 Malfunction Evaluation.

STANDARD OPERATING PROCEDURE

T-102

GEMINI HELMET EXERCISE

NORTHROP SERVCIES, INC.

SDL SUPPORT GROUP

JOHNSON SPACE CENTER

HOUSTON, TEXAS

NSI-SDL SUPPORT GROUP

Rev. E

T-102

GEMINI HELMET EXERCISE (WIF)

REVISION BLOCK

DATE	PREPARED BY	APPROVED BY	CONCUR	CONCUR	CONCUR	REVISION
1-29-69						Issued
7-17-69						A (Cover)
5-23-72						B (Reviewed)
8-4-72	Reviewed 8/9/72 JBM	Reviewed BDP 8-10-72	Reviewed JRS 8-10-72	Reviewed RFE 8/11/72	SCF 11/13/72	C (Format)
10-15-74	BDP 10-17-74	BDP 10-17-74	WPH 10-18-74	WCM 12-4-74 RFE 12/5/74	SCF 12/5/74	D (Format)
10-23-78	G.A.H 10-25-78 BDP 11-13-78	RFE 1-5-79	V C H 3-15-79	SC Franklin 3/16/79		E

T-102

GEMINI HELMET EXERCISE (WIF)

1.0 INTRODUCTION

This Gemini helmet procedure is a prelude to the underwater suit subject qualification. This checkout is to acquaint the subject with the experience of an in-rush of water and air bubbles in case of a major suit malfunction. The safety divers involved will explain to the subject, in detail, the operation and type of equipment to be used during the checkout. The subject will also be familiarized with all the regulations and procedures peculiar to the Water Immersion Facility before water entry.

2.0 GEMINI HELMET EXERCISES

2.1 Exercise No. 1

2.1.1 Sit on floor of tank in complete SCUBA.

2.1.2 Place 25 lb. weight belt on lap for ballast.

2.1.3 Remove face mask and lay within reach.

2.1.4 Don helmet with visor closed.

2.1.5 Exhale air into helmet until all water is displaced.

NOTE: Helmet becomes very buoyant. Use left hand to hold down at neck-ring.

2.1.6 Give OK SIGNAL

2.1.7 When ready, EXHALE! Open visor all the way. Experience inrush of water.

2.1.8 Give OK SIGNAL!

2.2 Exercise No. 2 Rev. E

2.2.1 Close visor.

2.2.2 Exhale air into helmet until all water is displaced.

2.2.3 Give OK SIGNAL.

2.2.4 When ready, drop regulator from mouth, EXHALE! and open visor all the way.

2.2.5 Safety diver will insert safety regulator through visor opening and into subject's mouth. (Subject should tilt head back in helmet for ease of receiving regulator.)

2.2.6 Subject will purge safety regulator by further exhalation or by use of purge button.

2.2.7 Give OK SIGNAL!

2.3 Exercise No. 3 Rev. E

2.3.1 Subject change back to own regulator.

2.3.2 Close visor.

2.3.3 Exhale into helmet until all water is displaced.

2.3.4 When ready, drop regulator from mouth, EXHALE! and open visor all the way.

2.3.5 Safety diver will insert safety regulator through visor opening and into subject's mouth.

2.3.6 Number 2 safety diver will purge his regulator under helmet neck-ring so subject will experience inrush of water and air bubbles.

2.3.7 Give OK SIGNAL!

2.3.8 Repeat steps 2.3.1 through 2.3.7 as required.

2.3.9 Drop safety regulator, remove helmet, replace own SCUBA mouthpiece and face mask, and surface.

STANDARD OPERATING PROCEDURE

T-103

UNDERWATER SUIT QUALIFICATION

NORTHROP SERVICES, INC.

SDL SUPPORT GROUP

JOHNSON SPACE CENTER

HOUSTON, TEXAS

T-103

UNDERWATER SUIT QUALIFICATION

REVISION BLOCK

DATE	PREPARED BY	APPROVED BY	CONCUR	CONCUR	CONCUR	REVISION
3-11-69						Issued
7-17-69						A (Cover)
5-23-72						B (Reviewed)
8-4-72	Reviewed 8/9/72	Reviewed BDP 8-10-72	Reviewed JRS 8-10-72	Reviewed AHS 8/11/72	GCF 11/13/72	C (Format)
10-15-74	BDP 10-17-74	BDP 10-17-74	WPH 10-21-74	AHS 10/21/74	GCF 10/30/74	D (Format)
10-12-78	J.O.S. BDP 9-27-78	AHS 1-5-79	C.K. LaPrade 1/9/79	J Chapper 1/15/79	UCH 3-15-79 GCF 3/16/79	E

NSI-SDL SUPPORT GROUP Rev. E

T-103

UNDERWATER SUIT QUALIFICATION

1.0 INTRODUCTION

When the subject has successfully completed the Gemini helmet exercise, the underwater suit qualification should follow as soon as possible. It is necessary that the subject perform this exercise the same day to prevent his losing the sensation of having water and air bubbles in his face when he opens the visor. Prior to water entry, the equipment, regulations and procedures will be explained to the subject in full. It will be assured by the Test Director and Medical Officer that the subject is mentally and physically prepared before water ingress.

This procedure is composed of two exercises, the removal of a glove and the raising of the visor. The raising of the visor will be performed twice to ensure that the subject has a thorough appreciation for a Rapid Decompression.

2.0 SURFACE PREPARATION Rev. E

2.1 The subject will don the PGA, with the exception of gloves and helmet in the WIF locker room.

2.2 When the subject enters the tank area, the surface crew will connect umbilicals for suit cooling and the comm line for a communications check.

2.3 The suit technician will finish suiting the subject and prepare him for pressurization.

2.4 When the subject is at approximately 1.0 psid the surface crew will attach the weight harness to the subject and escort him to the platform ladder. (Ref. NSI-SDL SUPPORT GROUP SOPM P-105).

3.0 UNDERWATER PREPARATION Rev. E

3.1 When the subject enters the water the safety divers will examine the suit and make sure it and the associated equipment are functioning properly.

3.2 Safety divers will pressurize the subject to 3.5 psid.

3.3 Safety divers will add weights to achieve neutral buoyancy and allow the test subject to familiarize himself with the suit.

3.4 After 5 to 10 minutes the Safety Divers will take the subject to the platform and reduce his pressure to 2.0 psid.

3.5 Safety divers will add necessary weights to subject to insure he is heavy feet down.

3.6 When subject is weighted out, the safety divers will position the subject on the platform with his back to the ladder.

4.0 RAPID DECOMPRESSION PROCEDURES Rev. E

4.1 Removal of glove

4.1.1 Before removing a glove, the test director will go over the procedures with the subject and insure he understands them fully.

4.1.2 One safety diver will remove the glove designated by the subject on subject's OK signal.

4.1.3 Subject will EXHALE as pressure reduces.

4.1.4 Subject will evaluate the removal of glove by moving arm back and forth.

4.1.5 Safety diver will replace glove.

4.2 Raising of Visor

4.2.1 Before raising visor the test director will go over the procedures with the subject and insure he understands them fully.

4.2.2 Subject and safety divers will confirm each is ready by giving OK signal, before raising visor.

NOTE: SUBJECT WILL REMEMBER TO EXHALE PRIOR TO AND DURING RAISING OF VISOR!

4.2.3 Subject will open own visor by raising locking flag and depressing release button. With the other hand, the subject will move bar up and back as far as it will go. REMEMBER TO EXHALE!

4.2.4 Safety divers will insure visor is completely back before inserting regulator.

4.2.5 Subject may purge regulator if all air was expended while exhaling.

4.2.6 Subject will give OK signal if he has purged regulator and is receiving air.

NOTE: Safety divers will immediately bring the subject to the surface if the OK signal is not given within a proper period of time, not to exceed 20 seconds.

4.2.7 With weight harness still attached, the safety divers will assist subject up ladder to surface.

4.2.8 After short rest period, obtain subject's comments and allow medics to check over subject.

4.2.9 Repressurize subject to 2.0 psid and repeat steps 4.2.1 through 4.2.6.

4.2.10 After subject has raised his visor for the second time, the safety divers will bring him to the surface, drop his weights and assist him out of the water.

STANDARD OPERATING PROCEDURE

T-104

SURFACE SUPPLIED AIR LIFE SUPPORT SYSTEM

(HELMET CHECKOUT)

NORTHROP SERVICES, INC.

SDL SUPPORT GROUP

JOHNSON SPACE CENTER

HOUSTON, TEXAS

NSI-SDL SUPPORT GROUP Rev. C

T-104

SURFACE SUPPLIED AIR LIFE SUPPORT SYSTEM

REVISION BLOCK

DATE	PREPARED BY	APPROVED BY	CONCUR	CONCUR	CONCUR	REVISION
5-17-72						Issued
8-4-72	Reviewed 8/9/72 RRB	Reviewed BDB 8-10-72	Reviewed JRB 8-10-72	Reviewed AFS 8/11/72	SCF 11/13/72	A (Format)
10-15-74	BDB 10-17-74	BDB 10-17-74	WFH 10-18-74	AFS 10/21/74	SCF 10/30/74	B (Format)
10-23-78	RRB 10-26-78 BDB 11-13-78	AFE 1-5-79	VCH 3-15-79	DC Reynolds 3/16/79		C

NSI-SDL SUPPORT GROUP Rev. C

T-104

SURFACE SUPPLIED AIR LIFE SUPPORT SYSTEM

(HELMET CHECKOUT)

1.0 DESCRIPTION

The purpose of this document is to establish a step-by-step procedure for the training and checkout of the personnel using the Surface Supplied Air Life Support System, and to act as a teaching outline to the instructor.

2.0 APPLICABLE DOCUMENTS

N/A

3.0 PRE-DIVE INSTRUCTION

3.1 System Description and Operation

3.1.1 SCUBA Regulator

3.1.1.1 Breathing restriction adjustment valve

3.1.2 Valve

3.1.2.1 Vent and purge

3.1.2.2 Clear faceplate

3.1.3 Nasal Compartment

3.1.3.1 No need to seal

3.1.4 Pad

3.1.4.1 Clear ears and sinuses

3.1.5 Communications

3.2 Don/Ditch of Helmet

3.2.1 Donning Helmet

3.2.1.1 Adjustment of the "Spider" band

3.2.2 Ditching Helmet

3.2.2.1 Emergency Procedure only

3.2.3 Use of the Safety Regulator

3.3 Safety Diver Procedures

3.3.1 Assist with helmet removal

3.3.2 Application of the safety regulator

4.0 UNDERWATER PROCEDURES

4.1 After Donning Helmet

4.1.1 Adjust Spider

4.1.2 Check Communications

4.1.3 Adjust Earpieces

4.1.4 Purge and Clear Faceplate

4.1.5 Adjust Regulator Demand Valve for Comfort

4.2 Underwater Doffing of the Helmet

4.2.1 Remove Helmet

4.2.2 Receive Safety Regulator from Safety Diver

4.2.3 Proceed to Surface

4.2.4 Review any Problem Areas

STANDARD OPERATING PROCEDURES

P-101

ENVIRONMENTAL CONTROL SYSTEM OPERATION

NORTHROP SERVICES, INC.
SDL SUPPORT GROUP
JOHNSON SPACE CENTER
HOUSTON, TEXAS

P-101

ENVIRONMENTAL CONTROL SYSTEM OPERATION

REVISION BLOCK

DATE	PREPARED BY	APPROVED BY	CONCUR	CONCUR	CONCUR	REVISION
4-12-72						Issued
8-4-72	Reviewed 8/9/72 JBM	Reviewed BDP 8-10-72	Reviewed JRS 8-10-72	Reviewed AFE 8/11/72		A (Format)
10-30-72	JBM 10/30/72	BDP 10-30-72	Reviewed JRS 11/1/72	AFE 11/1/72	JCF 11/1/72	B
10-11-74	BDP 10/14/74	BDP 10/14/74	Reviewed WAH 1-30-75	AFE 1/30/75	JCF 2/3/75	C
10-24-78	JAB 10-30-78 / BDP 11-13-78	AFE 1-5-79	VCH 3-15-79	JC Hamilton 3/16/79		D

NSI-SDL SUPPORT GROUP

P-101 Rev. D

ENVIRONMENTAL CONTROL SYSTEM OPERATION

1.0 DESCRIPTION

The purpose of this document is to establish a step-by-step procedure for the pressure console operator to follow during pressurized tests in the WIF.

2.0 APPLICABLE DOCUMENTS

NASA/WIF ORP - ECS/LCG Monitor's Checklist

3.0 PRE TEST CHECKLIST

3.1 Complete ECS/LCG Monitor's Checklist.

4.0 OPERATION

4.1 Suit subject prepares for weightout (helmet off).

4.1.1 Turn off individual air flow at appropriate flowmeter valve. (Red, white, or blue).

4.1.2 Console operator should verify that the Topside Monitor (TSM) has completed the following steps before bringing the flow up.

4.1.2.1 Gas connectors in and lock/locks secured.

4.1.2.2 Zipper locked.

4.1.2.3 Water connector locked.

4.1.2.4 Communication connector in and locked.

4.1.2.5 Differential Pressure regulating valve is set to minimum on outlet umbilical.

4.1.3 Turn individual air flow or LCG water on for suit subject comfort.

4.1.4 Leg and arm weights on.

4.1.5 Gloves on and locked.

4.2 Subject ready for pressurization. Rev. C

4.2.1 Console operator will reduce flow to zero.

4.2.2 TSM or suit tech will don helmet or close visor.

NOTE: Insure neck ring secure and locked.

4.2.3 Slowly turn individual air flow on and increase until flow is 6-12 scfm. Observe flow on appropriate flow gauge (red, white, or blue).

CAUTION: Pressure console operator will constantly check with suit subject as to the condition of his ears and will stop or reduce flow at the request of the suit subject to facilitate ear clearing.

4.2.4 At this time TSM will put weight ballast system on subject.

4.3 Subject ready for water entry.

4.3.1 Subject enters water.

4.3.2 Test Director will instruct safety divers to increase differential pressure valve to required setting (normal 3.7 psid). ECS operator will call out suit pressure as the safety divers increase it. Read differential pressure on appropriate gauges located just above the flow gauges.

4.3:3 When the subject reaches the desired pressure, the console operator will activate the individual umbilical warning system.

NOTE: The pressure light will activate when the pressure drops below 1 psid or goes above 5.0 psid. The flow light will activate when the flow drops below 4.0 - 5.0 scfm. Rev. C

4.3.4 Console operator monitors air flow and suit pressure throughout the test.

4.3.5 Console operator can now adjust individual water flow at the subject's request and to his comfort.

4.4 Subject ready to surface.

4.4.1 Safety divers will bring subject to surface.

4.4.2 Console operator will turn off individual water flow valve.

4.4.3 Console operator will turn off alarm system.

4.4.4 Test Director will instruct safety diver to decrease suit pressure to minimum.

4.4.5 Safety divers remove main ballast wieghts.

4.4.6 Subject egresses water.

4.4.7 Slowly turn individual air flow valve off.

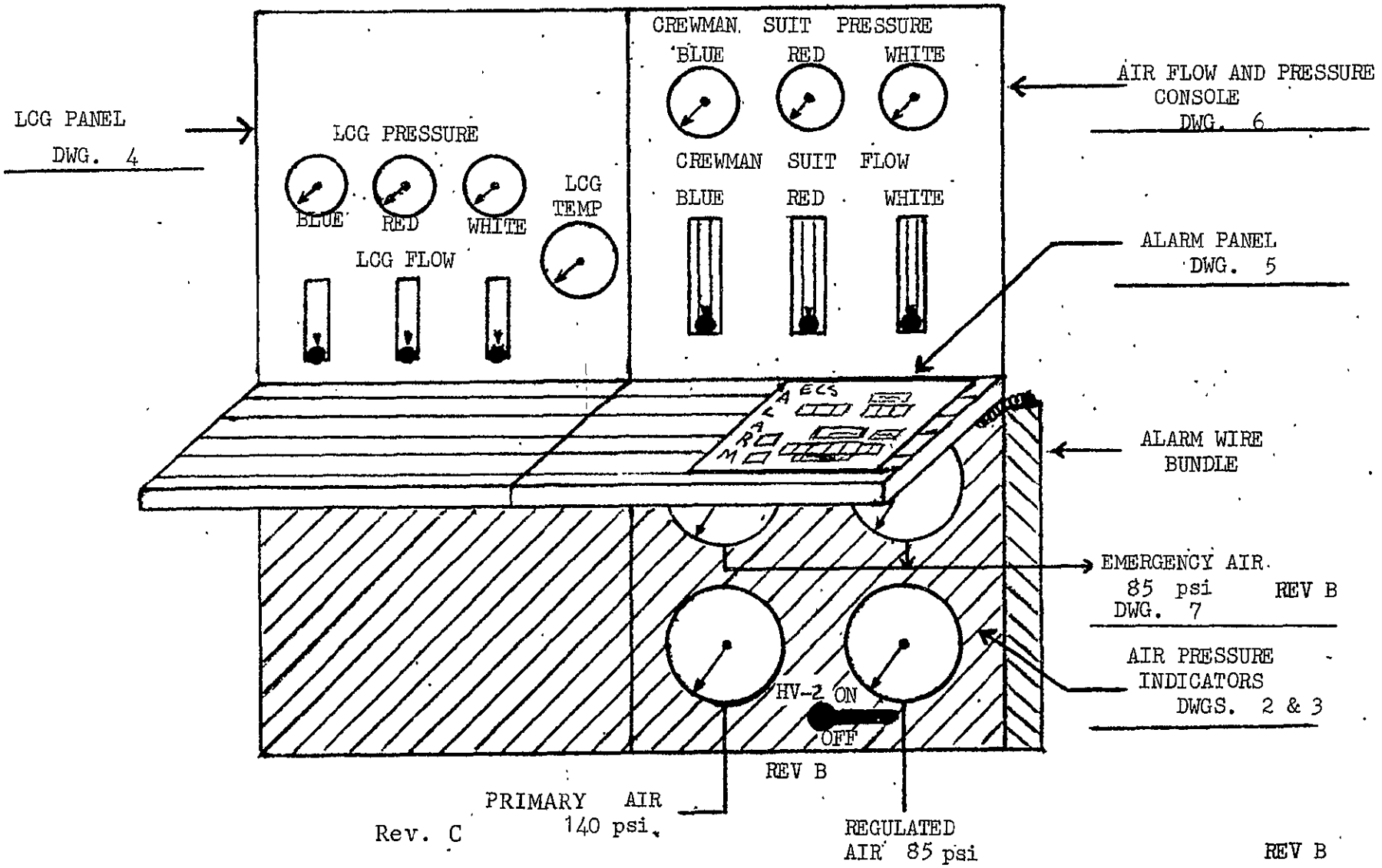
4.4.8 Remove helmet or raise visor and disconnect umbilicals.

4.5 End of test.

4.5.1 Complete ECS/LCG Monitor's Checklist. Rev. C

ENVIRONMENTAL CONTROL SYSTEM

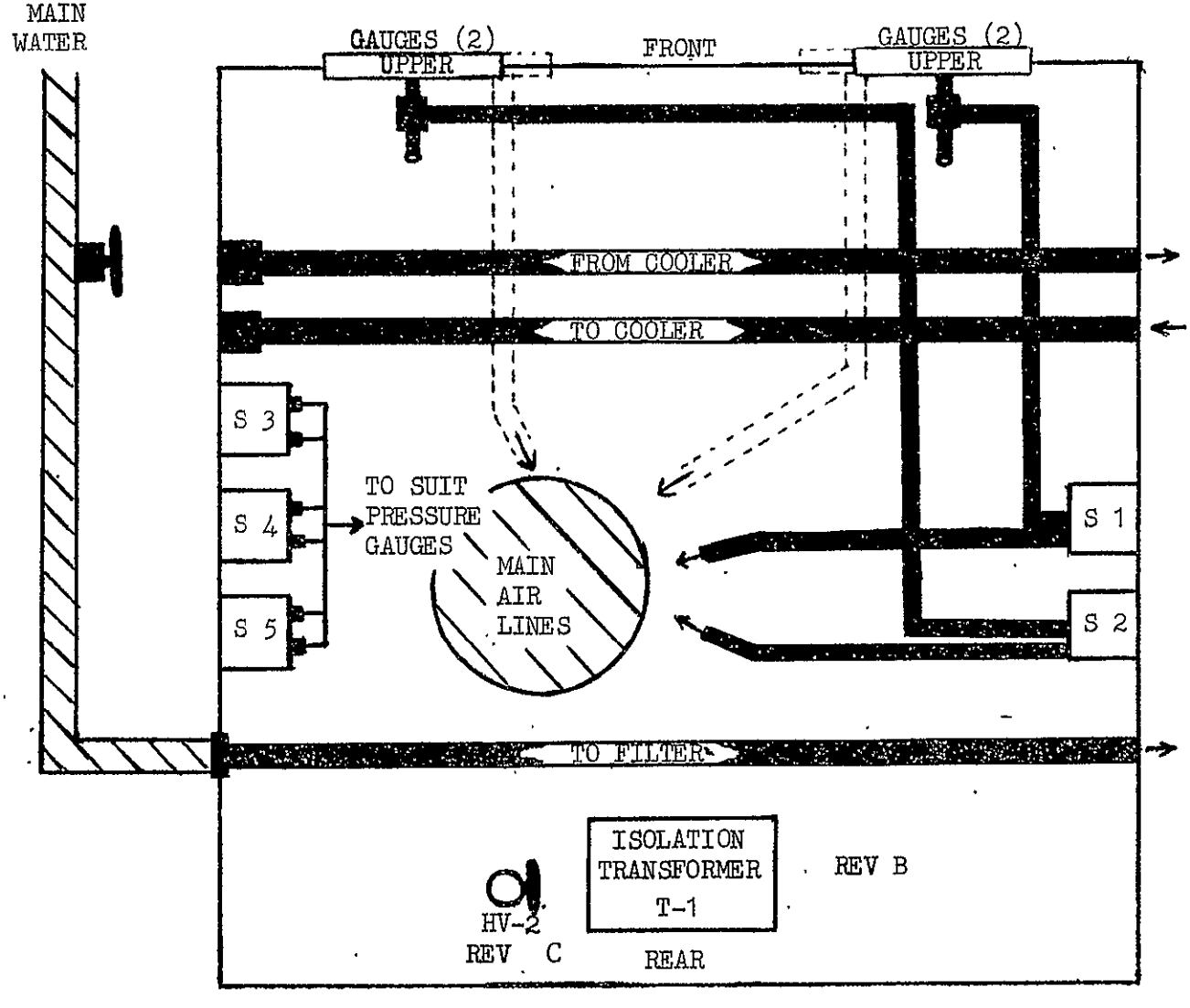
DWG. 1



E. C. S. C O N S O L E

LOWER LEFT- FROM REAR

DWG. 2



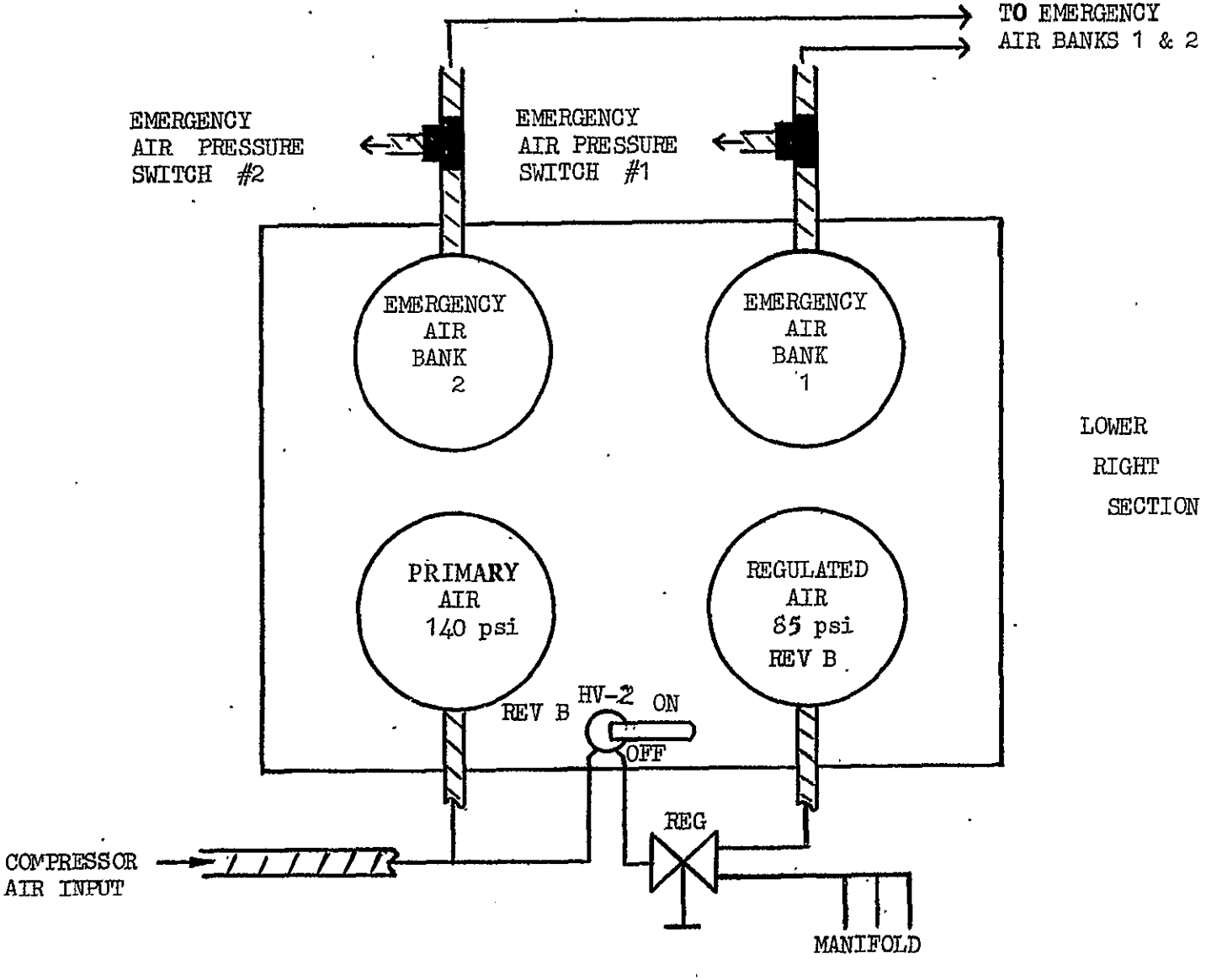
S 1 & S 2- EMERGENCY AIR BANK PRESSURE SWITCHES -SET APPROX. 85 psi

REV B

S 3, S 4, & S 5- CREWMAN AIR PRESSURE SWITCHES -SET 1 psi(LO) & 5 psi(HI)

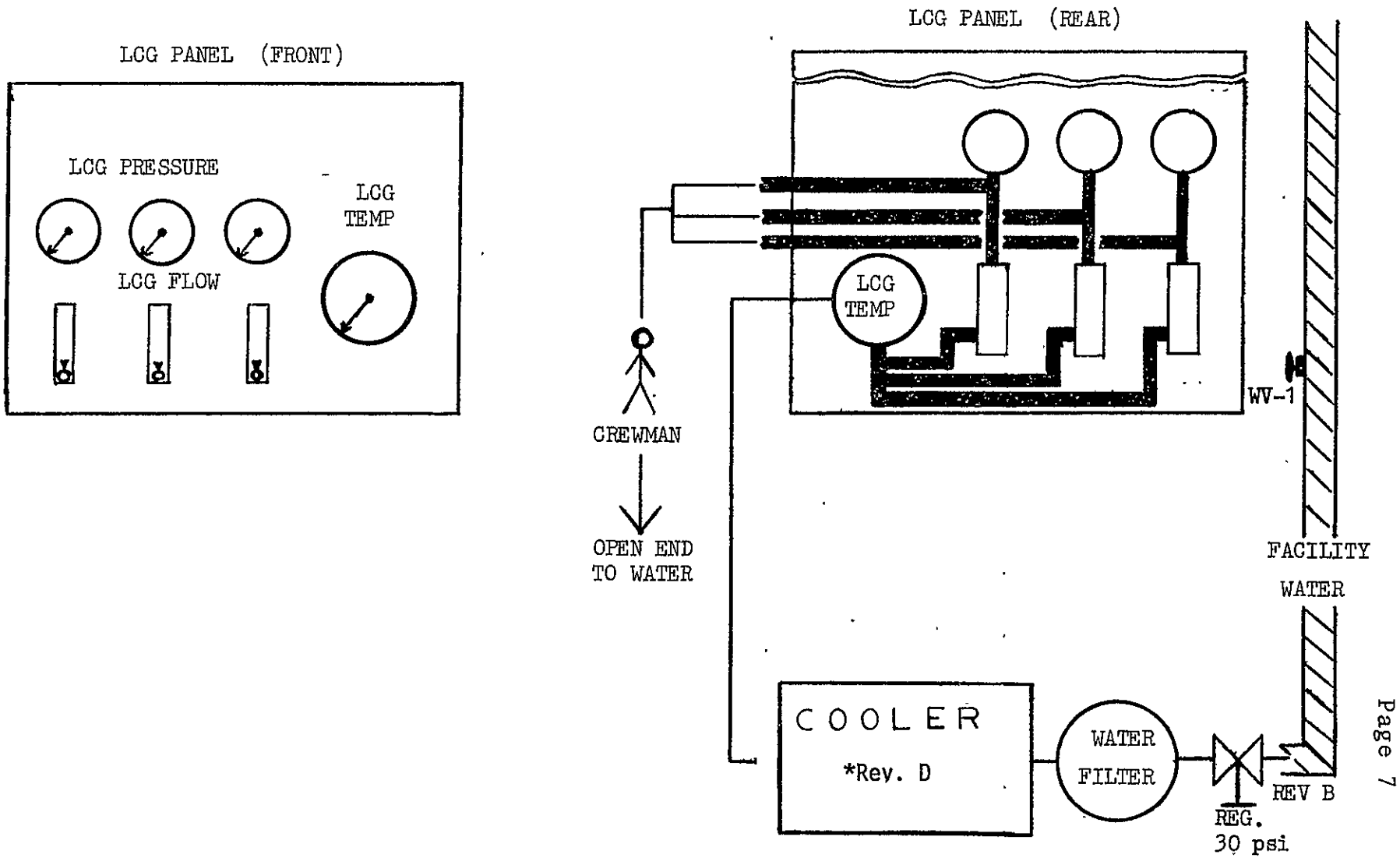
E. C. S. C O N S O L E

DWG. 3



L C G · P A N E L

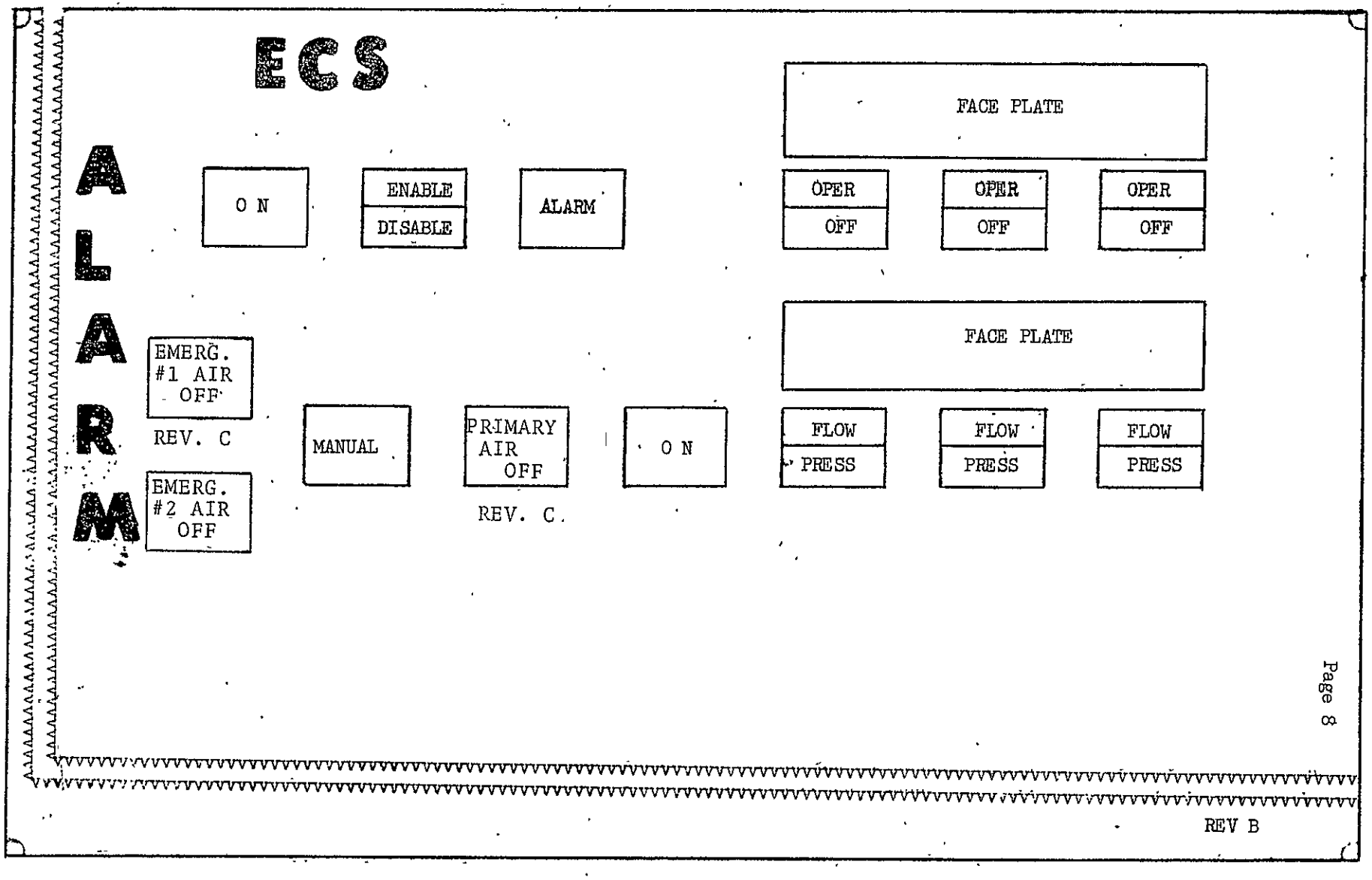
DWG. 4



ALARM SYSTEM

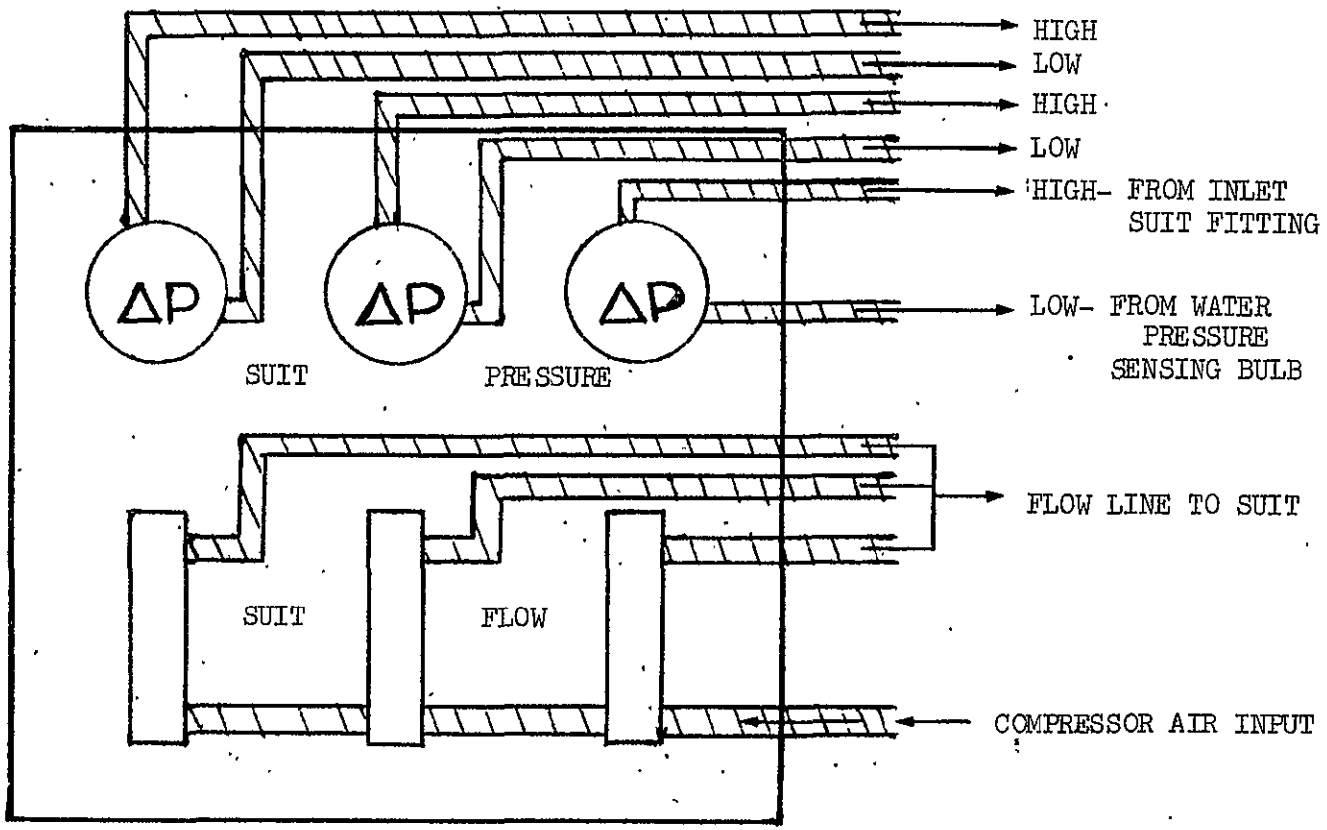
DWG. 5

P-101 ECS OPERATION



E. C. S. FLOW AND PRESSURE CONSOLE

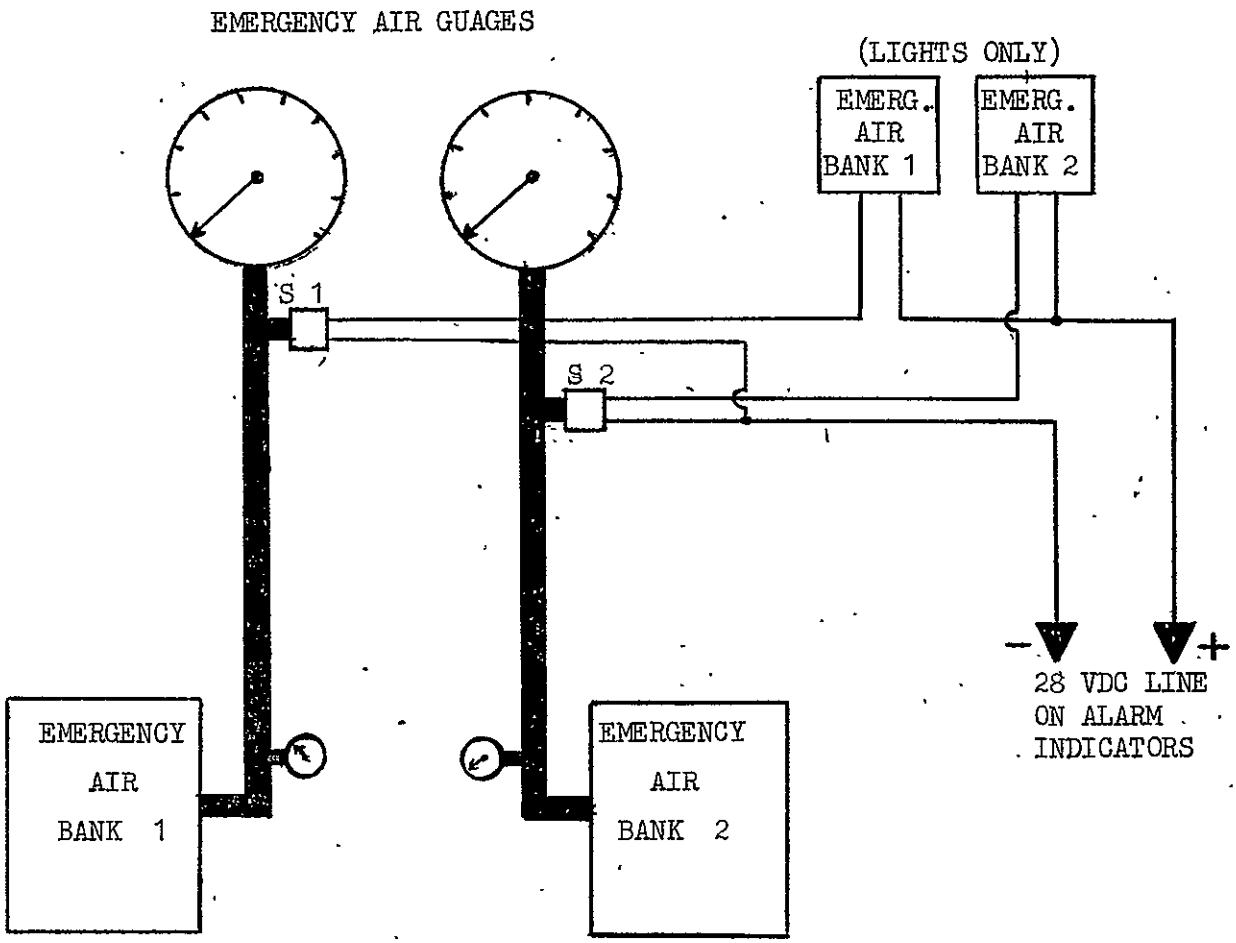
DWG. 6



E M E R G E N C Y A I R

(ELECTRICAL)

DWG. 7



S1 & S2 - EMERGENCY AIR PRESSURE SWITCHS -SET APPROX. 65 psi

REV B

STANDARD OPERATING PROCEDURE

P-102

TAKING OF AIR SAMPLES

AND PARTICLE COUNT

NORTHROP SERVICES, INC.

SPACECRAFT DESIGN LABORATORY SUPPORT GRO

JOHNSON SPACE CENTER

HOUSTON, TEXAS

NSI-SDL SUPPORT GROUP Rev. D

P-102

TAKING OF AIR SAMPLES AND PARTICLE COUNT

REVISION BLOCK

DATE	PREPARED BY	APPROVED BY	CONCUR	CONCUR	CONCUR	REVISION
8-4-71						Issued
6-2-72						A (Reviewed)
8-4-72	Reviewed 8/9/72 RRB	Reviewed BDB 8-10-72	Reviewed JRS 8-17-72	Reviewed AHS 8/17/72	SCF 11/13/72	B (Format)
10-11-74	BDB 10-21-74	BDB 10-21-74	WPH 11-21-74	RH 12-3-74 RH 12/4/74	SCF 12/4/74	C (Bldg.260)
9-25-78	J.G.S. BDB 9-27-78	RLE 1-5-79	C.K. 1/9/79	JJ Chapple 2/23/79	VCH 3-15-79 SLF 3/16/79	D

NSI-SDL SUPPORT GROUP Rev. D

P-102

TAKING OF AIR SAMPLES AND PARTICLE COUNT

1.0 DESCRIPTION

This document is presented to establish step-by-step procedures for taking air samples from the WIF Breathing Air System. Under normal conditions, the air sample is taken from a point that is farthest from air source, in this case a ECS Umbilical. However, due to the peculiarity of the WIF system, an additional air sample will be taken from the SCUBA fill station. All air sampling will be done under the cognizance of JSC Quality Assurance. When taking any air sample, it is of the utmost importance that a high quality of cleanliness be maintained at all times.

2.0 APPLICABLE DOCUMENTS Rev. D

2.1 JSC Document 01218

2.2 Breathing Air Specifications, BBA-1034A

2.3 JSM 5322 Rev. A 1974

3.0 GENERAL Rev. D

Air samples must be taken every two weeks to maintain an up-to-date system. If any maintenance, or the integrity of the system is broken for any reason, then air samples, and particle count must be taken daily for three consecutive days to rectify the system. Prior to taking samples, personnel involved will contact Quality Assurance and have the appropriate paperwork (TPS and JSC Request for Analysis) and equipment on hand.

4.0 EQUIPMENT REQUIRED FOR TAKING AIR SAMPLES Rev. D

4.1 One Hoke bottle for each air sample to be taken.

4.2 One DIA PUMP, Model No. 08-423-74 or equivalent.

4.3 Two 1/4 inch I.D. SS Flex hoses with 1/4 inch AN Female fitting at each end.

4.4 One Female Suit Connector with a 1/4 inch AN fitting attached to the back.

4.5 Regulator Control so flow of pressure can be controlled from 5 psig to 900 psig.

4.6 Fittings as required for adoption of system to sample bottle.

4.7 Appropriate hand tools.

4.8 Leak test solution (approved).

5.0 SAFETY AND GENERAL REQUIREMENTS Rev. D

5.1 The minimum personnel apparel shall be a face shield, goggles, or safety glasses.

5.2 Handle pressure-carrying items with extreme care, as dents or stresses can greatly reduce the certified safety factor.

5.3 Verify that all equipment has pressure test tags showing the current certification of a pressure test minimum of 1 1/2 times the system pressure.

5.4 Valves and regulators shall be in the closed position before and after any samples are collected. All open ports or fittings will be capped, plugged, or bagged to maintain cleanliness.

5.5 All high pressure lines, and flex lines in excess of 2 meters (6 feet), will be secured and restrained by approved methods.

NOTE: See Paragraphs 3,0 thru 6.1 of JSC 01218

6.0 PROCEDURE Rev. D

6.1 ECS - The ECS consists of three umbilicals, any one in which the gas sample can be taken from.

6.1.1 Turn air on one umbilical and set flow at 3 SCFM.

6.1.2 Connect the Female Suit Connector to the umbilical inlet fitting.

6.1.3 Connect the 1/4 inch SS Flex line on the inlet side of the DIA compressor to the suit inlet fitting.

6.1.4 Connect the DIA compressor 1/4 inch SS Flex line to the Hoke sample bottle.

6.1.5 Turn on DIA compressor and fill Hoke bottle to 150 psi. (NOTE: At no time should the Hoke sample bottle be allowed to vent to atmosphere).

6.1.6 Purge and refill the Hoke sample bottle until the fourth filling. This is the air sample.

6.2 SCUBA FILL STATION - This station is used to fill SCUBA bottles and SCOTT/SURVIVAIR Air Pack bottles. There are two places from which air samples can be taken, either valve E or one of the SCUBA fill lines. (NOTE: See Para. 5.4 of this procedure.)

6.2.1 Start compressor as per WIF/SOPM P-103.

6.2.2 Open valve A.

NOTE: If sample is to be taken from a SCUBA fill line, then open corresponding valve A1 thru A4 to the line to be sampled. If sample is to be taken from valve E, then open valves A, B, then Valve E).

6.2.3 Connect flex line from point sample is to be collected. See Paragraph 5.5 of this procedure.

6.2.4 Open regulator (turn clockwise) and adjust until a pressure of 25 psig is obtained. Flow at this pressure for a minimum of 1 minute.

6.2.5 Reduce pressure to 5 psig and connect free end of sample line to inlet valve of the sample cylinder while pressure is still flowing. Insure sample cylinder has a pad pressure.

6.2.6 Regulate the pressure to (900 $\pm$ 50 psig) and leak test all connections.

6.2.7 Open sample cylinder inlet valve and leak check remaining connections.

6.2.8 Close sample cylinder inlet valve and open cylinder outlet valve. Reduce the pressure to approximately 5 psig.

6.2.9 Slightly open sample cylinder inlet valve and allow air to purge through the cylinder for a minimum of 5 minutes.

6.2.10 Close the sample cylinder outlet valve and pressurize the cylinder to 900 $\pm$ 50 psig.

6.2.11 Alternately open and close the sample cylinder inlet and outlet valves until the cylinder has been pressurized and depressurized a total of four times.

6.2.12 Upon completion of above step, paragraph 6.2.11, close the cylinder outlet valve and pressurize the sample cylinder to 900 ± 50 psig. Close the inlet valve. This is the sample to be analyzed.

6.2.13 Close the sample source valve and back the pressure regulator off to the full counterclockwise position.

6.2.14 Carefully remove the sample cylinder. Slightly loosen the fittings and/or valves necessary to bleed off entrapped pressure in the sampling lines and regulator assembly.

6.2.15 Return the system to its original configuration.

6.2.16 Identify the sample with the applicable information and transport the sample to the laboratory for analysis.

7.0 PARTICLE SAMPLING Rev. D

If a particle count sample is to be taken due to maintenance or the integrity of the system being broken into, the sample will be taken downstream from the repair point, e.g. at the ECS umbilicals.

NOTE: Read paragraphs 1.0 DESCRIPTION and paragraphs 5.0 thru 5.5 of this procedure.

7.1 EQUIPMENT

7.1.1 One Gelman Flowmeter or equivalent (Calibrated)

7.1.2 One Female Suit Connector with a 1/4 inch AN fitting attached to the back.

7.1.3 One plastic millipore sample.

7.1.4 Stop watch or other suitable timing device.

7.1.5 Appropriate hand tools.

7.2 PROCEDURE

7.2.1 Connect the Female Suit Connector to the umbilical.

7.2.2 Connect the Flowmeter to the Female Suit Connector.

7.2.3 Connect the millipore sample to the Flowmeter.

7.2.4 Set flow at 6.0 SCFM and continue flow for 5.4 minutes.

7.2.5 Close flow source, and remove Millipore Sample, then close parts of sample with an approved seal.

7.2.6 Identify sample and seal in plastic bag. Transport sample to laboratory in a vertical position at all times.

7.2.7 Return system to its original configuration.

8.0 SAMPLING PRIOR TO TEST Rev. D

In addition to sampling every two weeks, an Oxygen/Carbon Monoxide/ Odor test will be taken from an ECS umbilical prior to each manned test. (Sample taken by Environmental Medicine Group).

STANDARD OPERATING PROCEDURE

P-103

HIGH PRESSURE AIR COMPRESSOR

NORTHROP SERVICES, INC.

SPACECRAFT DESIGN LABORATORY SUPPORT GROUP

JOHNSON SPACE CENTER

HOUSTON, TEXAS

NSI-SDL SUPPORT GROUP

Rev. E

P-103

HIGH PRESSURE AIR COMPRESSOR

REVISION BLOCK

DATE	PREPARED BY	APPROVED BY	CONCUR	CONCUR	CONCUR	REVISION
7-9-71						Issued
6-2-72						A (Reviewed)
8-4-72	Reviewed By BDP 8-10-72	BDP 8-10-72	Reviewed JRS 8-10-72	Reviewed AFS 8/11/72		B (Format)
10-12-72	10-12-72	BDP 10-18-72	JCS 10/24/72	AFS 10/24/72	DCF 10/24/72	C
10-21-74	BDP 10-21-74	BDP 10-21-74	WPH 1-24-75	AFS 1/27/75	DCF 1/27/75	D (Bldg. 260)
9-6-78	JEL 9-11-78	AFE 1-5-79	VCH 3-15-79	S. Tisinger 3/16/79		E

NSI-SDL SUPPORT GROUP

P-103

HIGH PRESSURE AIR COMPRESSOR

1.0 DESCRIPTION Rev. E

The purpose of this document is to establish a step-by-step procedure to be used when operating the high pressure compressor. This compressor is used to provide primary air for suited tests and to fill SCUBA, "K", and Survivair/Scott air packs with compressed air to a maximum of 2000 psi, at which pressure the compressor automatically shuts off. This system has three manifolds A, B and C. Manifold "A" is used to fill SCUBA bottles and has four valves, A1 through A4. Manifold "B", used to fill "K" bottles and survivair/Scott air packs, has four valves, B1 through B4. Valve "B1" is used to fill Scott air packs; valve "B2" is used to fill survivair packs and valves "B3" and "B4" are used to fill K-bottles. Manifold C consists of a bank of six "K" bottles and serves as a holding reservoir for the primary air system.

2.0 APPLICABLE DOCUMENTS Rev. E

2.1 Instruction manual for Type 30 High Pressure Compressor, Models 10T2, H10T2, 15T4 and H15T4. Form 1166 dated June 1967.

2.2 Standard Operating Procedures, High Pressure Air Compressor.

3.0 SAFETY CHECKLIST Rev. E

3.1 Manifolds and Fill Lines

3.1.1 Check flex lines and copper pig tails for abrasions, cuts and wear.

3.1.2 Check all manifolds gages for visual damage such as broken glass, stuck needles, etc.

3.2 High Pressure Cylinders Rev. E

3.2.1 Check that cylinder(s) to be filled are stamped with D.O.T. stamp and have been hydrostatically checked within the past five years for the 2000 psi fill pressure.

NOTE: If the high pressure bottle has a working pressure rated at less than 2000 psi, then the operator must insure the compressor is shut off manually so as not to exceed the working pressure of cylinder being filled.

NOTE: The filling of all pressure vessels will be observed, by the operator, while standing behind the protective blast shield.

3.2.2 Check for valve condition and visual damage to cylinder(s).

4.0 FILLING PROCEDURES FOR SCUBA BOTTLES (Ref. Figure 1) Rev. E

4.1 Compressor Filling Station, Manifold "A" (Read Note under 3.2.1).

4.1.1 Open main manifold valve "A" and close valves "B", "C", "E", filter bleed valve, and insure valves A1 through A4 are closed.

4.1.2 Submerge SCUBA bottle(s) in cooling tank.

4.1.3 Connect high pressure filling hose to each SCUBA bottle.

4.1.4 Close hose bleed valve(s).

4.1.5 Put reserve handle(s) in DOWN position.

4.1.6 Open SCUBA tank valve(s).

4.1.7 Open valves A1, A2, A3, and A4 as required.

4.1.8 Push switch button to start compressor.

4.1.9 Crack filter bleed valve periodically to prevent moisture buildup in filters.

4.1.10 Allow compressor to run until high pressure switch actuates and compressor stops.

4.1.11 Close all SCUBA tank valves.

4.1.12 Close valves A1, A2, A3 and A4 as required.

4.1.13 Open hose bleed valves and bleed down pressure.

4.1.14 Disconnect bottles for use.

4.1.15 Crack filter bleed valve to remove moisture from filter.

5.0 FILLING PROCEDURES FOR "K" BOTTLES (Ref. Figure 1) Rev. E

5.1 Compressor Filling Station, Manifold "B" (Read Note under 3.2.1).

5.1.1 Close main line valves "C", "B" and "E", leaving valve "A" open. Close filter bleed valve and valves A1 through A4.

5.1.2 Connect "K" bottles to manifold "B".

5.1.3 Open "K" bottle valves.

5.1.4 Open valves B1, B2, B3 and B4 as required.

5.1.5 Push button to start compressor.

5.1.6 Open main line valve "B".

5.1.7 Crack filter bleed valve periodically to prevent moisture buildup in the filters.

5.1.8 Allow compressor to run until high pressure switch actuates and compressor stops.

5.1.9 Close all "K" bottle valves.

5.1.10 Open valve "E" to bleed down manifold.

5.1.11 Disconnect "K" bottles for use.

5.1.12 Upon completion of filling all bottles, close valves "A", "B", "E" and B1 through B4.

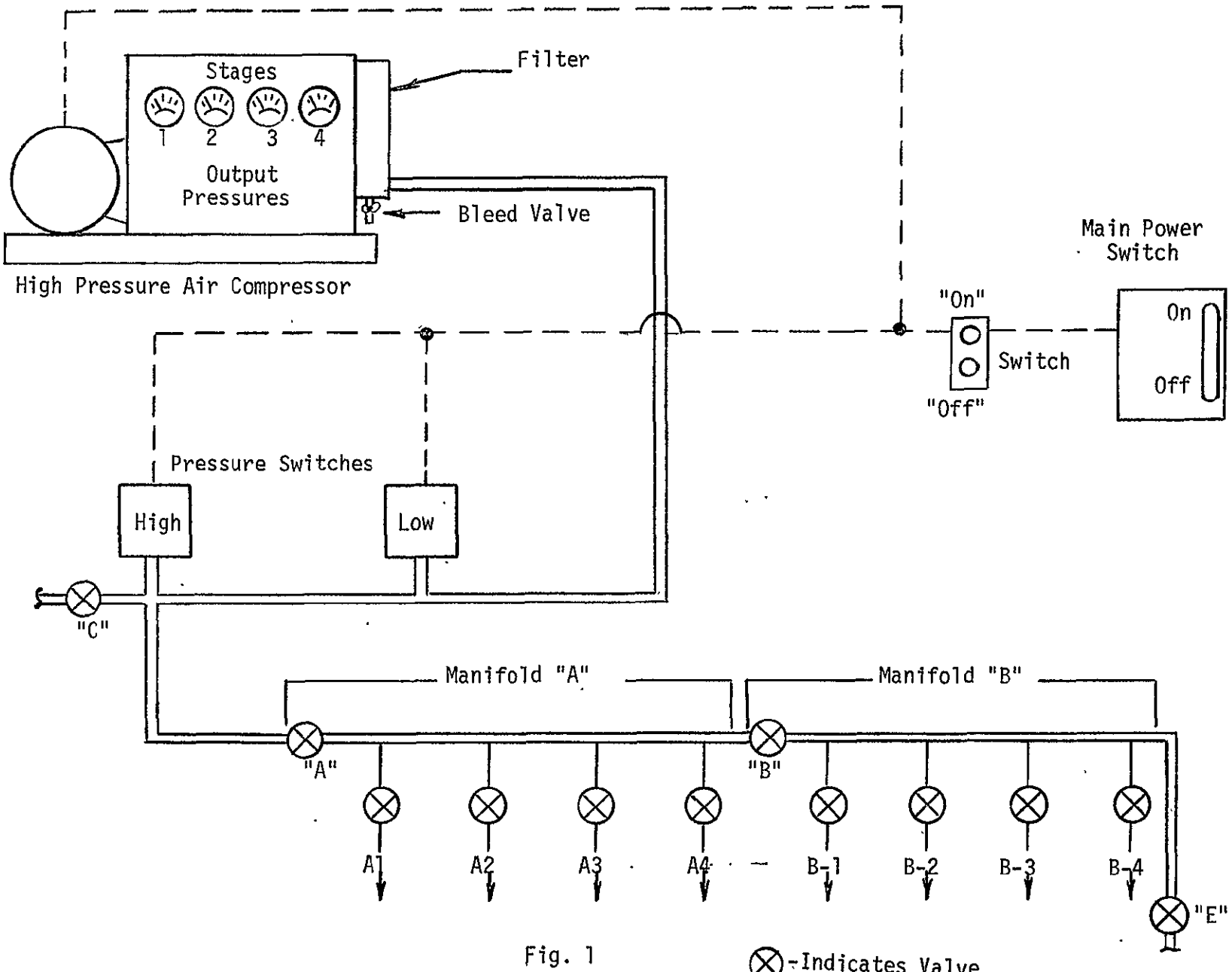


Fig. 1 ⊗-Indicates Valve

High Pressure Air Compressor

STANDARD OPERATING PROCEDURES

P-104

TEST DIRECTOR CONSOLE

NORTHROP SERVICES, INC.

SDL SUPPORT GROUP

JOHNSON SPACE CENTER

HOUSTON, TEXAS

NSI-EVA/IVA SUPPORT GROUP

Rev. C

P-104

TEST DIRECTOR CONSOLE

REVISION BLOCK

DATE	PREPARED BY	APPROVED BY	CONCUR	CONCUR	CONCUR	REVISION
5-19-72						Issued
8-4-72	Reviewed 8/9/72 JBm	Reviewed 8-10-72	Reviewed JRS 8-10-72	Reviewed HHS 8/11/72	GCF 11/13/72	A (Format)
10-21-74	BDP 10-21-74	BDP 10-21-74	WPH 10-25-74	HHE 1/30/75	GCF 2/3/75	B
10-19-78	BGD 10-23-78 BDP 11-14-78	HHS 1-5-79	V Cit 3-15-79	JL Franklin 3/16/79		C

P-104

EST DIRECTOR CONSOLE

1.0 DESCRIPTION

The purpose of this document is to establish a step-by-step procedure for preparation and operation of the Test Director (TD) console.

2.0 APPLICABLE DOCUMENTS

2.1 Block diagram of WIF comm system - SIB43102070

2.2 TD Panel - SKB43102069

2.3 Electrical Schematic of Comm Switching-SIB43102071

2.4 Electrical Schematic Alarm System - SIB43101908

3.0 PRE-TEST

3.1 Insure that ECS/LCG and TD consoles are plugged in to 115 VAC outlets.

3.2 Press TOPSIDE button on upper right side of console on. (Verify light on).

3.3 Left side - Verify that both mixers and amps are on. Verify that controls on both mixers are set as follow:

Chan	1	=	0
Chan	2	=	0
Chan	3	=	3
Chan	4	=	8
Power		=	On

3.4 Verify that controls on both amps are set as follows:

Mic 1	-	0
Mic 2	-	0
Aux	-	0
Master	-	8.5
Bass	-	4 Max

Treble - 4 Max

Power - On

3.5 Press SUIT and BIO-MED button ON. (Verify light on).

3.6 Adjust top-side volume control for comfortable volume.

3.7 Press UNDERWATER button ON and verify that underwater volume control is maximum - (full clockwise) (Verify light on).

3.8 Verify that both power supplies under the right side of the console table are on. (They should read 28 VDC).

3.9 Place all comm station buttons in the Chan A position.

3.10 Place A and B SPKR buttons on OPERATE.

3.11 Verify communications with each topside station.

3.12 Verify the comm from each of the crewmen umbilicals (blue, red, and white) and adjust volume if necessary.

3.13 Verify good comm from the underwater SPKRs.

3.14 Place all comm station buttons in the Chan B position.

3.15 Repeat steps 3.11, 3.12 and 3.13.

3.16 Check out of yack yack emergency comm system.

3.16.1 Turn ON-OFF switch to ON.

3.16.2 Press the LISTEN-TALK switch to TALK and verify communications with the safety divers.

3.16.3 Turn ON-OFF switch to OFF.

NOTE: If not anticipating a Kirby Morgan run, stations K/M 1, K/M 2, K/M 3 and K/M 4 do not need to be checked.

3.17 Press UNDERWATER button OFF. (Verify light off).

3.18 Press SUIT and BIO-MED button OFF. (Verify light off).

3.19 Turn TOPSIDE volume control down. (Full counter clockwise) (Verify light off).

3.20 Press TOPSIDE button OFF. (Verify light off).

4.0 TEST

4.1 Turn TOPSIDE comm on (light on).

4.2 Press SUIT and BIO-MED button. (Verify light on).

4.3 Press UNDERWATER button. (Verify light on).

4.4 Press the comm station buttons that correspond to the stations involved in this test, to the Chan A position.

4.5 Adjust topside volume control for comfortable volume.

4.6 Verify comm with these stations, including appropriate crewman umbilicals.

4.7 When all stations are manned and divers are in the water, turn the master volume on both amps (left side of console) up to 9.5, and readjust TOPSIDE volume control for comfort.

4.8 Operations: Rev. B

4.8.1 Video Tape Recording

4.8.1.1 Notify television console operator to start taping.

4.8.1.2 At conclusion of exercise, notify television console operator to stop taping.

4.9 Alarm System

Alarm system monitoring lights located on the TD Console are to provide the TD with a 10 second warning prior to the audio alarm coming over the comm system. At the TD's discretion, he may ask the ECS/LCG monitor to disable the audio alarm.

5.0 POST TEST

5.1 TD master volume on both amps (left side of console) must be turned down immediately.

5.2 Turn TOPSIDE volume down.

5.3 Press SUIT and BIO-MED button OFF. (Verify light off).

5.4 Press UNDERWATER button OFF. (Verify light off).

5.5 Press TOPSIDE button OFF. (Verify light off).

STANDARD OPERATING PROCEDURES

P-105

PREPARATION OF SUITED SUBJECTS FOR WATER ENTRY

NORTHROP SERVICES, INC.

SDL SUPPORT GROUP

JOHNSON SPACE CENTER

HOUSTON, TEXAS

P-105

PREPARATION OF SUITED SUBJECTS FOR WATER ENTRY

REVISION BLOCK

DATE	PREPARED BY	APPROVED BY	CONCUR	CONCUR	CONCUR	REVISION
7-14-72						Issued
8-4-72	Reviewed by BDP 8-10-72	BDP 8-10-72	Reviewed JRS 8-10-72	Reviewed AFS 8/11/72	SCF 11/13/72	A (Format)
10-21-74	BDP 10-22-74	BDP 10-22-74	WPH 10-25-74	AFS 10/25/74	SCF 10/30/74	B (Format)
10-19-78	SAD 10-24-78 ~~BDP 11-14-78~~	AFS 1-5-79	VCH 3-15-79	J. C Franklin 3/16/79		C (Format)

PREPARATION OF SUITED SUBJECTS FOR WATER ENTRY

1.0 DESCRIPTION

The purpose of this document is to establish a step-by-step procedure to be used when preparing a suited subject for any underwater exercise. Prior to water entry the subject(s) will have his umbilical hoses, gloves, weights, weight harness and helmet attached, as well as any other equipment required for the exercise.

2.0 APPLICABLE DOCUMENTS

2.1 General Operating Plan

2.2 S.O.P. Manual Emergency Procedures

2.3 Complete ECS/LCG Monitor's Checklist

3.0 SAFETY CHECKLIST PRIOR TO SUBJECT ARRIVAL

3.1 ECS Umbilicals

3.1.1 Inlet and exhaust air lines

3.1.1.1 Check that inlet and exhaust hose connectors are not dented or otherwise damaged; are securely attached and taped to the hose and are the correct fittings to mate to the P.G.A.

3.1.1.2 Check hoses for cuts, abrasions, kinks and other damage.

3.1.2 Communication

3.1.2.1 Check comm fitting for bent or damaged pins and for correct mating to insuit harness.

3.1.2.2 Check out comm using insuit harness and comm carrier.

3.1.3 L.C.G.

3.1.3.1 Check inlet and outlet L.C.G. hose

for cuts, abrasions and other damage.

3.1.3.2 Check security of hose fitting attachment and mate to test insuit fitting.

3.1.3.3 Adjust L.C.G. to 20 gallons per hour flow and observe that water flows from discharge side of fitting.

3.2 Weights

3.2.1 Insure the ripcord release mechanism is free of bent or broken ripcord pins, kinked or frayed cable, damage or crushing of the release cones and for the presence of the safety pin. Also insure smooth travel of cable in release tube.

3.2.2 Insure that weight harness is assembled and all pockets on back pack are filled with weights and zippers closed. Insure that the safety pin is installed in the top front quick release ripcord pin.

3.2.3 Insure weight harness webbing and fabric are free of abrasions, cuts, tears and broken stitching.

3.2.4 Insure weight harness is free of bent, broken or damaged hardware.

3.2.5 Insure leg and wrist weights are free of damage to container fabric and that all pockets are filled with weights.

3.2.6 Insure attachment webbing of wrist and leg weights is free of cuts, tears, abrasions and broken stitching. Insure proper threading of adjustable snaps and that there is no damaged or missing hardware.

4.0 SUBJECT ARRIVAL

4.1 Upon arrival of suited subject(s), suit technician will connect ECS hoses to PGA and insure subject has adequate vent flow.

4.2 Suit technician will connect gloves and insure com... is hooked up and that mikes and earphones are working.

5.0 ATTACHMENT OF STANDARD WEIGHTS

5.1 Attach leg weights to ankles of subject, insuring all three snaps are connected to the 'D' rings and that the weight pockets are upright and flaps sealed. Pull the webbing straps snug, keeping snaps on outside of ankle.

5.2 Attach wrist weights to forearms of subject. Insure wrist weight pockets are upright, sealed, and snaps connected to the 'D' rings. Make sure weights do not interfere or bind the glove locking ring or cover PGA pressure gauge.

5.3 Suit technician will then connect helmet to PGA and will insure helmet seats and neck ring locks.

5.4 Pressurize Crewman.

5.5 Place main weight harness on subject with quick release ripcord mechanism in front and straps over shoulder to back weight pack. To fasten each side weight (one on each side of subject), place end fittings over lower cone and install ripcord pin in front, then thread side weight belt through adjuster buckle on the side of the back weight pack. Secure crotch strap by attaching strap end fitting to the lower cone of the ripcord release mechanism. This requires holding the side weight fittings on the cone while withdrawing the ripcord pin, placing the crotch strap end fitting on the cone and replacing the pin. Tighten all straps and secure loose ends with elastic keepers.

6.0 ATTACHMENT OF ACCESSORY ITEMS REQUIRED FOR TEST

6.1 Attachment of OPS mockup behind head. When a test requires use of an OPS mockup, the back weight harness must be one which has clips attached to the end fittings of the shoulder straps.

The OPS is attached under water and mounts high on the back of the subject with two straps over each shoulder. The OPS mockup straps are snapped into the two clips. (One on each side of the front top cone of the weight release mechanism) The OPS straps are then pulled tight.

6.2 Install other equipment required on subject as directed by test director.

6.3 Subject ready for water entry.

6.3.1 Subject enters water by ladder and descends to platform. The two safety divers will verify suit and weight harness integrity. Safety divers will signal to the test director that everything is okay by use of the "OK" hand signal directed to the underwater T.V. camera. Divers will then increase suit pressure to 3.5 psi under direction of the test director and/or ECS console operator.

6.3.2 Divers will weigh out subject according to test plan.

6.3.3 Divers will attach accessory items at this point if required by test plan.

6.4 Subject ready to exit water. (Following steps will be accomplished on the platform):

6.4.1 Safety divers will reduce suit pressure by backing off back pressure valve.

6.4.2 Divers will hold the side weights as the lower ripcord pin only is released. Divers will then unthread side weight straps from adjuster buckle and lower weights to platform insuring weights do not fall and cause damage to themselves or others.

6.4.3 Subject will then climb the ladder till his neck ring is at the surface of the water and pause while the arm and leg weights are removed.

6.4.4 After leg and wrist weights are removed and subject is standing on the ladder with head out of the water, safety divers will remove safety pin from front ripcord mechanism and holding shoulder straps, pull ripcord pin and lower back weight from subject to the platform insuring weights do not fall and cause damage to themselves or others.

6.4.5 Subject will then exit the water and suit technician will depressurize the subject.

6.4.6 Suit technician will then remove gloves, helmet and ECS/Comm umbilicals. Subject is then free to leave tank deck.

STANDARD OPERATING PROCEDURE

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KIRBY MORGAN/AQUADYNE AIR SUPPLY

NORTHROP SERVICES, INC.

SDL SUPPORT GROUP

JOHNSON SPACE CENTER

HOUSTON, TEXAS

STANDARD OPERATING PROCEDURE

P-119

KIRBY MORGAN/AQUADYNE AIR SUPPLY

REVISION BLOCK

Date	Prepared by	Approved by	Concur	Concur	Concur	Rev.
10-26-78	10-31-78 BDB 11-14-78	1-5-79	3-15-79	3/16/79		Issued

NSI-SDL SUPPORT GROUP

P-119

KIRBY MORGAN/AQUADYNE AIR SUPPLY

1.0 GENERAL

1.1 Introduction

The purpose of this document is to establish a step-by-step procedure for turning on and off the air supply for the Kirby Morgan/Aquadyne Shallow water diving helmets.

2.0 APPLICABLE DOCUMENTS

None

3.0 OPERATION

3.1 Turn master power switch on.

3.2 Open valve "C".

3.3 Open valve C1 through C3.

3.4 Open K-bottles C1 through C3.

3.5 Open valve D, D1, D3, and D5.

3.6 Open Emergency Air bank #1. (Valve F)

3.7 Open Emergency Air K-bottles to Emergency Air bank #1. (Valves F-1, F-2, and F-3)

3.8 Plug in Kirby Morgan/Aquadyne.

3.9 Check operation of diving mask.

3.10 System is ready for use.

4.0 END OF TEST

4.1 Dry out diving mask.

4.2 Unplug and stow diving mask.

4.3 Close Emergency Air K-bottles in bank #1. (Valves F-1, F-2 & F-3)

4.4 Close valve C and C1, C2, and C3.

4.5 Open valves D4 and D6 and bleed system.

4.6 Close valves D4 and D6.

4.7 Close Emergency Air bank #1. (Valve F)

4.8 Close valve D.

4.9 Open valves C, C1, C2, and C3.

4.10 Turn manual "ON/OFF" switch "ON" and fill plenum system.

4.11 Close K-bottles C1, C2 and C3.

4.12 Turn master power switch "OFF".

4.13 Open valve D2 and bleed system.

4.14 Close valves D1, D2, C, C1, C2 and C3.

STANDARD OPERATING PROCEDURE

P-120

PRE & POST WIF CHECKLISTS

NORTHROP SERVICES, INC.

SDL SUPPORT GROUP

JOHNSON SPACE CENTER

HOUSTON, TEXAS

NSI-SDL SUPPORT GROUP

P-120

PRE & POST TEST CHECKLISTS

REVISION BLOCK

DATE	PREPARED BY	APPROVED BY	CONCUR	CONCUR	CONCUR	REVISED
2-13-79	2-13-79 J. Miranda 3-13-79	AFB 3/13/79	3-15-79	3/16/79		1 thru 14 Re-issued

NSI-SDL SUPPORT GROUP

P-120

PRE AND POST TEST CHECKLIST PROCEDURE

1.0 DESCRIPTION

The purpose of this document is to establish a procedure for controlling and updating Pre and Post test checklists which are conducted prior to and after a pressure suited subject test at the Water Immersion Facility.

2.0 PURPOSE

The Pre-test checklists are performed to verify the systems, the subject, all equipment and personnel are in a GO mode. The Post-test checklists are to secure everything to a safe and standby mode after a pressure suited subject test has been completed.

This document will establish steps to be performed to correct and update these checklists and to control the issuing so that the latest revision, and applicable checklists are issued for the test plan.

3.0 IDENTITY OF PRE & POST TEST CHECKLISTS

3.1 PRE-TEST checklists will be identified by a number only, ie: P-120-1, P-120-2, etc.

3.2 POST-TEST checklists will be identified by a number which is cognizant of its Pre-test checklist, but also with a letter, ie: P-120-1A, P-120-6A, etc.

4.0 PERFORMANCE OF THE CHECKLISTS

Prior to any pressure suited subject test, the series of pre-test checklists to be performed are to insure that:

(1) The systems are functional and in the GO mode.

(2) All safety equipment meets the criteria.

(3) The subject is cognizant of test to be conducted.

(4) All equipment for the test is of the proper configuration.

(5) All monitoring equipment, instrumentation and TV are functional.

(6) Test Safety Officer has concurred with all preparations.

(7) Medical Safety Monitors are ready.

(8) Communication is established with all personnel involved.

(9) All personnel on station.

(10) Test Director can verify test can start.

5.0 APPLICABLE DOCUMENTS

1. JSCM 1700A - JSC Safety Manual.
2. JSCM 5322A - JSC Contamination Control Requirements Manual.
3. JSCM 8080 - Manned Spacecraft Criteria and Standards Manual.
4. JSC 01218 - JSC Standard Procedures for Liquid and Gas Sampling.
5. JSC 13805 - WIF General Operating Procedure.
6. MSC 07652 - Standard Operating Procedure

6.0 PROCEDURE

6.1 The following steps will be verification that the latest revision of the pre-test and post-test checklists are being conducted.

6.1.1 All checklists will have the date and latest revision typed in the upper right hand corner of the front sheet.

6.1.2 The person responsible for issuing the checklists will verify step 6.1.1 before issuing the checklists prior to all tests.

6.1.3 If for any reason, the person conducting the pre or post test checklist has to deviate from the steps as listed in sequence, he will inform the TD. The TD will then decide if the deviation will or will not hinder completing the checklist and test. If the deviation will not interfere with the completion of test, the TD will redline a note or comment on the checklist, with date and initial, then continue.

6.1.4 If the deviation of step 6.1.3 is to be permanent, as time permits, the checklist will be retyped, revised and dated and the new revision will be entered into the system.

6.1.5 At the conclusion of performing all checklists, the person conducting the checklist will sign and date the same and turn into the TD for filing.

7.0 APPLICABLE CHECKLIST DOCUMENTS

1. - P-120-1 Pre ECS/LCG Console Operator's Checklist Shts 1 of 5
2. - P-120-1A Post ECS/LCG Console Operator's Checklist Shts 1 of 2
3. - P-120-2 WIF Medical Monitor's Checklist Shts 1 of 1
4. - P-120-3 Bldg. 260 WIF TV Checklist Sht 1 of 1
5. - P-120-4 Safety Diver's Checklist Sht 1 of 1
6. - P-120-5 Suit Technician's Checklist Sht 1 of 2
7. - P-120-6 Pre Top Side Monitor's Checklist Sht 1 of 1
8. - P-120-6A Post Top Side Monitor's Checklist Sht 1 of 1
9. - P-120-7 Hoist Operator's Checklist Sht 1 of 1
10. - P-120-8 Test Conductor's Checklist Sht 1 of 1
11. - P-120-9 Test Director's Checklist (Shuttle Hut) Sht 1 of 3
12. - P-120-10 Test Safety Officer's Checklist Sht 1 of 1
13. -P-120-11 Communication Checklist Shts 1 of 2
14. -P-120-12 Test Director's Checklist (A7LB) Shts 1 of 3

STANDARD OPERATING PROCEDURE

P-120-1

ECS/LCG CONSOLE OPERATOR'S CHECKLIST

Before beginning any subject run, the following procedures will be performed: (Note: Checklist should be run 40 minutes prior to exercise to insure water cooler has chilled the water.

Initial System Status

1. _____ Verify main power switch for compressor is off.
2. _____ Verify valve A closed.
3. _____ Verify valve C closed.
4. _____ Verify valves C1 thru C6 closed.
5. _____ Verify K-bottles to valve C1 thru C6 closed.
6. _____ Verify valve D closed.
7. _____ Verify valves D1 thru D6 closed.
8. _____ Verify emergency manifold valves F and G are closed and all K bottle valves are closed.
9. _____ Verify plenum plugs are in the plenum tank.
10. _____ Verify the umbilical interconnects are on the ECS/LCG umbilicals, and that all clamps and fittings are secure.
11. _____ Verify both main air supply valves (HV-1 and HV-2) on console are closed.
12. _____ Verify main water supply valve (WV-1) to console is closed.
13. _____ Verify each individual air control valve and water control valve located on ECS/LCG console is closed.
14. _____ Verify LCG cooler is off.
15. _____ Verify alarm system off.

16. _____ Visually inspect suit connectors and umbilical interface for damage or unusual wear.

For Air Pressurization

17. _____ Verify compressor intake clear of any pollution.

18. _____ Turn alarm power "ON".

19. _____ Verify emergency air supply lights "ON".

20. _____ Open emergency air supply bottles into both manifolds.

Operating Limits: No. of Subjects,	Sum of Manifold Pressure
1	1000 psi
2	1500 psi
3	2000 psi

Record total pressure_____.

Verify manifold regulators are 80 - 90 psi on ECS/LCG console and indicator lights are OFF.

21. _____ Open valve C and D1.

22. _____ Check pressure from valve D1.

NOTE: If pressure is above 1000 psi, open valve D2 to bleed manifold below 1000 psi.

23. _____ Turn main power switch ON.

24. _____ Insure compressor turns on automatically when D1 gage is reading below 1000 psi.

25. _____ Verify compressor shutdown at 2000 psi.

26. _____ Open valves C1 thru C6.

27. _____ Open K-bottles valves C1 thru C6.

28. _____ Open valve D.

29. _____ Open valve D3.

ECS/CONSOLE OPERATORS CHECKLIST (CONT)

30. _____ Check pressure on gage D3 for 250 psi.

31. _____ Open valve D5.

32. _____ Check pressure on gage D5 for 150 psi.

33. _____ Turn compressor run switch on.

NOTE: If pressure on gage D1 reads 2000 psi, then this step may be deleted.

34. _____ Open main air supply valves (HV-1 and HV-2) on console.

35. _____ Remove plenum plugs from plenum tank and umbilical interconnect from umbilical and connect suit connectors to plenum tank at crewman preparation station.

36. _____ Insure delta-pressure valve is set at minimum pressure (full counter-clockwise).

37. _____ Open individual air control valve and set flow at 6 SCFM on console flowmeter.

38. _____ Turn individual OPERATE/OFF switch to "OPERATE".

39. _____ Turn ENABLE/DISABLE switch to "ENABLE".

40. _____ Using the delta-pressure valve, vary the plenum tank pressure from 2 psi to 5 psi and compare with pressures read at the console.

41. _____ Verify activation of alarm light, alarm signal, and individual pressure light at 5 psi.

42. _____ Set delta-pressure valve to 3.7 psi.

43. _____ Verify alarm light out, alarm signal off, and individual pressure light off.

44. _____ With plenum tank pressure set at 3.7 psi, shut off air supply valve D.

45. _____ Insure activation of emergency air system.

46. _____ Verify activation of alarm light, inlet light, alarm signal.

47. _____ Open air supply valve D.

48. _____ Verify alarm light out, inlet light out, and alarm signal off.

ECS/CONSOLE OPERATORS CHECKLIST (CONT)

49. _____ Turn individual OPERATE/OFF switch to "OFF".

50. _____ Verify suit flow is 6 SCFM and suit pressure is 3.7 psi.

51. _____ Remove umbilical inlet line from bulkhead.

52. _____ Verify actuation of umbilical pop-off valve and then shut off individual flow control valve on console.

53. _____ Verify suit pressure gage does not drop below a reading of 1.0 psig within 30 seconds of umbilical inlet disconnect.

54. _____ Reconnect umbilical inlet line at bulkhead.

55. _____ Remove umbilical from plenum tank and put on interconnect and reinstall plenum plugs on plenum tank.

56. _____ Adjust air flow to 6 SCFM on umbilical.

57. _____ Verify pressure is 3.7 $\pm$ 0.2 psi.

58. _____ Turn individual OPERATE/OFF switch to OPERATE.

59. _____ Submerge umbilical and verify proper operation of delta-pressure valve ($\pm$ 0.3 psi).

60. _____Return umbilical to the tank deck.

61. _____ Set delta-pressure valve at minimum pressure.

62. _____ Slowly shut off individual air control valve on console.

63. _____ Verify activation of alarm light, alarm signal, and individual flow light at 3 SCFM; and individual pressure light at 1 $\pm$ 0.2 psi.

64. _____ Turn individual OPERATE/OFF switch to "OFF".

65. _____ Dry out communication connector.

66. _____ Repeat steps 34 through 65 for each additional umbilical that is to be used. Steps 44 through 48 may be deleted.

67. _____ System is ready for subject running.

For Water Cooling

68. _____ Turn LCG COOLER POWER "ON".

69. _____ Open main water supply valve (WV-1) to console.

70. _____ Insure the umbilical LCG interconnect is on the umbilical LCG fitting.

71. _____ Open individual water control valve and set flow at 30 gallons per hour.

72. _____ Pressure should be at approximately 2-10 psi and should never exceed 20 psi.

73. _____ Shut off individual water control valve.

74. _____ Remove umbilical LCG interconnect.

75. _____ Repeat steps 69 through 74 for each additional umbilical that is to be used.

76. _____ System is ready fc ubject running.

_____
Signature

_____
Date

STANDARD OPERATING PROCEDURE

P-120-1A

ECS/LCG CONSOLE OPERATOR'S POST CHECKLIST

This checklist will be conducted after subject run, and TD has verified to secure from exercise and return system to standby configuration.

1. _____ Umbilical fittings have been dried out.
2. _____ Umbilicals are stowed on racks.
3. _____ Turn off both manifolds of emergency air supply.
4. _____ Close valve D.
5. _____ Bleed emergency air lines by turning on flow to umbilicals.
6. _____ Monitor emergency and inlet air gages.
7. _____ Insure emergency air gages read 0 psi.
8. _____ Turn compressor power "OFF".
9. _____ Close K-bottle valves C1 thru C6.
10. _____ Open valve D1 and D2 and bleed system.
11. _____ Verify valve A closed.
12. _____ Verify valve C closed.
13. _____ Verify valves C1 thru C6 closed.
14. _____ Verify K-bottles to valve C1 thru C6 closed.
15. _____ Verify valve D closed.
16. _____ Verify valves D1 thru D6 closed.
17. _____ Verify emergency manifold valves F and G are closed and all K-bottle valves are closed.
18. _____ Verify plenum plugs are in the plenum tank.
19. _____ Verify the umbilical interconnects are on the ECS/LCG umbilicals, and that all clamps and fittings are secure.

ECS/LCG CONSOLE OPERATOR'S CHECKLIST

20. _____ Verify both main air supply valves (HV-1 and HV-2) on console are closed.

21. _____ Verify main water supply valve (WV-1) to console is closed.

22. _____ Verify each individual air control valve and water control valve located on ECS/LCG console is closed.

23. _____ Verify LCG cooler is off.

24. _____ Verify alarm system off.

25. _____ Visually inspect suit connectors and umbilical interface for damage or unusual wear.

All items on this checklist have been accomplished except as specified on this sheet.

Signature_____

Date_____

STANDARD OPERATING PROCEDURE

P-120-2

WIF MEDICAL MONITOR'S CHECKLIST

A copy of this checklist will be completed by the Medical Monitor and given to the Test Director prior to the beginning of water activities on any given date.

1. _____ The hyperbaric chamber, and a crew, is on standby for exercise.

2. _____ Dr._____, Extension_____, is the physician at test site, with a medical technician.

3. _____ Personnel scheduled to undergo activity in the water have been examined to determine their physical fitness status.

4. _____ Medical equipment has been checked to assure all necessary items are available.

Signature_____

Date_____

STANDARD OPERATING PROCEDURE

P-120-3

BUILDING 260 WIF TELEVISION CHECKLIST

1. _____ Turn on all equipment as required for needed coverage.

2. _____ Check Rucker "Safety Sentry" system for proper operation by depressing "test" button located on front of panel of unit. If system is operating normally, return unit to "on" condition by removing power and resetting the circuit breaker located on the unit.

NOTICE:

If this system fails to "test" properly, notify the test director of this malfunction before any equipment is placed in the water.

3. _____ Check all underwater camera cables and housings for water tight seals.

4. _____ Check underwater camera lighting system for proper operation.

5. _____ Verify that the handheld camera and lights are certified for underwater operation.

6. _____ Set up and adjust camera control units. Insure that cameras are operating at their optimum, according to manual specifications and test conditions.

7. _____ Set up and check audio levels.

8. _____ Verify that audio/video transmission are at proper levels, as received in Building 8, and are acceptable for recording.

9. _____ Entries of test title and names of test subjects should be made in building operations log. Any problems or difficulties encountered should also be recorded and corrected at this time.

I have accomplished all items on the television checklist.

Signature_____

Date_____

STANDARD OPERATING PROCEDURE

P-120-4

SAFETY DIVER'S CHECKLIST

Prior to entering the water for any WIF test, safety divers will complete this checklist and sign below.

1. _____ Check SCUBA bottle for minimum of 2000 psig.

2. _____ Check SCUBA safety bottle for minimum of 1500 psig.

3. _____ Assemble SCUBA bottles in backpack and attach regulators to bottles.

4. _____ Turn air on each tank; test purge button on each regulator.

5. _____ Breathe through each regulator. Insure that they are each working properly.

6. _____ If any malfunction occurs, obtain replacement equipment and log malfunction. Repeat checklist.

7. _____ Check mask, fins, snorkel, weight belt, and stand by prepared for test.

I have completed the Safety Diver's Checklist; have reviewed test procedures and emergency procedures, and to the best of my knowledge am physically able to perform as a safety diver.

Signatures:

1. _____ 6. _____

2. _____ 7. _____

3. _____ 8. _____

4. _____ 9. _____

5. _____ 10. _____

STANDARD OPERATING PROCEDURE

P-120-5

SUIT TECHNICIANS CHECKLIST

The suit technician will insure that this checklist is completed and submitted to the Test Director prior to any WIF activity.

1. _____ Pressure Suit #_____ is qualified for this test as shown on TPS _____.

2. _____ I have suited this crewman and all connections, clamps and fittings are secure and to the best of my knowledge all systems are working.

3. _____ For safety reasons suit technicians will follow suited crewman as he ascends stairway to top deck of WIF and will precede him down the stairway to the dressing room.

4. _____ Shuttle Hut

   Prior to crewman donning PGA, verify/perform the following:

   _____ Air sample w/Beckman D-Z analyzer and CO sample acceptable.

   _____ Weights installed in rear of back pack.

   _____ Upper torso in donning station and two (2) lock pins installed.

   _____ Air inlet fittings (2) installed and locked.

   _____ Air outlet fittings (2) installed and locked.

   _____ Back pressure valve on outlet connector full out (CCW).

   _____ H_2O connector installed and locked.

   _____ Comm. umbilical connector installed and locked.

   _____ Neck ring in "engage" position.

   _____ Wrist rings in "engage" position.

   _____ DCM installed with lock pin and straps installed.

5. A7L

   Prior to crewman donning PGA, verify/perform the following:

_____ Air sample w/Beckman D-Z analyzer and CO sample acceptable.

_____ Back pressure valve on outlet connector full out (CCW).

_____ Neck ring in "engage" position.

_____ Wrist rings in "engage" position.

Signature_____

Date_____

STANDARD OPERATING PROCEDURE

P-120-6

TOP SIDE MONITOR'S CHECKLIST

The Top Side Monitor will insure that this checklist is completed and submitted to the Test Director prior to any WIF activity.

1. _____ Verify mockup trainer and test article hardware correctly configured and properly weighted for desired buoyancy.
2. _____ Emergency exits on mockup trainer working properly.
3. _____ Ballast weights ready for suit subject(s).
4. _____ Verify driveway clear and that "Test in Progress" sign is in proper position, and red light(s) ON.
5. _____ Verify evacuation path clear.
6. _____ Verify High-bay door is in operation.
7. _____ Check facility air pressure for 80 psi.
8. _____ Verify operation of facility low pressure alarm system.
9. _____ Verify ambulance and Hyperbaric Chamber people are on station and ready for test to start.
10. _____ Install "Test in Progress, Do not Enter" signs at the bottom of the stairwell and at the machine shop gate.

Signature_____

Date_____

STANDARD OPERATING PROCEDURE

P-120-6A

TOP SIDE MONITORS

POST TEST CHECKLIST

1. _____ Insure that the Billy Pugh net is stored.

2. _____ Contact the Hyperbaric Chamber and ambulance people to inform them that the test has been concluded.

3. _____ Store "Test in Progress", "Do not Enter" signs and red light(s).

Signature_____

Date_____

STANDARD OPERATING PROCEDURE

P-120-7

HOIST OPERATOR'S CHECKLIST

1. _____ Verify Billy Pugh net is in proper configuration and connected to the hook.

2. _____ Verify EMU Donning Station on Tank Deck and connected to hoist hook. (Shuttle Hut only)

3. _____ Verify hoist operational and in proper position.

4. _____ Verify electric hoist turned OFF.

Signature_____

Date_____

STANDARD OPERATING PROCEDURE

P-120-8

TEST CONDUCTOR'S CHECKLIST

The Test Conductor will insure that this checklist is completed and submitted to the Test Director prior to any WIF activity.

1. _____ Procedures have been submitted to the Mockup and Trainer Section for safety evaluation and incorporation into WIF operational procedures.

2. _____ Crewmen or suit subjects have been briefed on procedures to be used.

3. _____ A Test Conductor has been assigned to coordinate test objectives and procedures, record subject comments throughout the test, and debrief the crew.

All items on this checklist have been accomplished except as specified on this sheet.

Signature_____

Date_____

STANDARD OPERATING PROCEDURE

P-120-9

TEST DIRECTORS CHECKLIST

(Shuttle Hut)

1. _____ Receive completed and signed pretest checklists from:

   a. Medical monitors_____

   b. Safety divers_____

   c. Suit technicians_____

   d. TV personnel_____

   e. ECS/LCG console operator_____

   f. Topside monitor_____

   g. Test conductor

   h. Test safety officer_____

   i. Hoist operator_____

   j. Communication technician_____

2. _____ Insure that necessary personnel are on station and receive go from:

   a. Medical monitors_____

   b. TV personnel_____

   c. ECS/LCG console operator_____

   d. Topside monitor_____

   e. Test conductor_____

   f. Test safety officer_____

   g. Hoist operator_____

   h. Suit subject_____

   i. Suit technicians_____

NOTE: Crewman has donned the LCVG, lower torso, and is standing by at the donning station.

3. Verify/perform the following suit/WIF hardware:

   a. _____ LTA waist disconnect in "ENGAGE" position.

   b. _____ Donn upper torso.

   c. _____ Connect LCVG and verify both tabs engaged.

   d. _____ Initiate air and water flow.

   e. _____ Verify no leaks around LCVG conn.

      NOTE: Constant stream of water NO-GO.

   f. _____ Connect body seal closure and lock.

   g. _____ Donn comm carrier.

   h. _____ Press suit and bio med switch OFF.

   i. _____ Connect electric harness and chin strap; position microphones.

   j. _____ Press suit and bio med switch ON.

   k. _____ Perform comm check with subject.

   l. _____ Donn EV gloves and lock.

4. Verify the following:

   a. _____ Air inlet fittings (2) installed and locked.

   b. _____ Air outlet fittings (2) installed and locked.

   c. _____ Back pressure valve on outlet connector full out (CCW).

   d. _____ Water connector locked.

   e. _____ Comm. umbilical connector locked.

   f. _____ Neck ring in "engage" position.

   g. _____ Wrist rings in "locked" position.

   h. _____ Body seal closure in "locked" position.

5. Perform the following:

   a. _____ Attach arm and leg weights.

   b. _____ Reduce air flow.

   c. _____ Donn helmet/EVVA.

   d. _____ Verify locked.

   e. _____ Increase air flow to 6 SCFM.

6. _____ Give go ahead for suit final pressure adjustment. Set suit delta pressure to 3.7 psid. Perform comm. check with subject.

7. _____ Release back pack from donning station; pip-pin keeper open.

8. _____ Connect shoulder strap; install mini work system.

9. _____ Give go ahead for hoisting subject into water.

10. _____ Log start time for safety divers and control safety diver rotation.

11. _____ Perform underwater comm check with subject.

12. _____ Lower subject to platform area.

13. _____ Release shoulder strap.

14. _____ Remove subject from donning station.

15. _____ Have subject hold to ladder; raise donning station.

16. _____ Have safety divers take subject to bottom of tank for final ballasting.

17. _____ Verify suit pressure is 3.7 psid.

18. _____ Receive ballasting complete and ready for test from safety divers.

19. _____ Receive go from safety divers and verify yac yac.

20. _____ Turn test over to T.C.

21. _____ Have emergency procedures and test rules available.

22. _____ When TC is finished, have safety divers bring subject to EMU donning station. Lower donning station.

23. _____ Connect shoulder strap.

24. _____ Hoist crewman out of water to tank deck.

25. _____ Connect back pack to donning station.

26. _____ Decrease suit pressure.

27. _____ Remove leg and arm weights, and mini work station.

28. _____ Shut off water flow.

29. _____ Shut off air flow.

30. _____ Disconnect glove and remove helmet.

31. _____ Press suit and bio med - OFF (Verify light OFF).

32. _____ Proceed with suit doffing.

33. _____ Release duty station personnel "Test Complete".

34. _____ Press topside - OFF (Verify light OFF).

35. _____ Secure facilities.

Signature_____

Date_____

STANDARD OPERATING PROCEDURE

P-120-10

TEST SAFETY OFFICER'S CHECKLIST

The Test Safety Officer will insure that this checklist is completed and submitted to the Test Director prior to any WIF activity.

1. _____ Confer with Test Director to see that all mockup equipment is ready for use.

2. _____ Confer with Test Director to see that all WIF systems are operational.

3. _____ See that all required personnel are on hand and are ready to commence test.

4. _____ Verify all systems to see that they are in "GO" condition.

5. _____ Verify that required checklists have been completed and submitted to the Test Director.

Signature_____

Date_____

STANDARD OPERATING PROCEDURE

P-120-11

COMMUNICATION CHECKLIST

1. _____ Insure 28V power supplies ON.
2. Press topside switch on and verify:
   a. _____ All comm lights ON
   b. _____ Power supply 1 and power supply 2 ON (16.8V)
   c. _____ Ch A mixer and amp ON
   d. _____ Ch B mixer and amp ON
3. Adjust mixer and amp controls if necessary.
   a. _____ Ch A
   b. _____ Ch B
4. Adjust topside volume control if necessary.
   a. _____ Ch A
   b. _____ Ch B
5. Verify comm with each of the following stations:

Ch A	Ch B	
_____	_____	TD
_____	_____	TV
_____	_____	ECS
_____	_____	TSMI
_____	_____	Hoist
_____	_____	TSM2

Ch A	Ch B	
_____	_____	Med
_____	_____	TC
_____	_____	Viewing Room
_____	_____	U/W Speakers

6. _____ Press suit and Bio Med switch ON. (Verify lights on).

7. Verify comm with crewman umbilicals:

Ch A	Ch B	
_____	_____	Red
_____	_____	White
_____	_____	Blue

8. _____ Press suit and bio-med switch OFF.

9. _____ Verify emergency comm from yack/yack.

10. _____ Wind and set 24 hour clock. (On TD console).

11. _____ Verify building emergency lights operate.

Signature_____

Date_____

STANDARD OPERATING PROCEDURE

P-120-12

TEST DIRECTORS CHECKLIST

(A7LB)

1. _____ Receive completed and signed pretest checklists from:
   a. Medical monitors _____
   b. Safety divers _____
   c. Suit technicians _____
   d. TV personnel _____
   e. ECS/LCG Console Operator _____
   f. Topside monitor _____
   g. Test Conductor _____
   h. Diving Safety Representative _____
   i. Hoist Operator _____
   j. Communication Technician _____
2. _____ Insure TSM starts attaching arm and leg weights.
3. _____ Insure that necessary personnel are on station and receive go from:
   a. Medical monitors _____
   b. Suit subject _____
   c. Suit technicians _____
   d. TV personnel _____
   e. ECS/LCG Console Operator _____
   f. Topside monitor _____
   g. Test Conductor _____

h. Diving Safety Representative _____

i. Hoist Operator _____

4. Verify the following suit/WIF hardware is properly secured:

_____ Inlet and outlet ECS nozzles are attached to PGA and "lock-lock" is engaged.

_____ Diverter valve in vertical position.

_____ Back pressure valve on outlet connector is full open (CCW).

_____ External LCG connector is attached and locked. Route connector inboard.

_____ Comm connector is attached and locked.

_____ Comm carrier chin strap and electrical harness is attached and locked. Verify comm with crewman.

_____ Gloves are attached and locked.

_____ Reduce flow and secure helmet.

_____ Increase flow to 6 SCFM.

5. _____ Give go-ahead for installation of weight pack.

6. _____ Give go-ahead for subject water entry. (Topside monitor).

7. _____ Log start time for safety divers and control safety diver rotation.

8. _____ Verify pressure suit and weight harness integrity. (When test subject first enters the water).

9. _____ Conduct underwater communications check with crewmen.

10. _____ Give go-ahead for final suit pressure adjustment. Set suit delta pressure to 3.7 psid on platform.

11. _____ Have Safety Divers take subject to bottom of tank for final ballasting. Insure suit delta pressure is a 3.7 $\pm$ 0.2 psid. (Add PLSS and OPS if required).

12. _____ Receive ballasting complete and ready for test from Safety Divers.

13. _____ Receive GO from Safety Divers via Yac Yac.

14. _____ Give go-ahead for test (Turn test over to T.C.)

15. _____ Have emergency procedures and test rules available.

16. _____ When T.C. is finished, have safety divers bring subject to top of the ladder.

17. _____ Drop suit pressure.

18. _____ Remove weights.

19. _____ Give subject go-ahead to egress tanks. (Ask subject to stand a top of ladder letting water drain into tank for a few minutes.)

20. _____ Verify that T.S.M. assists subject out of water.

21. _____ Verify that suit technician vents gloves and helmet of suit.

22. _____ Give "Net" all clear that the test is complete.

23. _____ Press SUIT & BIO MED button OFF. (Verify light off).

24. _____ Press TOPSIDE button OFF (Verify light off).

25. _____ Secure facilities upon completion of activity.

Signature_____

Date _____

STANDARD OPERATING PROCEDURE

M-101

SCUBA REGULATOR

SEMI-ANNUAL INSPECTION

NORTHROP SERVICES, INC.

SDL SUPPORT GROUP

JOHNSON SPACE CENTER

HOUSTON, TEXAS

NSI-SDL SUPPORT GROUP Rev. E

M-101

SCUBA REGULATOR SEMI-ANNUAL INSPECTION

REVISION BLOCK

DATE	PREPARED BY	APPROVED BY	CONCUR	CONCUR	CONCUR	REVISION
11-5-68						Issued
3-6-70						A (Cover)
3-30-72						B (P. 5 & 6)
8-4-72	Reviewed by BEF 8-8-72	BDP 8-8-72	Reviewed JRH 8-10-12	Reviewed AFS 9/11/72	BEF 11/13/72	C (Format)
10-21-74	BDP 10-22-74	BEF 10-22-74	WRH 11-20-74	AFS 11/6/75	BEF 1/7/75	D (Format)
11-3-78	BDP 11-6-78 BDP 11-14-78	AFS 1-5-79	VCH 3-15-79	[illegible] 3/16/79		E

M-101

SCUBA REGULATOR

SEMI-ANNUAL INSPECTION

1.0 DESCRIPTION

The purpose of this document is to establish a step-by-step procedure for semi-annual inspection and maintenance of the SCUBA Regulator.

2.0 APPLICABLE DOCUMENTS

N/A

3.0 TOOL LIST

3.1 The following tools are required for disassembly and inspection of the second stage of the Scubapro regulator:

3/4"open-end wrench
11/16" open-end wrench
Small common screwdriver
1/4" nut driver (SPIN-TITE)
or 1/4" socket & ratchet

3.2 The following tools are required for disassembly and inspection of the first stage of the Scubapro regulator:

9/16" open-end wrench
Snap-ring pliers
1/2" open-end wrench
Small spanner wrench
12" crescent

4.0 DISASSEMBLY OF SECOND STAGE (See Fig. 1)

4.1 Disconnection of hose (101-61)

4.1.1 Use 3/4" open-end wrench to hold demand valve body (101-60).

4.1.2 Use 11/16" open-end wrench to loosen hose connection for removal.

4.2 Clamps (101-71 & 101-72)

4.2.1 Use common screw driver to remove screws (101-73) in clamps.

Rev. D

4.2.2 Upon removing screws and clamps, cover ring (101-70), insignia plate (101-69), and cover (101-68), the diaphragm assembly (101-67) will be released and can be removed. Inspect diaphragm and replace if questionable.

NOTE: Peripheral "Bead" on diaphragm must face correctly with case assembly (101-52) and cover (101-68).

4.3 Demand Valve Assembly

4.3.1 Use 3/4" open-end wrench to remove demand body (101-60) from case assembly (101-52) at hose inlet port.

4.3.2 Lift valve assembly from inside case assembly.

4.3.3 Inspect seat (101-53) in demand valve stem (101-54) port. If prominent ring is visible in demand valve seat, replace.

NOTE: When replacing seat, use a nominal amount of neoprene cement to insure seat stays in stem port.

4.3.4 Inspect demand valve body (101-60) for proper condition of internal flaired seat ring.

Note that this fits against demand valve seat (101-53) during use.

4.3.5 Inspect 'O'-ring (101-12) for damage and replace if necessary.

4.3.6 Normally there is no reason to disassemble the demand valve assembly. However, if it is malfunctioning, and it is believed that the spring has lost tension, or some other part is worn, disassembly procedures are as follows:

4.3.6.1 Remove adjustment nut (101-59), washer (101-58), and lever (101-57). Use 1/4" nut driver (SPIN-TITE), or 1/4" socket with ratchet.

4.3.6.2 Remove stem (101-54) and spring (101-55) from housing.

4.4 Exhaust Tee (101-66).

4.4.1 Remove exhaust tee by simply prying it from case assembly (101-52).

4.4.2 Inspect exhaust valve (101-65). Insure exhaust valve is not curled, cracked or deteriorated.

4.5 Mouthpiece (101-64).

4.5.1 Inspect mouthpiece to insure that tooth grips have not been chewed off, and/or that rubber has not cracked or deteriorated.

4.5.2 Insure that there is a mouthpiece clamping strap (101-63) holding mouthpiece to case assembly.

4.6 Reassemble in reverse order making certain that demand valve lever (101-57) actuates inwardly.

5.0 DISASSEMBLY OF FIRST STAGE (See Fig. 2) Rev. D

5.1 Disconnect Hose (101-61) (Use 9/16" open-end wrench). (See Fig. 1).

5.1.1 Check 'O'-Ring 101-9 (Fig. 1) for cuts, wear and deterioration. Replace if necessary.

5.2 Unscrew Cap (103-2).

5.2.1 Use small spanner wrench.

5.2.2 Remove piston (103-4) and spring (103-5) from cap.

5.2.3 Check 'O'-rings (103-3), (102-5) and seat (102-4).

5.2.4 Inspect internal flaired seat ring in first stage body (102-7). Note that this fits against piston seat (102-4) during use.

5.3 Yoke Retainer (102-8).

5.3.1 Unscrew Yoke Retainer with 12" crescent.

5.3.2 Remove Yoke (101-15). Check thread interface between yoke screw (101-20) and yoke for wear and damage.

5.4 Remove retainer (101-19) and filter (101-18), with snap-ring pliers. (Upon removing retainer, sintered filter is freed.) Check filter carefully; it should be bright and clean. If filter is green, it indicates salt water corrosion. If filter is red, it indicates rust from tank. If filter is black, it indicates bad or moist air. Replace filter if necessary.

5.5 Check body (102-7).

5.5.1 Check 'O'-ring (101-17) in body; replace if deteriorated.

5.6 Reassemble first stage in reverse order, except do not assemble hose (101-61) Fig. 1. In place of hose, connect a test gauge or any standard 0 to 200 pressure gauge with bleeder valve to the hose fitting on body (102-7).

5.7 With first stage mounted on not more than 500 psig air supply, turn on air supply. Test gauge should read the exact required specification for this model's first stage intermediate pressure setting. If pressure is below the required setting, the regulator may breathe hard, if above it, the regulator may leak. Adjust accordingly.

6.0 POST-INSPECTION CHECKOUT Rev. D

6.1 Connect regulator (1st and 2nd stage assembled) to air supply.

6.2 Verify that regulator does not free-flow.

6.2.1 If regulator free-flows, loosen demand valve assembly adjusting nut (101-59) as necessary and/or replace diaphragm (101-67).

6.3 Check for ease of breathing by inhaling through mouthpiece.

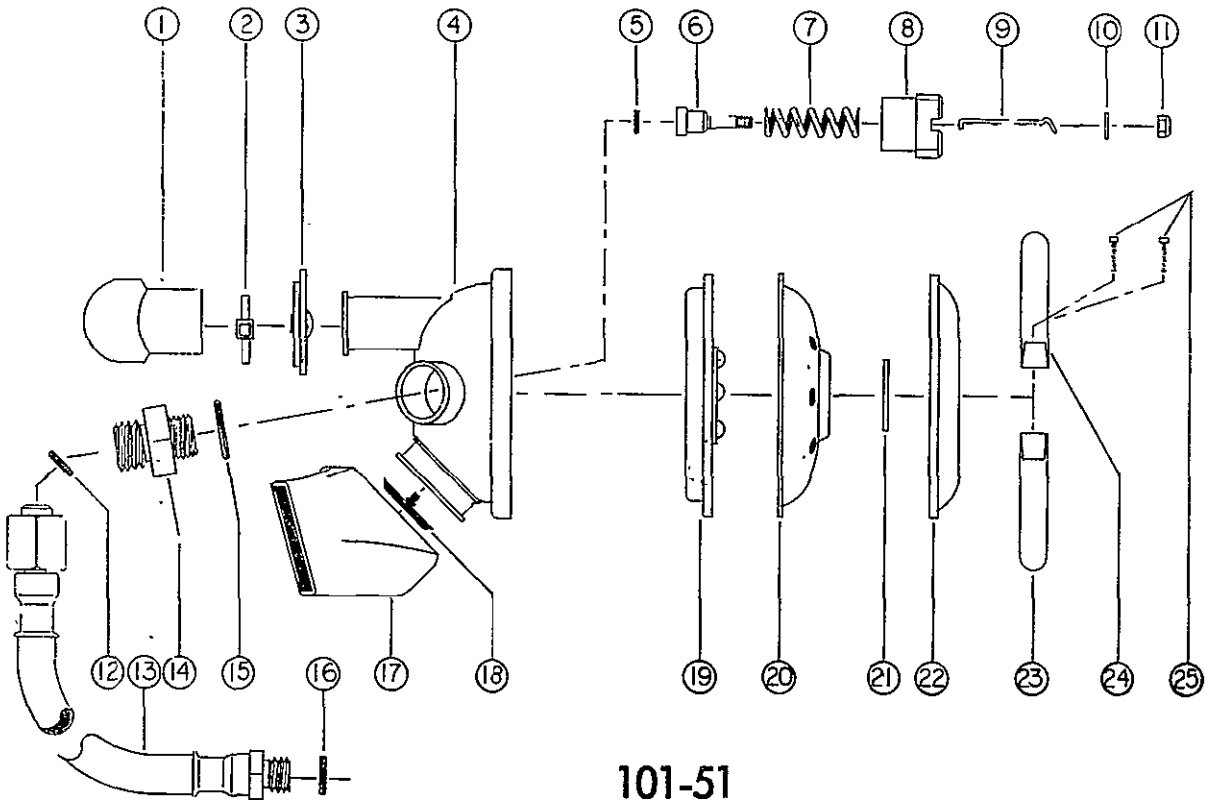
6.3.1 If regulator draws hard, tighten demand valve assembly adjusting nut (101-59) as necessary to permit easier breathing. (Fig. 1)

6.4 Check for normal ease of exhalation.

6.4.1 If difficult, free the exhaust valve (101-65) or replace. (Fig. 1)

7.0 DOCUMENTATION REQUIRED

7.1 Update all maintenance log records insuring that they have been properly initialed and dated. Enter all repairs, adjustments, and replaced parts in spaces provided.

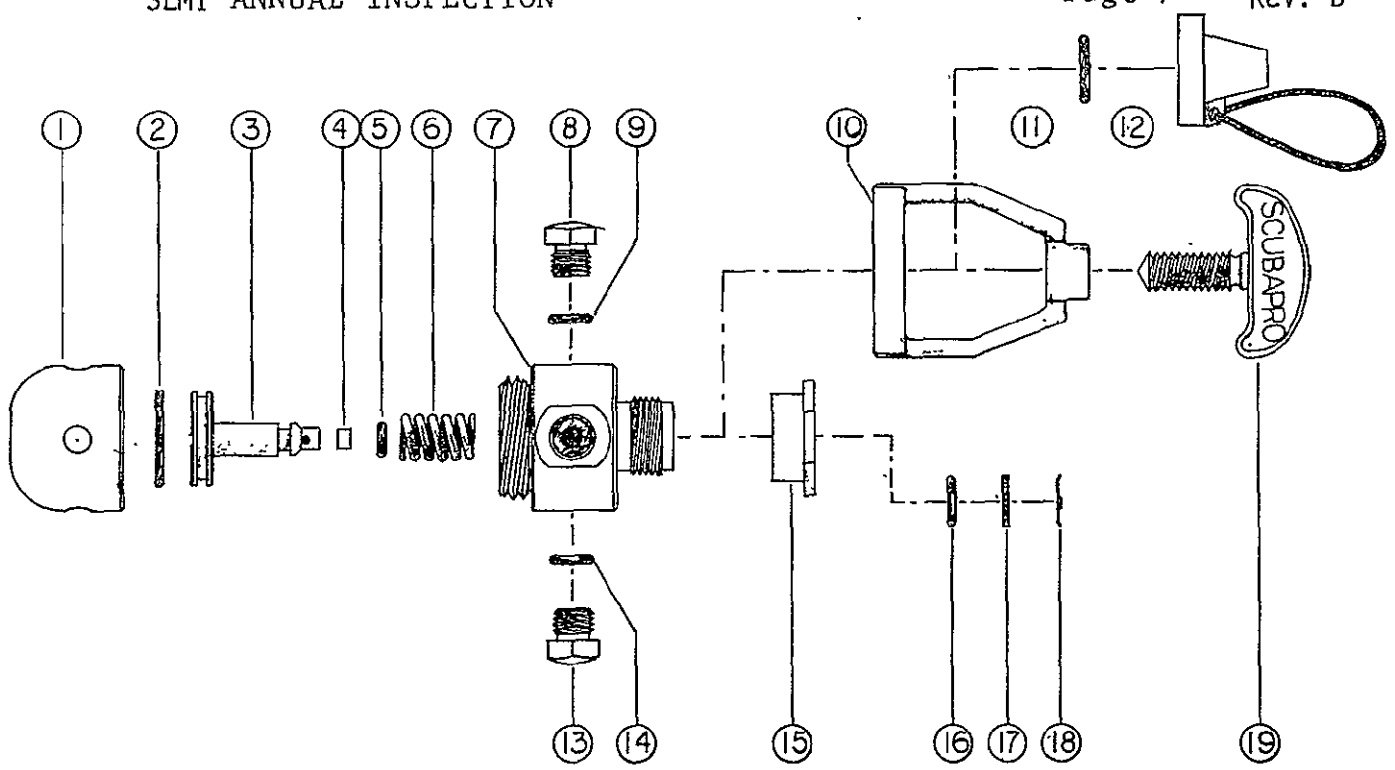


101-51

SECOND STAGE

No.	Cat. No	Description	No.	Cat. No	Description
1	101-64	Mouthpiece	14	101-60	Demand Valve Body
2	101-63	Mouthpiece Strap			
3	101-62	Neck Strap Assy.	15	101-12	'O' Ring
4	101-52	Case Assy.	16	101-9	'O' Ring
5	101-53	Demand Valve Seat	17	101-66	Exhaust Tee
6	101-54	Demand Valve Stem	18	101-65	Exhaust Valve
7	101-55	Demand Valve Spring	19	101-67	Diaphragm Assy.
8	101-56	Demand Valve Housing	20	101-68	Cover
9	101-57	Demand Valve Lever	21	101-69	Insigna Plate
10	101-58	Demand Valve Washer	22	101-70	Cover Ring
11	101-59	Demand Valve Adj. Nut	23	101-71	Threaded Clamp
12	101-6	'O' Ring	24	101-72	Unthreaded Clamp
13	101-61	Hose	25	101-73	Screw (2 req.)
				101-51	Second Stage Complete

Figure 1



103-1

MK 3 FIRST STAGE

No.	Cat. No	Description	No.	Cat. No	Description
1	103-2	Cap	11	101-22	'O' Ring
2	103-3	'O' Ring	12	101-21	Protection Cap Assy.
3	103-4	Piston			
4	102-4	Seat	13	101-8	Plug
5	102-5	'O' Ring	14	101-9	'O' Ring
6	103-5	Spring	15	102-8	Yoke Retainer
7	102-7	Body	16	101-17	'O' Ring
8	101-8	Plug	17	101-18	Filter
9	101-9	'O' Ring	18	101-19	Retainer
10	101-15	Yoke	19	101-20	Yoke Screw
				103-1	First Stage Complete

Figure 2

STANDARD OPERATING PROCEDURE

M-102

SEMI-ANNUAL INSPECTION OF THE WIF SUIT BACK PRESSURE VALVE

NORTHROP SERVICES, INC.

SDL SUPPORT GROUP

JOHNSON SPACE CENTER

HOUSTON, TEXAS

NSI-SDL SUPPORT GROUP Rev. E

M-102

SEMI-ANNUAL INSPECTION OF THE WIF
SUIT BACK PRESSURE VALVE
REVISION BLOCK

DATE	PREPARED BY	APPROVED BY	CONCUR	CONCUR	CONCUR	REVISION
1-26-70						Issued
5-23-72						A (Reviewed)
8-4-72	Reviewed BDP 8-15-72	BDP 8-15-72	REVIEWED JRA 8-16-72	Reviewed AFE 8/16/72	BCF 11/13/72	B (Format)
10-21-74	BDP 10-22-74	BDP 10-22-74	WRH 10-23-74	DWT 10-24-74 AFE 10/31/74	10/30/74 BCF	C (Format)
11-3-78	GRS 11-6-78 BDP 11-14-78	AFE 1-5-79	VCH 3-15-79	3/16/79		E (Review)

M-102

SEMI-ANNUAL INSPECTION OF THE WIF SUIT BACK PRESSURE VALVE

1.0 DESCRIPTION

The purpose of this document is to establish a step-by step procedure for semi-annual inspection of the WIF suit back pressure valve.

2.0 APPLICABLE DOCUMENTS

N/A

3.0 TOOL LIST

3.1 The following items are required for disassembly of the WIF suit back pressure valve.

3.1.1 SEB 36101415 Drawing.

3.1.2 One set Allen Wrenches.

3.1.3 Lubricant

4.0 INSPECTION OF THE (SEB 36101415-102) BACK PRESSURE VALVE

4.1 Remove the three Allen Screws from the inlet fitting (SDB 36101416-001) and remove the fitting. Check the two "O" rings and the seat (SDB 36101338-002) for any nicks or any other damage. Replace if necessary.

4.2 Remove the three Allen Screws and the Bellofram Housing (SDB 36101417-001) and measure the free length of the back pressure spring (SDB 36101420 -001). The spring should measure 0.75± .06 inches; if not, replace.

4.3 Remove the stem bolt (SDB 36101341-002) while holding the Bellofram Retainer (SDB 36101340-002). The Poppet assembly will then come apart. The Poppet Plate (SDB 36101336-001) may now be removed from the valve housing. Check the Poppet Plate for nicks and flatness. Check the Bellofram

(L-100-062-CBJ) for holes or tears. Replace defective parts as necessary. Check O-ring on stem bolt.

4.4 Visually check the three major parts of the valve, the inlet fitting (SDB 36101333-001), outlet fitting (SDB 36101337-001), and the Bellofram Housing (SDB 46101417-002) for any obstructions or damage. Lubricate sliding surfaces.

4.5 Reassemble in the reverse order. Note when replacing the Bellofram Housing that the Bellofram must be slipped over the lip of the housing.

5.0 DOCUMENTATION REQUIRED

5.1 All maintenance performed is to be recorded in the WIF "Bi-Weekly Maintenance" log book and in the regular maintenance log book.

STANDARD OPERATING PROCEDURE

M-104

MAINTENANCE OF THE WIF UMBILICAL

NORTHROP SERVICES, INC.

SDL SUPPORT GROUP

JOHNSON SPACE CENTER

HOUSTON, TEXAS

NSI-SDL SUPPORT GROUP

Rev. C

M-104

MAINTENANCE OF THE WIF UMBILICAL

REVISION BLOCK

DATE	PREPARED BY	APPROVED BY	CONCUR	CONCUR	CONCUR	REVISION
5-19-72						Issued
8-4-72	Reviewed 8/9/72 RHB	Reviewed BDF 8-15-72	Reviewed JRD 8-16-72	Reviewed AHS 8/16/72	SCF 11/13/72	A (Format)
10-21-74	BDF 10-22-74	BDF 10-22-74	WRH 10-25-74	gmt 10-25-74 AHS 10/25/74	SCF 10/30/74	B (Format)
11-3-78	JHH 11-6-78 BDF 11-14-78	AHS 1-5-79	VCH 3-15-79	L. Trimble 3/16/79		C (Review)

M-104

MAINTENANCE OF THE WIF UMBILICAL

1.0 DESCRIPTION

The purpose of this document is to establish a step-by-step procedure for maintenance of the WIF umbilical. The umbilical is designed to provide a suited crewman with breathing gas, suit cooling, and communications.

1.1 The inlet fitting is designed to retain suit pressure should the inlet suit hose be inadvertently vented to the surface. This fitting has a non-return valve that is designed so that the spring loaded poppet valve closes when airflow into the suit is shut off.

1.2 The exhaust fitting is designed to maintain a constant differential pressure at varying water depths. The exhaust fitting has an adjustable knob which enables the differential pressure to be varied. Rotating the knob clockwise/counter clockwise increases/decreases suit pressure. This is accomplished by changing the spring tension on a poppet valve in the fitting. Water pressure acting on the pressure suit and the backside of the poppet valve eliminates any effect of water depth variation.

1.3 The differential pressure system is designed to give accurate delta pressure readings at any depth in the tank. This system consists of a bulb to sense water pressure; a fitting on the inlet fitting to read suit pressure; and a Barton 0-10 psi differential pressure gauge. The differential pressure reading is obtained by measuring the difference between the suit pressure and the water pressure.

2.0 APPLICABLE DOCUMENTS

N/A

3.0 TOOL LIST

3.1 The following tools are required for disassembly

and inspection of the WIF umbilical.

3.1.1 One set of Allen wrenches

3.1.2 7/16 open end wrench

3.1.3 9/16 open end wrench

3.1.4 5/8 open end wrench

3.1.5 Flat blade screwdriver

3.1.6 Phillips head screwdriver

3.1.7 Drawings, WIF 034 and WIF 041

3.1.8 Lubricant - Perflorinated Grease (KRTOX240AC)

4.0 INSPECTION OF THE NON-RETURN VALVE

4.1 Remove the three Allen screws holding WIF 036-001 connector to the WIF 038 housing.

4.2 Remove the two O-rings and lubricate or replace if necessary.

4.3 Remove the spring and WIF 040 poppet from the housing. Check the spring for any signs of rust; if any rust is found, replace the spring.

4.4 Insure that the neoprene seat on the WIF 040 poppet is free of cuts, cracks, and is properly bonded and replace if necessary.

4.5 Remove the Allen screws holding the WIF 039 fitting to the WIF 038 housing.

4.6 Insure that the two O-rings are free of any cuts or cracks and replace if necessary.

4.7 Lubricate all moving parts and O-rings before assembly.

4.8 Reassemble in the reverse order. When the poppet is put back into the housing, lubricate the stems; if this is not done, the valve will flutter and/or stick, causing noise in the suit.

5.0 INSPECTION OF THE DELTA PRESSURE VALVE

5.1 Remove the three flat head screws holding the knob assembly to the outlet fitting.

5.2 Remove the knob assembly from the outlet fitting.

5.3 Remove the spring from the knob assembly. Check the spring for corrosion; if any is found, replace the spring.

5.4 Remove the poppet assembly from the outlet fitting. Insure that the poppet seat is free of cuts, cracks, and is properly bonded and replace if necessary.

5.5 Insure that the O-ring between the stem bolt and bellofram retainer is free of cuts or cracks and replace if necessary.

5.6 To check the knob assembly, punch out the three spring pins and remove the knob.

5.6.1 Insure that the O-ring is free of any cuts or cracks and replace if necessary.

5.6.2 Do not lubricate the O-ring.

5.6.3 Insure that the bellofram is free of any pin holes and replace if necessary.

5.7 Remove the three flat head screws from the inlet fitting and remove the fitting.

5.8 Insure that the two O-rings are free of cuts or cracks and replace if necessary.

5.9 Lubricate all moving parts and O-rings before assembly.

5.10 Reassemble in the reverse order. When the poppet assembly is inserted into the outlet fitting, the poppet stem and the bellofram retainer should be lubricated to insure proper functioning of the valve. When inserting the spring housing, slip the bellofram over the lip of the spring housing.

6.0 INSPECTION OF THE UMBILICAL HOSES.

6.1 Insure that the tygon hose is free of any cuts or cracks.

6.2 Insure that the hose connection clamps joining tygon and darling hose are free of corrosion.

6.3 Insure that tygon hose has not pulled loose from bulkhead quick disconnect fittings.

6.4 Insure that the darling hose is free of any pin holes or cuts and replace if necessary.

6.5 Insure that the two nylon lines are free of any crimps or cuts, and the swagelock fittings do not leak.

7.0 INSPECTION OF THE COMMUNICATION CABLE

7.1 Insure that the potting compound that forms the handle for the cable does not have any cuts or cracks.

7.2 Insure the connector operates freely from the lock and unlock position.

7.3 Insure the female pins in the connector are free of any obstructions or corrosion.

8.0 INSPECTION OF THE WATER CONNECTOR

8.1 Insure that the clamps securing the tygon tubing to the connector are holding the tubing firmly in place and free of any corrosion.

8.2 Insure that the tygon tubing is free of any cuts or cracks.

9.0 INSPECTION OF THE WATER PRESSURE SENSE BULB Rev. B

9.1 Insure that the diaphram is free from punctures and shows no signs of deterioration.

9.2 Insure that the connection is firmly secured.

10.0 DOCUMENTATION REQUIRED

10.1 All maintenance performed is to be recorded in the WIF "Bi-Weekly Maintenance" log book and in the regular maintenance log book.

STANDARD OPERATING PROCEDURE

M-105

SCUBA HIGH PRESSURE

("J") VALVE ANNUAL INSPECTION

NORTHROP SERVICES, INC.

SDL SUPPORT GROUP

JOHNSON SPACE CENTER

HOUSTON, TEXAS

M-105

SCUBA HIGH PRESSURE "J" VALVE ANNUAL INSPECTION

REVISION BLOCK

DATE	PREPARED BY	APPROVED BY	CONCUR	CONCUR	CONCUR	REVISION
3-6-70						Issued
3-30-72						A (Page 6)
8-4-72	Reviewed by BEP 8-10-72	BEP 8-10-72	Reviewed JRB 8-10-72	Reviewed APK 8/11/72	11/13/72	B (Format)
10-21-74	BEP 10-22-74	BEP 10-22-74	WPH 10-23-74	APK 11/12-15-74 1/6/75	1/7/75	C
11-3-78	BEP 11-6-78 BEP 11-14-78	APK 1-5-79	VCH 3-15-79	SC 3/16/79		D (Review)

SCUBA HIGH PRESSURE ("J") VALVE ANNUAL INSPECTION

1.0 INTRODUCTION Rev. C

The constant reserve valve ("J") is a pressure relief valve with a manual override. It serves two purposes; it gives warning to diver that his air supply is almost exhausted, and it provides reserve air sufficient enough to enable him to reach the surface.

The purpose of this document is to establish a step-by-step procedure for annual inspection of the SCUBA high pressure ("J") valve.

2.0 APPLICABLE DOCUMENTS

N/A

3.0 TOOL LIST

3.1 The following tools are required for disassembly and inspection of the Dacor high pressure "J" valve with reserve.

3.1.1 6" common tip screwdriver.

3.1.2 8" cushion grip screwdriver with WIF modified common tip.

3.1.3 1/2" open end wrench.

3.1.4 5/8" open end wrench.

3.1.5 1 3/8" open end wrench or the WIF modified 12" crescent wrench.

3.1.6 13/16" open end wrench.

3.1.7 Needle nose pliers.

3.1.8 Scribe.

3.1.9 Wire brush.

4.0 DISASSEMBLY OF HIGH PRESSURE VALVE (See Figure 1)

4.1 Bleed SCUBA bottle of all air pressure.

4.1.1 Reserve valve must be in the "Down-on-Reserve" position while SCUBA bottle is being bled, insuring all air pressure in SCUBA bottle is relieved.

4.1.2 After SCUBA bottle has been completely relieved of all air pressure, use the 1 3/8" open end wrench or the WIF modified 12" crescent to remove high pressure valve from SCUBA bottle.

NOTE: Most units in use today incorporate an "O" ring as a seal, but some earlier models will have a tapered thread design. One type will not connect with the other. The "O" ring seal can normally be removed by hand after the pressure in the tank has been completely bled down. Rev. C

4.1.3 Upon removing high pressure valve from SCUBA bottles, use a rubber plug or tape to protect the mouth of the SCUBA bottle from damage to the thread area, also keeping ambient air, dirt, and foreign objects from contaminating the bottle. Rev. C

4.1.4 Check "O" ring (KV 3/4-6-1) for damage, replace if necessary.

4.1.5 Inspect brass tube for excess corrosion. Clean with wire brush if necessary.

4.2 On-off valve.

4.2.1 Use 8" cushion grip screwdriver with WIF modified common tip to remove spring retainer and spring from valve assembly.

4.2.2 Upon removing spring retainer and spring, the hand wheel is freed. Remove same.

4.2.3 Remove packing nut using 5/8" open end wrench.

4.2.4 After removing packing nut, the packing (KV 3/4-12-1), the "O" ring (KV 3/4-6-4), and the stem can be removed.

4.2.5 Inspect packing and "O" ring for damage. Replace if necessary.

4.2.6 Use stem of needle nose pliers to unscrew seat assembly (KV 3/4-10-1). Check teflon seat in internal end of seat assembly. Replace entire seat assembly if damaged.

4.2.7 Check gasket (KV 3/4-27-1). Replace if necessary.

4.2.8 Inspect internal flaired seat ring in on-off valve side of body.

4.3 Reserve Valve.

4.3.1 Use 8" cushion grip screwdriver with WIF modified common tip to remove spring from reserve valve assembly.

4.3.2 Upon removing spring retainer and spring, lever is freed and packing nut is exposed.

4.3.3 Remove packing nut using a 13/16" open end wrench.

4.3.4 When packing nut is removed reserve seat assembly (JV 3/4-10-1) and stem is freed.

4.3.5 Check "O" ring (JV 3/4-6-1) packing (KV 3/4-12-1) and "O" ring (KV 3/4-6-4) for damage. Replace if necessary.

4.3.6 Check rubber seat in reserve assembly. Replace if damaged.

4.3.7 Inspect internal flaired seat ring in reserve side of body.

NOTE: This fits against reserve assembly seat.

4.4 High Pressure Rupture Diaphragm.

4.4.1 Use 6" common tip screwdriver to remove plug.

4.4.2 Check high pressure disc (KV 3/4-57-1) for ruptures. If disc is not ruptured there is no need to remove it from body.

NOTE: Should disc be ruptured a sharp pointed object such as a scribe may be needed to pry disc loose. When such an occasion arises be sure to check safety gasket (KV 3/4-27-2), insuring it has not been damaged while prying disc loose. Replace if necessary.

4.5 High Pressure Gauge Port.

4.5.1 Remove plug using a 1/2" open end wrench.

4.5.2 Check "O" ring for damage. Replace if necessary.

4.6 Reassemble in Reverse Order.

5.0 POST-INSPECTION CHECKOUT

Rev. C

5.1 Install high pressure valve into a SCUBA bottle.

NOTE: When installing high pressure valve into a SCUBA bottle designed for an "O" ring seal, tighten only hand tight. (When bottle is pressurized, valve will be fully tighten.

5.1.1 Fill SCUBA bottle with reserve in "Down-on-Reserve" position to 2000 psi; check for leaks by submerging into water. While valve is submerged turn on-off valve to the open position for a short burst of air and then to the off position. This will show if seat assembly (KV 3/4-10-1) is seating properly. If no leaks appear, proceed. Rev. D

5.1.2 Check reserve by putting reserve lever into

the "Up-start Dive" position and open on-off valve, thereby draining SCUBA bottle of main air supply. After bottle has drained, turn on-off valve to closed position and attach SCUBA air pressure gauge to high pressure valve. Turn on-off valve to open position and turn reserve lever to the "Down-on-Reserve" position. Gauge pressure should read approximately 300 psi. If gauge pressure is considerably below 300 psi, the reserve assembly (JV 3/4-10-1) should be replaced, as spring tension has weakened and will not retain a proper amount of reserve air.

5.1.3 Drain SCUBA bottle completely and remove high pressure valve. Install into original bottle, again tightening only hand tight. And fill same. Check for leaks by submerging into water. If no leaks appear, post-inspection checkout is completed.

Rev. C

NOTE: When filling SCUBA tanks, "J" valves should always be in the down position.

6.0 DOCUMENTATION REQUIRED

6.1 Update all maintenance log records insuring that they have been properly initialed and dated. Enter all repairs, adjustments, and replaced parts in space provided.

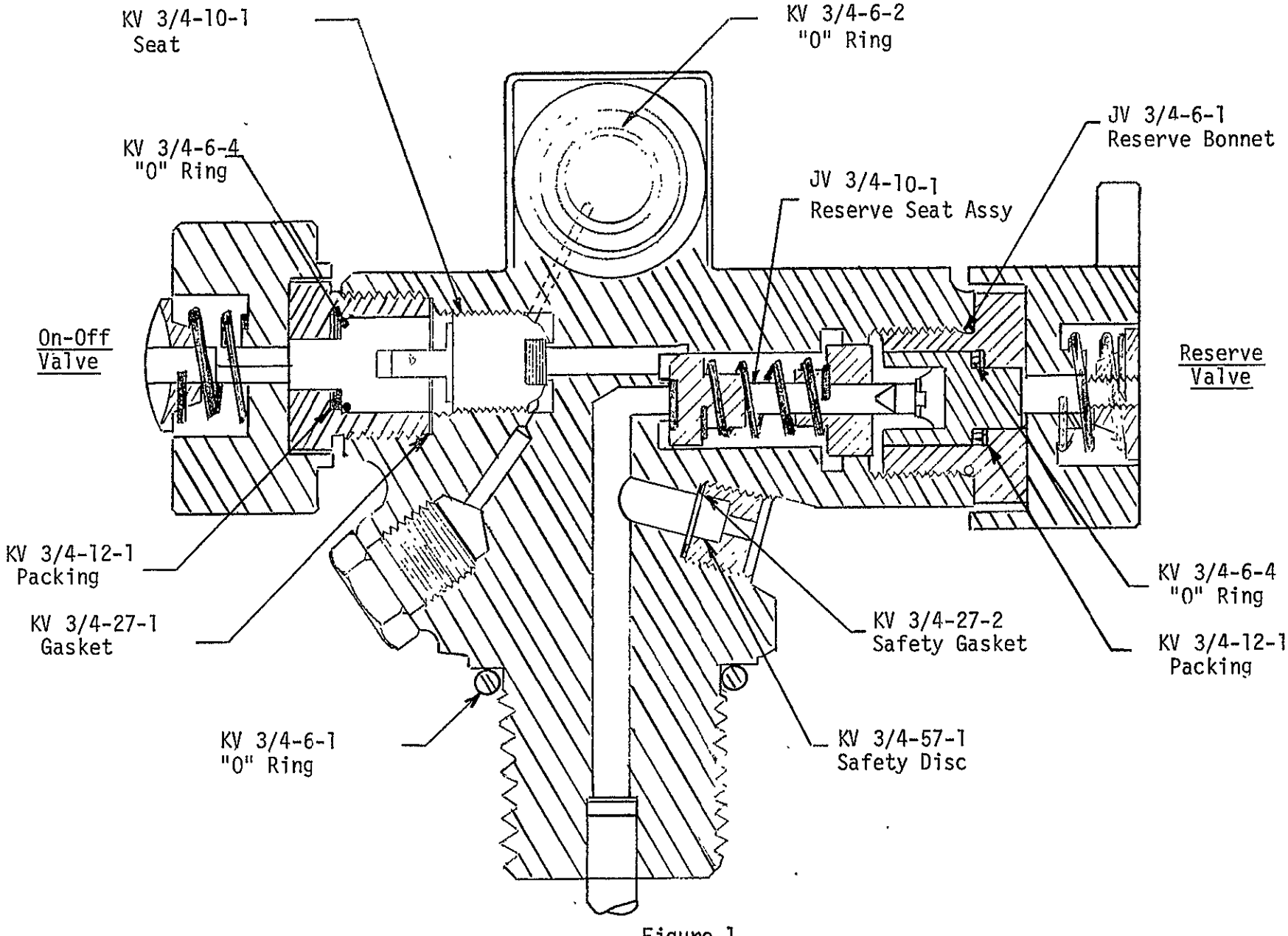


Figure 1

"J" Valve Annual Inspection

STANDARD OPERATING PROCEDURE

M-106

FUNCTIONAL CHECK OF GAUGES AND FLOWMETERS

NORTHROP SERVICES, INC.

SDL SUPPORT GROUP

JOHNSON SPACE CENTER

HOUSTON, TEXAS

NSI-SDL SUPPORT GROUP Rev. B.

M-106

FUNCTIONAL CHECK OF GAUGES AND FLOWMETERS

REVISION BLOCK

DATE	PREPARED BY	APPROVED BY	CONCUR	CONCUR	CONCUR	REVISION
10-13-72						Issued
10-21-74	BDP 10-22-74	BDP 10-22-74	RHH 10-23-74	Just 10-24-74 RHH 10/24/74	10/30/74 DCF	A (Format)
1-15-79	BDP 1-17/79 BDP 2-20-79	RHH 2-21-79	VCH 3-15-79	DCF Just 3/16/79		B

M-106

FUNCTIONAL CHECK OF GAUGES AND FLOWMETERS

1.0 DESCRIPTION

The purpose of this document is to establish a step-by-step procedure for performing a functional check of the pressure gauges and the flowmeters located in the Water Immersion Facility.

2.0 APPLICABLE DOCUMENTS

WIF Drawings as listed below:

SEB43102088
SEB43101982
SEB43102102

3.0 TOOL LIST

3.1 The following items are required to perform a functional check on the gauges and flowmeters.

3.1.1 1 ea. 1/4" NPT Female Tee

3.1.2 Calibrated flowmeters and/or pressure gauges (obtained at Bldg. 7)

3.1.3 3 ea. 1/4" AN x 1/4" NPT Male connectors

3.1.4 2 lengths of 1/4" AN, Stainless Steel Flexline

3.1.5 1 ea. 3/8" NPT female x 1/4" NPT Female Union

3.1.6 1 ea. 1/4" Swagelok x 1/4" NPT Male Connector

3.1.7 A regulated air source capable of obtaining a flow and/or pressure required in the functional checking of the gauges or flowmeters.

4.0 PERFORMING THE FUNCTIONAL CHECK OF PRESSURE GAUGES

4.1 Differential Pressure Gauges (0-10 psig)

4.1.1 Remove the gauge from the system.

4.1.2 Attach gauge to one side of the 1/4" NPT Female Tee.

4.1.3 Connect a calibrated 0-10 psig gauge to the other side of the 1/4" NPT Female Tee.

4.1.4 Attach 1/4" AN, SS, Flexline to the Tee and to the regulated air supply.

4.1.5 SLOWLY bring the pressure up to the desired levels.

NOTE: Gauges should be checked at the low, mid and high ranges.

4.1.6 Allow a plus or minus 5% difference between the test gauge and the calibrated gauge.

4.1.7 Reduce the regulated air supply until a reading of "0" psig is indicated.

4.1.8 Remove the test gauge from the test set-up.

4.1.9 Reinstall in the system.

4.1.10 Check system for leaks, and repair as necessary.

4.1.11 Place a functional check sticker, (NASA-MSC Form 743Q) on the gauge with a new due date of 180 days from date of functional check.

4.2 Water Pressure Gauges (0-15 psig) & (0-30 psig)

4.2.1 Remove gauge from the system.

4.2.2 Connect gauge to one side of 1/4" NPT Female Tee.

4.2.3 Connect a calibrated 0-15, (or 0-30), psig gauge to 1/4" NPT Female Tee.

4.2.4 Repeat steps 4.1.4 through 4.1.11.

4.3 Primary Air and Regulated Air Gauges (0-160 psig) Rev. B

4.3.1 Remove gauge from system.

4.3.2 Attach gauge to 1/4" NPT Female Tee using the 3/8NPT Female x 1/4" NPT Male connector.

4.3.3 Attach a calibrated 0-160 psig gauge to the 1/4" NPT Female Tee.

4.3.4 Repeat steps 4.1.4 through 4.1.11.

4.4 SCUBA Compressor and Fill Station Gauges (Manifold) (0-3000 psig)

4.4.1 Attach a calibrated 0-3000 psig gauge to the bleed port of the SCUBA Manifold, downstream of Valve E.

4.4.2 Isolate all gauges by insuring Valves A1, A2, A3, A4 & B1, B2, B3 & B4 are closed.

4.4.3 Select the gauge to be checked, and open that isolation valve.

EXAMPLE: To check gauge A1, open Valve A1.

4.4.4 Open Manifold Valves A, B, and E.

4.4.5 Start SCUBA Compressor and check pressure of test gauge versus the calibrated gauge at the low, mid and high ranges.

4.4.6 When the Compressor shuts off, (2000 psig), bleed system via the condensate drain valve, and compare the gauge readings as the pressure drops.

4.4.7 Allow a plus or minus 5% difference between the test gauges and the calibrated gauge.

4.4.8 When the manifold pressure is "0" psig, remove the calibrated gauge unless there are more gauges to be checked.

4.4.9 If further use of the calibrated gauge is required, repeat steps 4.4.2 through 4.4.8.

4.4.10 Place a functional check sticker, (NASA-JSC Form 743Q) on the gauge(s) with a new due date of 180 days from the date of the functional check.

4.5 ECS Backup Manifold (0-4000 psig)

4.5.1 Remove gauge from the system.

4.5.2 Install gauge on the 1/4" NPT Female Tee.

4.5.3 Install a calibrated 0-4000 psig gauge on the 1/4" NPT Female Tee.

4.5.4 Repeat steps 4.1.4 through 4.1.11.

4.6 SCUBA Compressor Gauges (for each of the four stages) Rev. B

4.6.1 Attach a calibrated 0-3000 psig gauge to the bleed port of SCUBA Manifold, downstream of Valve E.

4.6.2 Open Valves A, B and E.

4.6.3 Start compressor per NSI-SDL Support Group SOP P-103.

4.6.4 As stage pressures build up, verify stage gauge readings by comparison with the calibrated gauge.

4.6.5 Allow a plus or minus 5% difference between the test gauge and the calibrated gauge.

4.6.6 When the compressor stops, bleed the system via the condensate drain.

4.6.7 Remove the calibrated gauge from the bleed port.

4.6.8 Close Valves A, B and E.

4.6.9 Place a functional check sticker, (NASA-JSC Form 743Q), on the gauges with a new due date of 180 days from the date of the functional check.

4.7 SCUBA Tank Pressure Gauge (0-3000 psig) Rev. B

4.7.1 Remove gauge from the yoke assembly.

4.7.2 Attach the test gauge to the 1/4" NPT Female Tee.

4.7.3 Attach a calibrated 0-3000 psig gauge to the 1/4" NPT Female Tee.

4.7.4 Repeat steps 4.1.4 through 4.1.11.

5.0 PERFORMING THE FUNCTIONAL CHECK OF FLOWMETERS

5.1 Air Flowmeters

5.1.1 ECS Air Flowmeters (0-10 SCFM).

5.1.1.1 Remove the flowmeter from the ECS Console.

5.1.1.2 Attach flowmeter to the calibrated flowmeter using the 1/4" NPT x 1/4" AN unions and the 1/4" AN, SS Flexline.

NOTE: Connect the outlet of the test flowmeter to the inlet of the calibrated flowmeter.

5.1.1.3 Attach the regulated air supply to the test flowmeter using the 1/4" AN, SS flexline and the 1/4" AN x 1/4" NPT union.

5.1.1.4 SLOWLY bring the flow up until the desired flow is obtained.

5.1.1.5 Compare the flow readings on the test flowmeter and the calibrated flowmeter.

NOTE: Flow may be adjusted on test item by rotating the adjusting nut on top.

5.1.1.6 Compare readings at the low, mid and high range and adjust until flow is within plus or minus 5% on the test flowmeter versus the calibrated flowmeter.

5.1.1.7 Reduce the regulated air until a flow of zero is indicated.

5.1.1.8 Remove the functionally checked flowmeter from the test setup.

5.1.1.9 Reinstall in the ECS console.

5.1.1.10 Check for leaks, and repair as necessary.

5.1.1.11 For remaining flowmeters repeat steps 5.1.1.1 through 5.1.1.10.

5.1.1.12 Attach a functional check sticker, (NASA JSC Form 743Q) to the flowmeters, with a new date of 180 days from the date of the functional check. Rev. B

5.2 Water Flowmeters (LCG System) Rev. A

5.2.1 Visually inspect the flowmeters on the LCG side of the ECS Console for cleanliness. If any contamination is noted, remove the flowmeter from the console and flush with clean water until visibly clean. Reinstall the flowmeter in the console.

5.2.2 Slowly bring the flow up to 40 gallons per hour on each flowmeter. Check to insure that there are no obstructions to water flow and no leaks are present. Repair as necessary.

5.2.3 Attach a functional check sticker, (NASA JSC Form 743Q), to the flowmeter with a new date of 180 days from the date of the functional check.

6.0 DOCUMENTATION

6.1 Record all functional checks in the WIF Bi-Weekly Maintenance Log Book.

6.2 Record checks on the appropriate maintenance cards in the Maintenance Files.

6.3 A functional check should be performed when any system maintenance affects the integrity of a gauge and/or flowmeter.

6.4 Any gauge or flowmeter that does not meet the calibration specifications as per this procedure is to be replaced with a functionally checked gauge/flowmeter and the change to be logged per steps 6.1 through 6.3.

6.5 Any gauge or flowmeter that does not meet the calibration specifications as per this procedure, is to be returned to the NSI tool crib for disposition.

STANDARD OPERATING PROCEDURE

M-107

INSPECTION OF THE BILLY PUGH NET

NORTHROP SERVICES, INC.

SDL SUPPORT GROUP

JOHNSON SPACE CENTER

HOUSTON, TEXAS

NSI-SDL SUPPORT GROUP

M-107

INSPECTION OF THE BILLY PUGH NET

REVISION BLOCK

DATE	PREPARED BY	APPROVED BY	CONCUR	CONCUR	CONCUR	REVISION
10-26-78	F.A.B. 10-30-78 BDB 11-14-78	APE 1-5-79	VCH 3-15-79	[illegible] 3/16/79		Issued

NSI SDL SUPPORT GROUP

M-107

INSPECTION OF THE BILLY PUGH NET

1.0 INTRODUCTION

A helicopter sea/land rescue net manufactured by the Billy Pugh Co., Corpus Christi, Texas, is provided for emergency rescue of an incapacitated crewman from the Water Immersion Facility during all test and training operation when pressure garment assemblies are used for zero 'g' simulations. During these activities a certified crane operator is required to be on station and the communications loop. Upon command and direction of the Test Director, the Crane Operator will hoist the netted crewman out of the tank, swing the assembly over the guard rail, and lower the netted crewman to the floor of the high bay. At this point medical personnel take charge of the crewman.

2.0 APPLICABLE DOCUMENTS

2.1 National Safety Council Accident Prevention Manual for Industrial Operations, Ropes, Chains, and Slings, pages 636 through 640.

2.2 OSHA 1910.184, June 27, 1975, Slings.

3.0 INSPECTION AND MAINTENANCE OF THE NET

3.1 A detailed visual inspection will be performed on the net at 30 day intervals when the net is in use and/or before a test/operation if the net has been idle for over 30 days. Inspection will include, but not limited to:

3.1.1 Polypropylene ropes for wear, abrasions, powered fibers, displacement of yarns or strands, variation in size or roundness of strands, discoloration, and rotting. The inner fibers of ropes should be untwisted in several places to see whether the inner yarns are bright, clean, and unspotted.

3.1.2 Tubular frame structure for general condition, including cracks, bends, distortions, etc.

3.1.3 Hardware including rings, hinges, nuts, bolts, etc., for general serviceable condition.

3.2 Damage and/or irregularities identified during inspection or use will be documented and dispositioned in accordance with WIF operational procedure. In addition nets will be red

tagged by the Safety Officer when open discrepancy reports are in effect.

3.3 Historical data will be maintained on each net by the using activity. Data will include procurement specifications, drawings, maintenance and inspection records and other pertinent information.

3.4 Service life of the Billy Pugh net will be limited to 5 years of WIF operations. Nets will not be used for other activities.

STANDARD OPERATING PROCEDURE

M-108

MAINTENANCE AND REPAIR OF THE KIRBY-MORGAN/ SHALLOW WATER BAND MASK

NORTHROP SERVICES, INC.

SDL SUPPORT GROUP

JOHNSON SPACE CENTER

HOUSTON, TEXAS

NSI-SDL SUPPORT GROUP

M-108

MAINTENANCE AND REPAIR OF THE KIRBY-MORGAN/ SHALLOW WATER BAND MASK

REVISION BLOCK

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NSI-SDL SUPPORT GROUP

M-108

MAINTENANCE AND REPAIR OF THE KIRBY-MORGAN/ SHALLOW WATER BAND MASK

1.0 DESCRIPTION

The Kirby-Morgan/Shallow Water Band Masks are designed for use with an umbillical, composed of a gas or air supply hose and a communication wire.

This document is presented to establish a procedure for the care and maintenance of the mask.

2.0 APPLICABLE DOCUMENTS

2.1 Service manual for Kirby-Morgan Model KMB-8 Band Mask.

3.0 TOOL LIST

3.1 The following tools are required for the dis-assembly and inspection of the Kirby-Morgan Band Mask.

Silicon grease or equivalent
Common screwdriver
Philips screwdriver
9/16 open end wrench
11/16 open end wrench
8 inch cresent may be substitued for the two wrenches listed above.

4.0 POST DIVE PROCEDURES

The following steps are recommended upon the completion of a dive to insure proper operation for any subsequent dives.

4.1 Visually inspect the interior and exterior of the mask.

4.2 If the open-cell foam on the face seal is saturated with water, squeeze it out by pressing the sponge against the main body and drain the water out through the exhaust valve. If possible, the hood and face seal assembly should be removed, turned inside-out, and dried in preparation for the next dive.

4.3 Check all moving parts such as the adjustment handle, the valve handle, and the nose clearing device to ensure smooth and proper operation.

4.4 Check the communication system for proper operation.

5.0 SEMI-ANNUAL MAINTENANCE

The following procedures should be used every six months, however, during high usage it might become necessary to perform the maintenance more frequently.

5.1 Remove hood and face seal from the mask, dry if necessary.

5.2 Inspect and test ear phones, microphone, and connector.

5.3 Remove muffler nut and washer, muffler deflector, and plastic sponge muffler. Inspect sponge muffler and replace or clean if necessary.

5.4 Remove nose clearing guide, and lubricate o-rings and main shaft.

5.5 Remove the main exhaust cover and lubricate or replace the main exhaust valve.

5.6 Remove the exhaust tube, and lubricate or replace the regulator exhaust valve.

5.7 Remove demand regulator clamp and lift off demand regulator cover assembly and diaphragm.

5.8 Remove the retainer nut on the adjustment shaft of the demand regulator. Unscrew handle removing adjustment shaft. Turn the mask on its side and drop out spacer, spring, and piston. Clean and lubricate with silicon grease and then reassemble.

5.9 If the regulator lever needs readjustment, pressurize the breathing system and readjust at this time.

5.10 Test the one-way valve. Remove hose from the demand regulator inlet nipple, turn off side valve, remove umbilical hose (if attached) so that the one-way valve is open. Try to blow through the open end of the demand regulator supply hose. If any gas passes through the hose and out through the one-way valve, it must be replaced.

5.11 Reassemble the entire mask and test the face seal to ensure the bands are properly sealing the hood and face seal against the main body. Hook-up the unit to a gas supply to test the breathing systems.

5.12 The above listed steps are intended as preventive maintenance only, if any other maintenance or adjustments become necessary that are beyond the scope of the document, then refer to the service manual for the model KMB-8 Band Mask.

6.0 DOCUMENTATION REQUIRED

6.1 Update all maintenance log records insuring that they have been properly initialed and dated. Enter all repairs, adjustments, and replaced parts in the space provided.