CREW AND THERMAL SYSTEMS DIVISION

NASA - LYNDON B. JOHNSON SPACE CENTER

HOUSTON, TEXAS

JSC - 24877
ILC - 10107-70935

IMPROVED WASTE COLLECTION SYSTEM DTO

(IWCS)

PROJECT SUMMARY, PERFORMANCE EVALUATION,

AND CLOSE-OUT REPORT

MARCH, 1991

DOC. NO. CTSD-SH-522 DATE 3/5/91

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DOC NUMBER CTSD-SH-522

REVISIONS

REV. LETTER	DATE	AUTHOR	SECTION	BRANCH	OTHER	DIVISION

10107-70935

IMPROVED WASTE COLLECTION SYSTEM (IWCS) DTO PROJECT SUMMARY, PERFORMANCE EVALUATION AND CLOSE-OUT REPORT

STS-35

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3/5/91

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SUMMARY

The Improved Waste Collection System (IWCS) DTO project has been completed with a very successful test of the IWCS aboard Columbia on STS-35. The IWCS is a fecal matter collection system designed to test a new concept of collecting and compacting the fecal matter. This DTO was also designed to evaluate air flow characteristics required for separation and collection of the fecal matter. Results obtained from the successful test of the IWCS, will aid in the development of the Extended Duration Orbiter (EDO) and Space Station waste collection systems.

For STS-35 the IWCS was installed in its operational location next to the WCS, on the middeck floor. The IWCS was used on the 7th, 8th and 9th days of the STS-35 mission.

The IWCS performed flawlessly in orbit. All DTO goals were met.

This report contains a brief project history, equipment description, post-flight evaluation of its performance, performance measurements, crew comments, and conclusions.

STS-35 MISSION

Mission dates: December 1, 1990 thru December 10, 1990

CREW:

COMMANDER:	Vance Brand
PILOT:	Guy Gardner
MISSION SPECIALIST:	Mike Lounge
MISSION SPECIALIST:	Jeffrey Hoffman
MISSION SPECIALIST:	Robert Parker
MISSION SPECIALIST:	Ronald Parise
MISSION SPECIALIST:	Samuel Durrance

Night launch and night landing

PAYLOAD: ASTRO-1 Observatory

Broad Band X-Ray Telescope (BBXRT)

1.0 PURPOSE

To present a brief project history, a post-flight performance report, and a closing summary of the IWCS DTO project.

2.0 SCOPE

This report contains a closing summary of the IWCS DTO project, including IWCS development history, equipment description, STS-35 crew debrief, and a post-flight performance evaluation. This report also contains some general recommendations for future design of a waste collection system, or modification to the IWCS, based on IWCS post flight inspection and evaluation of its performance.

Crew debrief and performance evaluation presented in this closing report is limited to evaluation of the IWCS only.

3.0 EQUIPMENT DESCRIPTION AND BRIEF DEVELOPMENTAL HISTORY

3.1 EQUIPMENT DESCRIPTION

3.1.1 IWCS Description

The IWCS is a solid waste (fecal) collection system designed for evaluation on the Shuttle.

The IWCS operational concept is similar to that of a waste compactor. Solid waste is deposited into the collection/compactor chamber and is later compacted by a piston against the end of the compaction chamber. Prior to use, a highly absorbent pad (wiper frame), is introduced into the collection/compaction chamber. The wiper frame which wraps around the piston head, wipes the collection/compaction chamber clean during compaction and also absorbs all the moisture contained in the waste. The piston is operated by the user by means of a hand crank. A blower provides air for separation and collection of waste deposited. Odor and particle control is provided by circulating the air through a particle filter and then through a hydrophobic filter. The IWCS can be connected to the WCS vacuum vent in the event that odors are detected during use or in-between uses.

3.1.2 IWCS DTO Components

The IWCS DTO components are shown in Figures 1-1 and 1-2. The descrition of each component is listed below.

1. The Improved Waste Collection System (IWCS) (P/N 10178-10078-01).

   The IWCS contains the collection/compaction chamber, blower, filters, support frame and mounting structure.

2. Wiper Frame Container. P/N 10178-20057-01

   The wiper frame container is a metal container designed to hold 40 wiper frames.

   During orbit use, the wiper frame container is installed with velcro next to the IWCS on the middeck floor.

3. IWCS Stowage Pouch. P/N 10178-20065-01

   The IWCS stowage pouch is a plastic liner designed for stowage of the IWCS after its use on orbit, before its restowage in the Airlock Stowage Bag. The IWCS stowage pouch provides protection to the airlock stowage bag in case of spill, and odor control.

4. WCS Privacy Curtain Extension. P/N 10108-10113-01

   The WCS privacy curtain is a nomex cloth curtain which extends the WCS top privacy curtain so that it can be attached to the middeck ceiling. the privacy curtain extension is necessary because, with the IWCS in place, the WCS door is opened further and the top privacy curtain will not reach its normal connection point.

5. AC Power Cable Assy. P/N 10108-10102-13

   The AC power cable is GFE provided. The AC power cable connects the IWCS to the MO13Q power outlet in the Orbiter.

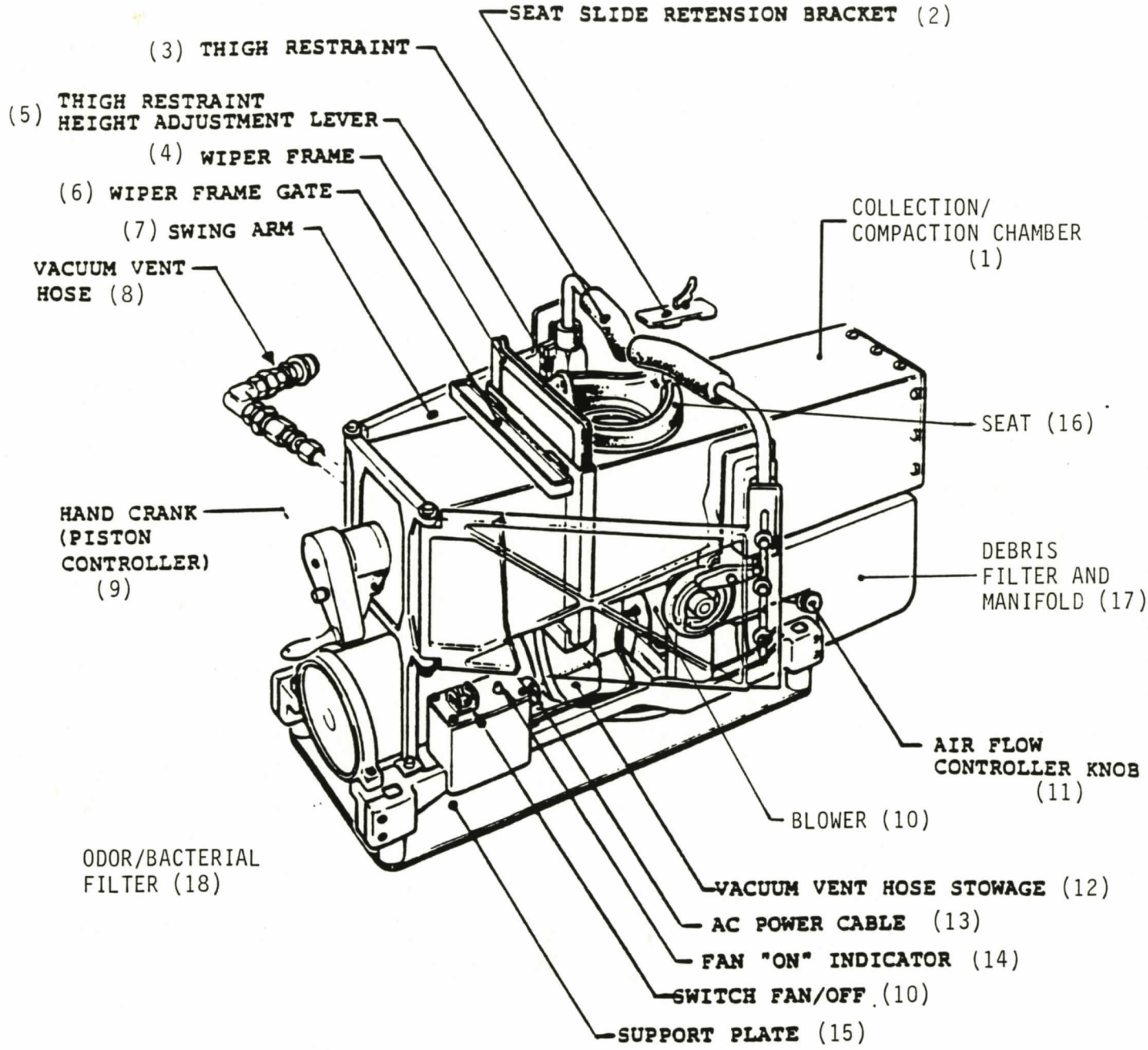
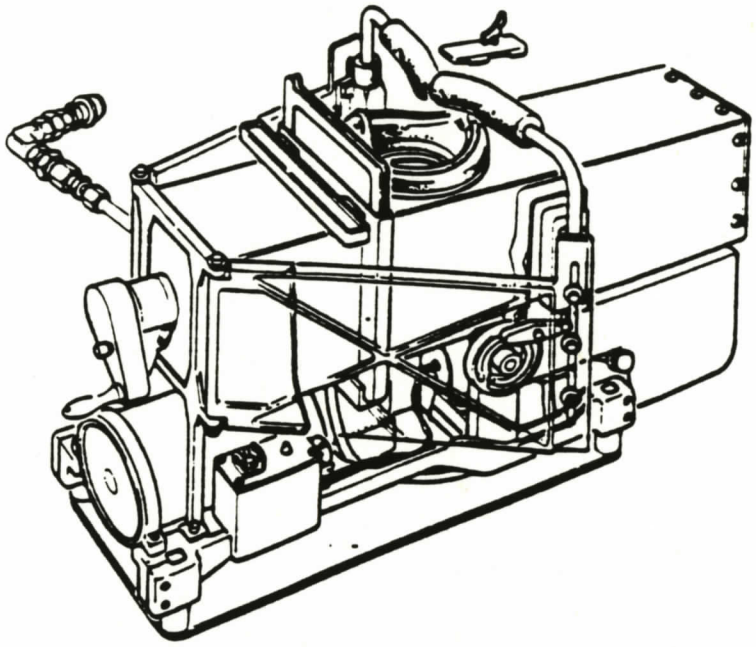
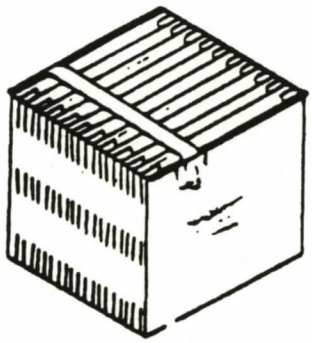


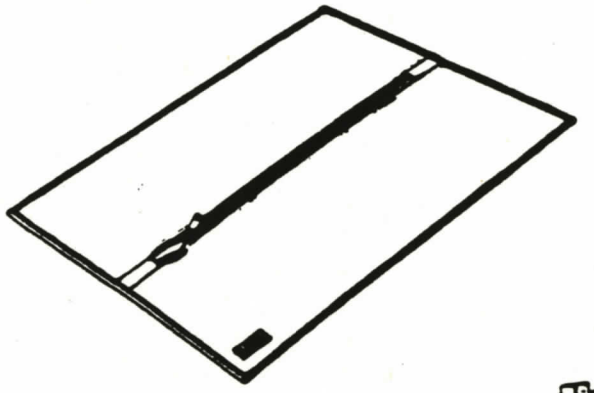
FIGURE 1-1 IMPROVED WASTE COLLECTION SYSTEM



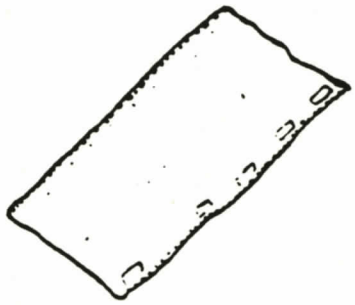
IMPROVED WASTE COLLECTION
SYSTEM (IWCS) 10178-10078-01



WIPER FRAME CONTAINER
10178-20057-01



IWCS STOWAGE POUCH ASSEMBLY
10178-20065-01



WCS PRIVACY CURTAIN EXTENSION
10108-10113-01

AC POWER CABLE ASSEMBLY
10108-10102-13

FIGURE 1-2 IWCS DTO (LESS AIRLOCK STOWAGE BAG)

3.2 IWCS BRIEF DEVELOPMENT - HISTORY

3.2.1 Design and Development of the IWCS 1984-1986

The IWCS was originally designed and developed as a joint effort between ILC Space Systems, SSD and Whitmore Enterprises, Inc. The IWCS was designed and developed during NASA's fiscal years 1984-1986 at which time the IWCS and the Wiper Frame Container were built. Whitmore Enterprises was responsible for development and fabrication of the Collection Compaction chamber, which included all mechanisms to operate the piston/plunger and air diverter valves, seat, and air control valve. Whitmore Enterprises also built the Wiper Frame Container and all components for the wiper frames. ILC Space Systems was responsible for development of the air/blower system, frame, structural components, fan control system, and overall project integration and documentation responsibilities.

The IWCS was close to certification for flight but was placed on hold pending further funding and flight manifesting in 1986.

3.2.2 Manifesting of the IWCS for STS-35

In 1989 the IWCS was manifested as DTO 0329 aboard STS-35. ILC Space Systems received responsibility to integrate the IWCS for flight. Integration for flight required: modifications to the IWCS including the addition of a variable air control feature to give the IWCS the capability of six air flow settings, addition of a vent hose, repairs due to damage received during handling, fit checks, certification testing, documentation, integration of DTO components, crew training, processing for flight, and post flight evaluation. Refurbishment of the IWCS after crew training and post-flight was performed by Whitmore Enterprises.

3.3 IWCS DTO PROJECT MAJOR MILESTONES

1.	Original fabrication	FY 1984 - 1986
2.	KSC fit check OV-102	11/6/89
3.	Modifications, testing certification complete	4/27/90
4.	STS-35	12/1/90 - 12/10/90
5.	Cleanout/post-flight Evaluation	12/19/90

3.4 STOWAGE

The IWCS and ancillary equipment known as the IWCS DTO (items listed in 3.1.2) were soft stowed for launch and re-entry in the airlock stowage bag, P/N V669-000652-002. Soft stowage was provided by Boeing FEPC.

3.5 ON-ORBIT INSTALLATION OF THE IWCS

For use on-orbit, the IWCS and Wiper Frame Container were de-stowed from the airlock stowage bag and placed in front of the WCS on the middeck floor. The IWCS and wiper frame container were secured in place by way of velcro hook/loop fasteners. To place the IWCS in front of the WCS it was required to removed the crew escape slide assembly. (See Photograph 1-0)

4.0 IWCS PERFORMANCE SPECIFICATIONS AND USE DESCRIPTION

4.1 PERFORMANCE SPECIFICATIONS

1. Torque required to operate the IWCS piston/crank is 35 in-lbs. maximum forward and reverse.

2. Compactor compression force at override torque is 55 ± 5 lbs. minimum.

3. The IWCS is capable of variable air flow rate with six flow setting as follow:

   Setting 1 @ 16 ± 3 SCFM
   Setting 2 @ 30 ± 3 SCFM
   Setting 3 @ 45 ± 3 SCFM
   Setting 4 @ 54 ± 3 SCFM
   Setting 5 @ 58 ± 2 SCFM
   Setting 6 @ 60 ± 2 SCFM

4. The IWCS is capable of collecting up to 100 grams of stimulated fecal material plus five (5) dry wipes at each use.

5. The wiper frame container contains 40 wiper frames. One wiper frame is necessary for each use of IWCS.

6. The IWCS assembly (excluding ancillary DTO components) weight is 126.8 lbs.

ON-ORBIT LOCATION/INSTALLATION OF THE IWCS FOR USE.
PICTURE TAKEN DURING OV-102 INTERFACE FITCHECK.

PHOTOGRAPH 1-0

4.2 IWCS USE/OPERATION DESCRIPTION

(Reference Figure 1-1)

To operate the IWCS, the user turns on the air circulation blower (8, 10), removes the seat slide retention bracket (2), retracts the piston by turning a manual crank (9), opens wiper frame gate (6) and installs a wiper frame (4) into the wiper slot, advances the piston until the wiper is pulled free of the frame and covers the piston head. Retraction of the piston automatically opens the seat slide valve (not shown) and the air intake/manifold valves. The user positions himself on the seat (16) and places the thigh bars (3) over the upper thighs to hold himself in place. During defecation, waste material is transported into the collection area by airflow. Cabin air enters the orifices under the seat and circulates across a debris/bacteria filter (17) and odor bacterial filter (18) before it is returned to the cabin. Large pieces of fecal material and paper are trapped in the collection area by air currents. Fine particulates, liquid droplets, and bacteria are retained in the debris/bacterial filter similar to the one presently used in the Shuttle WCS. Odors are removed by the odor/bacteria filter which is also a standard Shuttle WCS component. After defecation, the user deposits dry wipes and wet wipes into the collection area and gets off the seat. The user then manually cranks the piston forward which automatically closes the seat slide valve. As the piston reaches the intake valve manifold area, the separation valves close so that the piston does not force fecal materials into the manifold area. The piston is advanced until the fecal material and wipes are compacted and the crank reaches it torque override position. Springs in the piston drive assembly maintain a compaction force on the fecal material until the next usage. The user then turns the blower off and resumes his normal duties. Between uses, a vent flow (8) to space vacuum of approximately 1 - 1/2 pounds of air per day removes odors generated from the compacted feces.

5.0 IWCS PERFORMANCE EVALUATION

5.1 STS-35 CREW DEBRIEFING

The STS-35 crew debriefing for the IWCS and other waste management systems took place on December 13, 1991, in building 4.

5.1.1 General Crew Comments

The following comments were noted by the STS-35 crew in regard to IWCS.

- "Design of IWCS is Commendable" (BRAND)
- Use of the IWCS "was like being at home". (BRAND)
- "We liked the idea of being able to put everything in it" referring to tissues, wipes, etc. (HOFFMAN)
- IWCS was used flight day 7 (at approximately 6 days 10 hours - first use.)
- One wiper frame was bent by attempts to remove it while piston/plunger was in the compaction position.

5.2 NUMBER OF USES

Based on review of flight CUE card for use of the IWCS (CUE-32b/0) The IWCS was used as follows on day(s) 7 thru 9 of STS-35 mission.

Crew members used the IWCS 2 to 3 times each, for a total of 16 uses.

Air Flow Setting	Total
1	0
2	2
3	3
4	4
5	5
6	2
TOTAL	16

During the crew debriefing at least three crew members noted that they had used the IWCS at least one more time each, bringing the total to 16 uses. It was noted later during cleanout that 18 wiper frames were actually used. This could mean that the IWCS could have been used up to 18 times but only 16 uses were recorded The number of uses for the IWCS is therefore assumed to be between 16 - 18 times. The number of uses for each crew member is recorded in the flight CUE card.

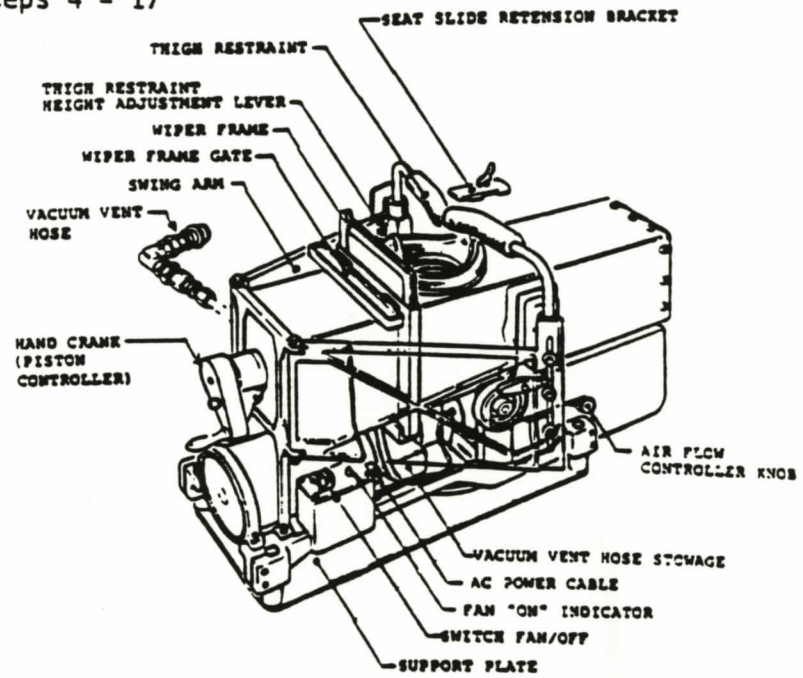
[redacted]

3

IWCS Failures

1. If seat slide gate fails to close, repeat steps 4 - 17. If problem not corrected, go to step 3
2. If ratcheting occurs prematurely, press ratchet override button
3. If slide gate does not close (URINE/FECES COLLECTION, step 15), repeat steps 4 - 6

   If wiper frame cannot be replaced, perform following steps (otherwise complete steps 7 - 17):
   Rotate handle cw until piston clears seat opening
   Reach thru seat opening and pull slide gate forward until it completely seals seat opening
   Repeat steps 4 - 17



Crew Member	Setting 1ST USE						Setting 2ND USE						Setting 3RD USE					
	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
CDR					✓					✓						✓		
PLT				✓			05:6/8											
MS1	10:15				✓			✓	✓									
MS2					✓				✓									
MS3				✓								✓			✓			
PS1					✓			✓										
PS2					✓							✓						

5.3 ANSWERS TO QUESTIONNAIRE

A questionnaire was presented to the crew for debriefing on the IWCS and other waste management system items. The following were the questions contained in that questionnaire for the IWCS, and the crew answers to those questions.

5.3.1 Question 1

When was the IWCS set up initially? Was it easy to set up? Was all of the hardware easily accessible in the airlock stowage bag?

- Flight day 7 (approximately 6 days 10 hrs.)
- No problems were encountered setting up the IWCS for use.
- Velcro system for attaching the IWCS to the middeck floor did not work very well. "It was easy to rip the IWCS loose."
- Crew refrained from making additional comments in regards to any other items that were not directly related to IWCS use and performance.

5.3.2 Question 2

Were there any problems in removing or installing the escape slide?

- None

5.3.3 Question 3

The commode airflow for the IWCS is similar to the EDO design. The airflow is such that it exits the sides of the canister. This exists also in the EDO design. What comments can be made on the transport of the material after depositing it into the commode? Did the material remain at the point where it first came in contact with something below the seat area, or was it transported down to the air exit vents by the airflow, and at what setting did that occur?

- Hoffman performed a test using a tissue to determine the minimum flow setting required to "suck" the tissue into the IWCS collection/compaction chamber. Setting 1 was not sufficient to pull the tissue in. Setting 2 barely sucked the tissue in, with tissue floating around. Setting 3 was required to suck tissue in.

- During use, setting 3 was adequate or minimum for transporting of the fecal material into the chamber.

- Recommend the use of some sort of "turbo charge" for separation.

- Not much difference in air flow or performance was noted between settings 4, 5, and 6.

- Material stuck and remained in place where it first came in contact with the walls of the chamber.

- Material stuck mostly on the bottom surface.

5.3.4 Question 4

The IWCS has six different airflow settings. Describe the difference between the settings from a user standpoint. Which setting worked the best for stool separation and why? Which the least?

- Setting 3 and 4 worked best. Not much difference was noted in other settings.

5.3.5 Question 5

Was there a lot of turbulence at the higher settings, and did this create additional problems?

- No

5.3.6 Question 6

Did you have any problems depositing the used tissues inside the IWCS as far as lifting up on a thigh bar to do it?

- No

Is this more difficult than using the tissue can located on the side wall as with the present WCS?

- No, easier. "like a normal toilet."

5.3.7 Question 7

Did you notice any odors resulting from the IWCS?

- No

5.3.8 Question 8

Was the vacuum vent QD connected to the WCS for odor control, and if so, when?

- No

5.3.9 Question 9

Was the urinal hose long enough for urinal operations using the WCS? Did the WCS foot rest get in the way?

- Yes, it was long enough.
- No, the WCS foot rest did not get in the way

5.3.10 Question 10

Any additional comments on IWCS operations?

- Ratcheting occurred early during compaction cycle. The override button was used frequently. Concern was expressed in over-stressing the IWCS by using the override button.

- The seat slide gate was out of adjustment on initial setup. The slide gate was closed by reaching in and pulling the slide gate closed. No problems with the slide gate were noted after initial setup.

- On a couple of occasions it was noted that the wiper paper was almost falling off the piston as it traveled across the seat opening. No mention was made of the flow setting at which this occurred.

- The seat design was comfortable and sealed well. No problems with size or form were reported. The best report for the system was the simplicity with which

the IWCS operated. Even though this system is manual and required cranking action, there were no objections to this activity. The IWCS did not require the use of the vacuum line for venting of odors. The crew reported that no odors were noticed. It was mentioned that there was the possibility that odors did exist, but by staying in such a small environment for that length of time one could become desensitized to odors.

- IWCS stowage bag was not used for stowage of the IWCS. Stowage pouch was needed to store UCDs and other liquid waste due to the plugged waste water dump nozzle on STS-35.

- Explore some way of differentiating which wiper frames have been used in the wiper frame container.

5.4 POST-FLIGHT INSPECTION AND PERFORMANCE EVALUATION OF THE IWCS

The IWCS was returned from Edwards Air Force Base December 17, seven (7) days after return of Columbia. The IWCS was delivered to the Hamilton Standard WCS processing facility for post-flight evaluation and cleaning.

5.4.1 Post-flight Inspection of IWCS Components

Prior to emptying contents, the IWCS and components were inspected for damage during use or flight. No damage was noted.

Inspection of the wiper frame container noted that 18 wiper frames were used.

5.4.2 Collection Capacity Evaluation

To evaluate the performance of the IWCS, contents collected were removed by attaching a transparent container at the end of the collection/compaction chamber.

The transparent container was designed to accept contents from the IWCS with minimum disturbance. Please refer to Photographs 1-1 thru 1-11.

The end of the compaction chamber was removed and the transparent container was installed at the end of the

compaction chamber. Turning the crank started the waste ejection process. The compacted wipes and waste stack was measured at 4.75 inches. When the container and waste were removed, the waste expanded to 5.25 inches. There was a small amount of space left between uses as observed through the container. This indicates that for future design the compaction force can be increased, adding at least three more uses in this area depending on the volume of fecal matter.

5.4.2.1 Capacity Calculation

As previously mentioned in 5.1.2 from crew debriefing and CUE-32b/o card examination, the IWCS was used 16 times or 18 times based on the number of wiper frames used. For the purpose of this calculation we will use 16 as the number of IWCS uses.

Based on above results it is then calculated that each use of the IWCS takes up 0.32 (5.25 16) inches of the space available in the compaction side of the chamber. Since 10.0 inches is the space available for collection of waste, it's then calculated that the IWCS as designed, has the capacity for 30 uses. (If the IWCS was used 18 times as it is suspected then the capacity of the IWCS is 35 uses.)

5.4.3 Collection/Compaction Chamber Evaluation

5.4.3.1 Internal Surfaces

Inspection of internal surfaces of the collection/ compaction chamber revealed a slight accumulation of fecal matter on all sides. There was slightly more accumulation on the bottom surface.

Inspection of the area behind the piston (scissor jack area) did not reveal any sign of contamination.

5.4.3.2 Air Intake/Manifold Valves

Air valves were found generally clean. There was no indication that any material had entered into the air valves.

5.4.3.3 End Plug

Inspection of end plug prior to removing contents in the

IWCS indicated no signs of leakage.

5.4.4 Particle Filter Evaluation

Disassembly of the particle filter compartment and examination of the filter did not show any signs of contamination from fecal matter. Visual examination of the filter showed small amounts of what appeared to be lint.

5.4.5 Fecal Collection/Dispersement

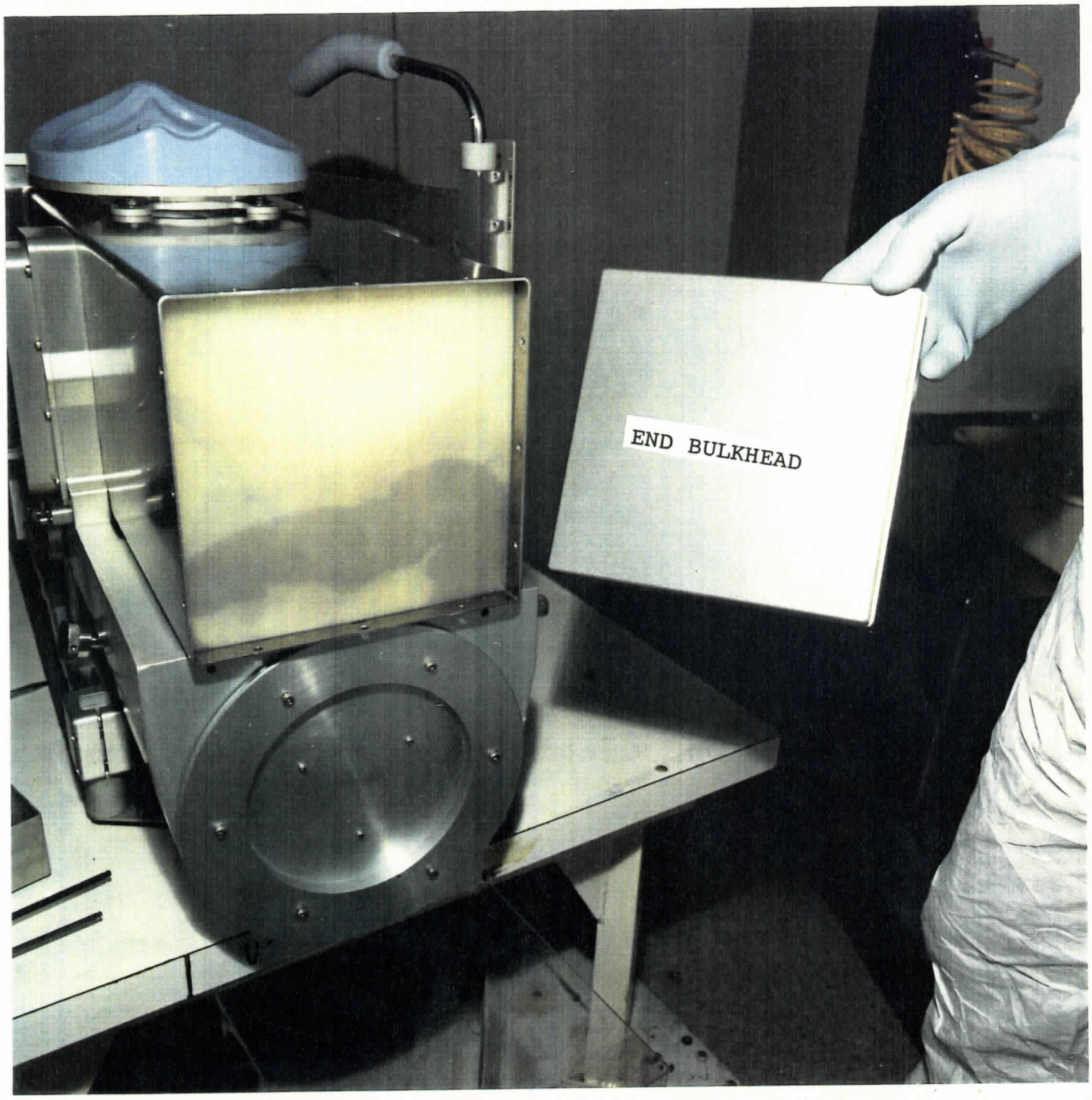
Fecal material was noticed to have dispersed mostly to the sides and bottom of the collection chamber.

IWCS DURING CLEANOUT AND POST FLIGHT PERFORMANCE EVALUATION.
IWCS PRIOR TO REMOVAL OF END BULKHEAD

PHOTOGRAPH 1-1

WIPER FRAME CONTAINER. SHOWING USED WIPER FRAME AND NUMBER OF WIPER FRAMES USED DURING STS-35.

PHOTOGRAPH 1-2

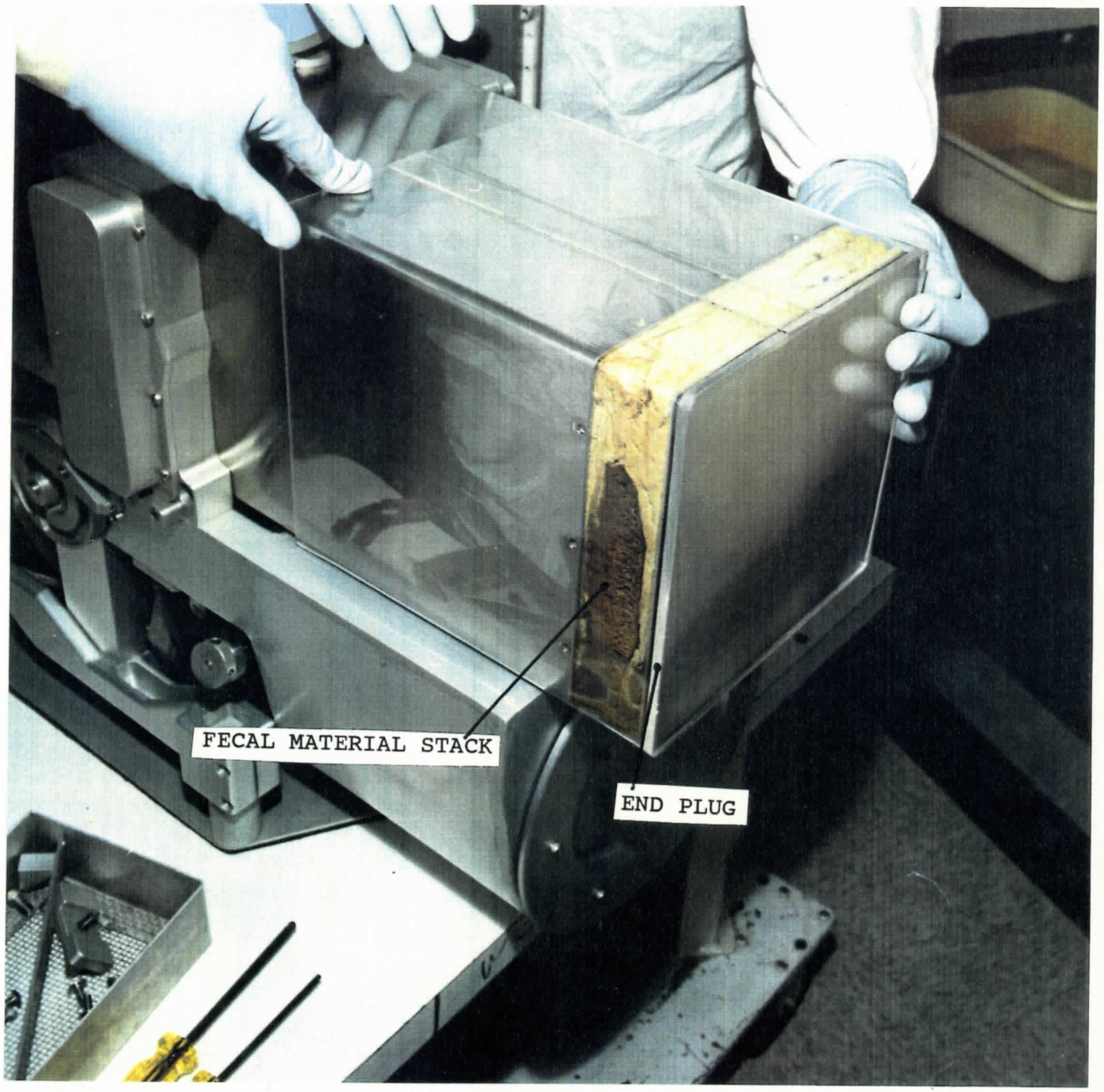


IWCS CLEANOUT. IWCS WITH END BULKHEAD REMOVED.

PHOTOGRAPH 1-3

IWCS CLEANOUT. END BULKHEAD REMOVED AND TRANSPARENT CONTAINER INSTALLED.

PHOTOGRAPH 1-4

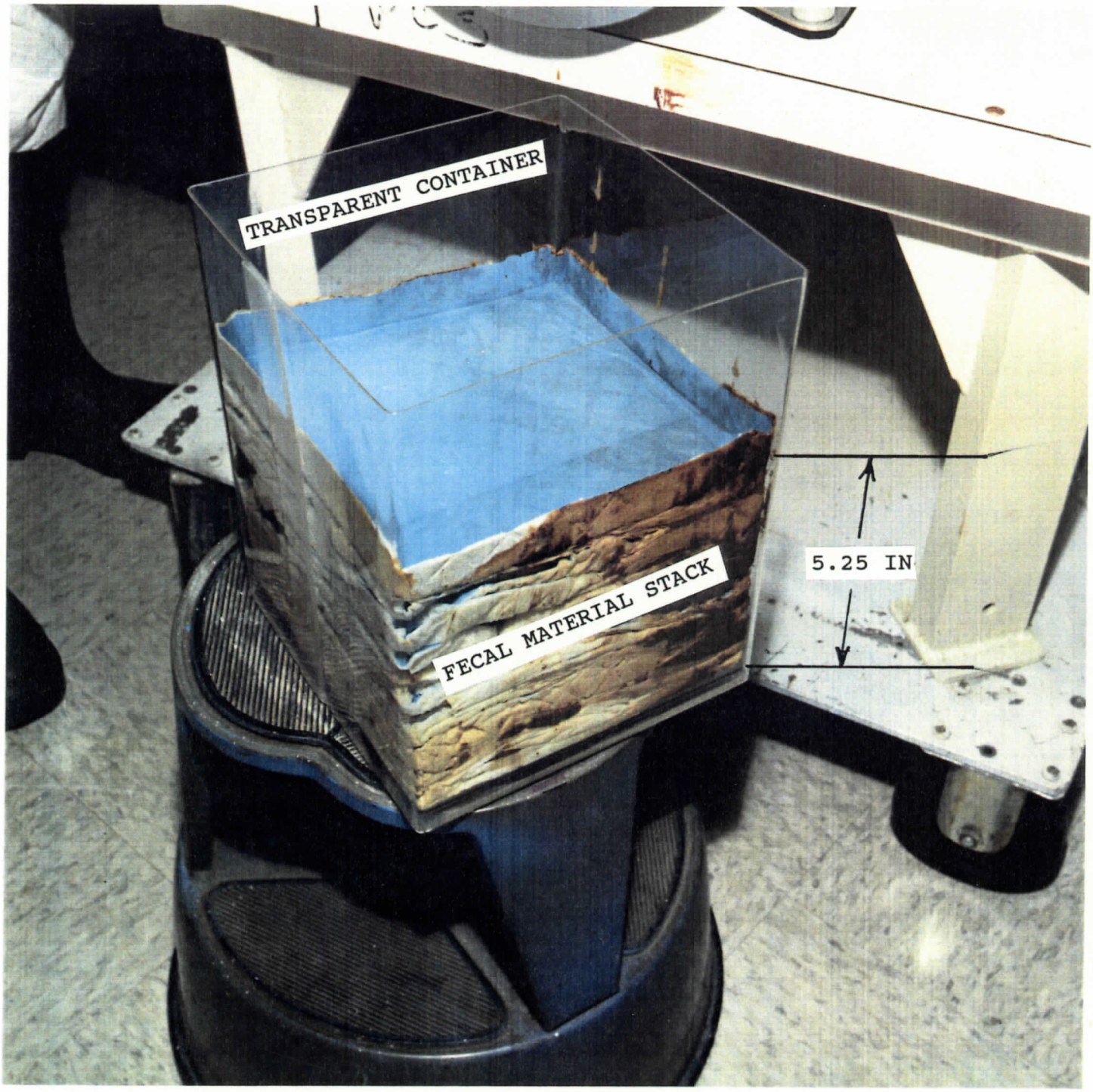


IWCS CLEANOUT. START OF REMOVAL OF CONTENTS FROM COLLECTION/COMPACTION CHAMBER INTO THE TRANSPARENT CONTAINER. CONTENTS PARTIALLY OUT.

PHOTOGRAPH 1-5

IWCS CLEANOUT. CONTINUING REMOVAL OF CONTENTS FROM THE COLLECTION/COMPACTION CHAMBER.

PHOTOGRAPH 1-6

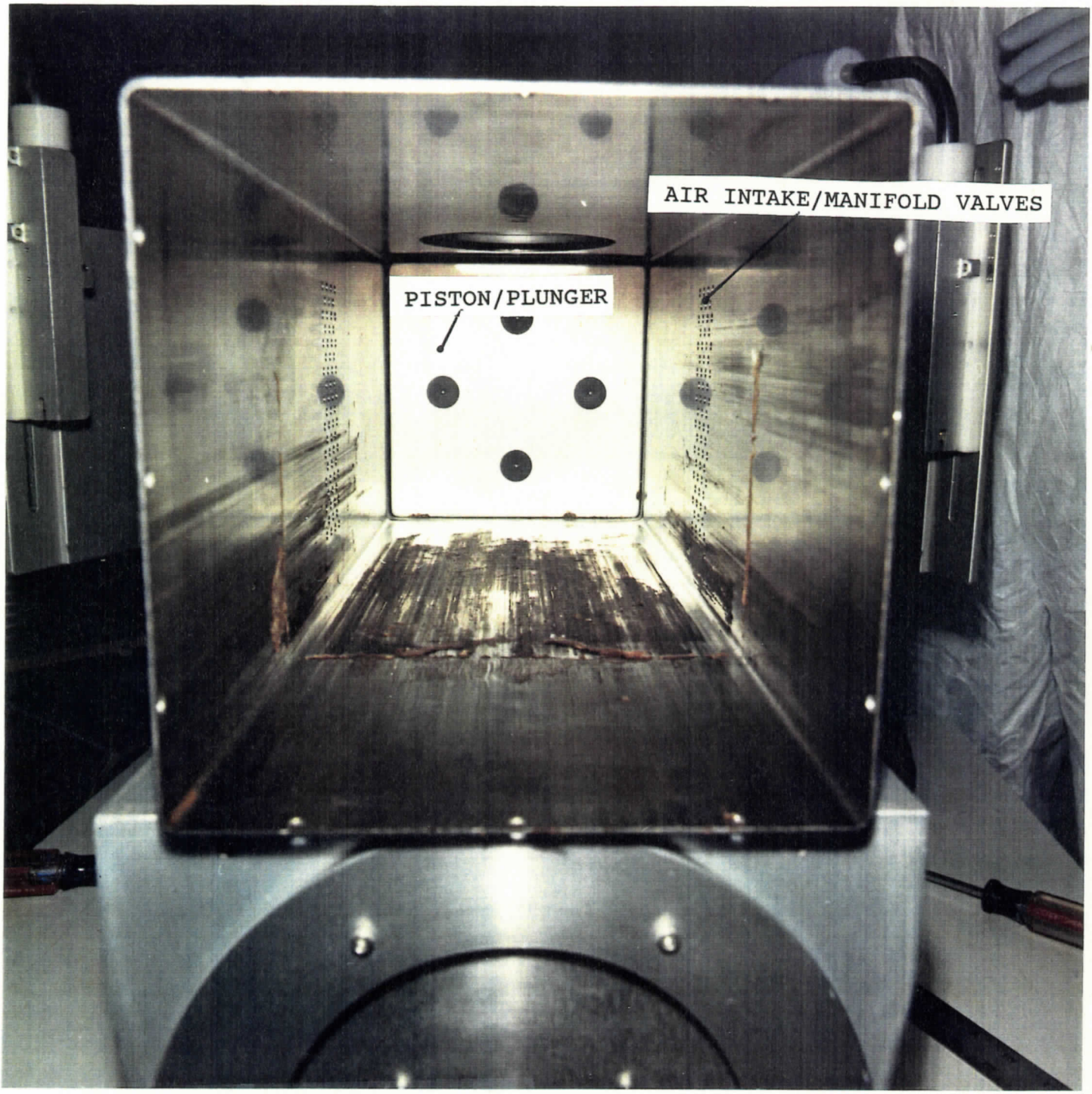


IWCS CLEANOUT. CONTENTS REMOVED FROM THE COLLECTION/ COMPACTION CHAMBER. TRANSPARENT CONTAINER WITH FECAL MATERIAL STACK.

PHOTOGRAPH 1-7

IWCS CLEANOUT. TRANPARENT CONTAINER SHOWING FECAL MATERIAL STACK (COVERED FOR EVALUATION).

PHOTOGRAPH 1-8

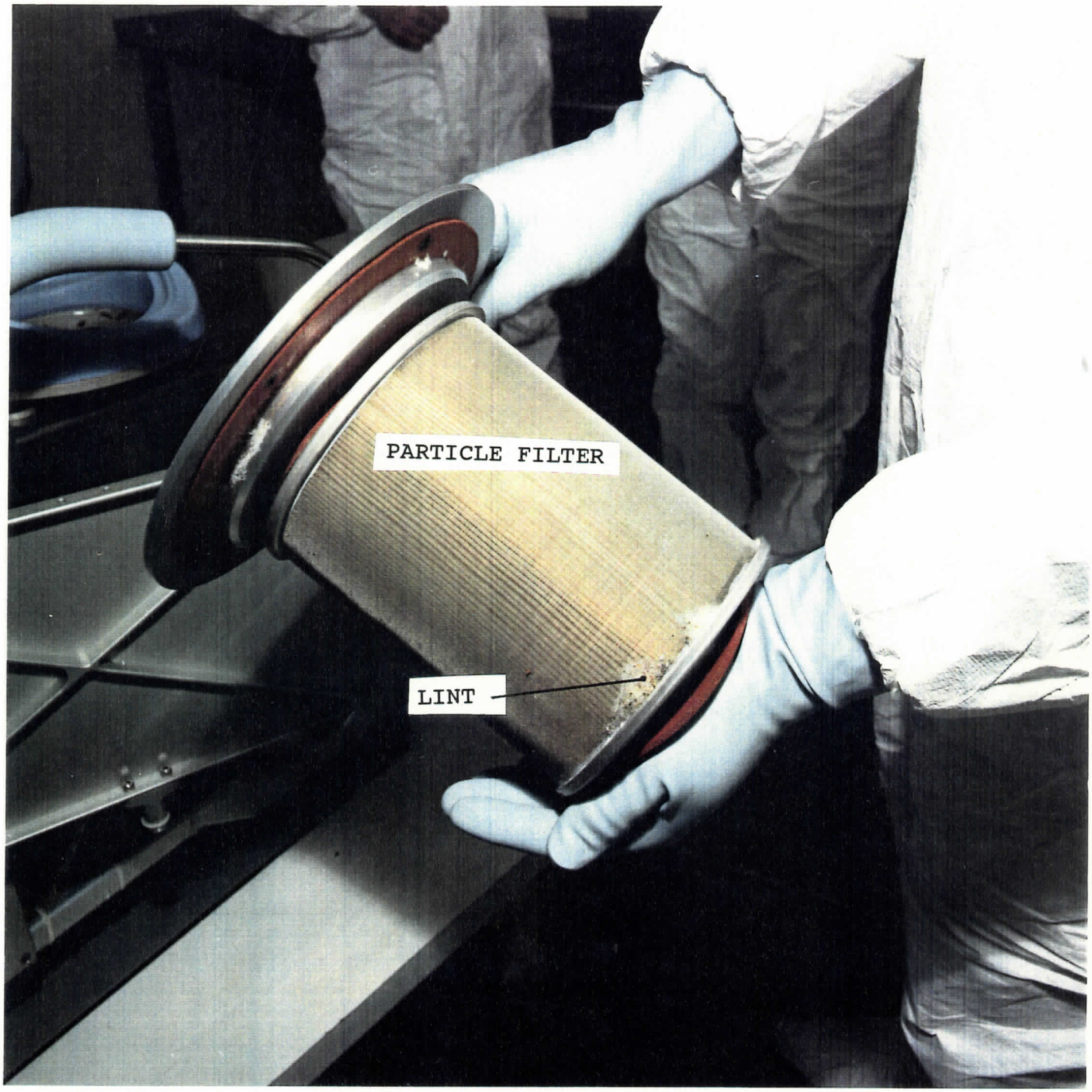


IWCS CLEANOUT. CONTENTS REMOVED.
VIEW OF COLLECTION/COMPACTION CHAMBER.

PHOTOGRAPH 1-9

IWCS CLEANOUT. VIEW OF COLLECTION/COMPACTION CHAMBER THRU SEAT OPENING. NOTE SLIGHT ACCUMULATION OF FECAL MATTER ON THE BOTTOM OF THE COLLECTION/COMPACTION CHAMBER

PHOTOGRAPH 1-10



IWCS CLEANOUT. PARTICLE FILTER INSPECTION.

PHOTOGRAPH 1-11

6.0 CONCLUSIONS

1. The IWCS has met or exceeded all goals presented as DTO requirements.

   All objectives regarding fecal compaction, air flow, odor control, and ease of use were all achieved. For the IWCS design, air flow rates of 42 to 57 SCFM proved optimal for fecal separation and for carrying the tissue into the collection chamber.

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Document No.: 10107-70935
Release Date: 3/14/91

APPENDIX A

334138

JOHNSON SPACE CENTER SPACE S
GFE CERTIFICATION REPORT REVIE

Document No.: 10107-70935
Release Date: 3/14/91
Page 1 of APPX. A

LOG NO. EC-10178-10078 CERT. PLAN FRD 10107-70814

PART NAME Improved Waste Collection System (IWCS)

TEST COMPLETION DATE 2/20/90

TEST ARTICLE P/N 10178-10078

FLIGHT P/N See page 2

DOCUMENTS REVIEWED
10107-70904
10107-70590

CERTIFICATION APPLICABILITY				
OV102	OV103	OV104	OV105	OTHER
✓	✓	✓	✓	

EVA	LOCATION STOWED/INSTALLED	MISSION CONSTRAINT
N	Airlock	015

MISSION DURATION	MISSION/LIFE DUTY CYCLE	TOTAL MISSION
310	N/A	001

Anything other than unlimited approval will require completion or corrections to actions indicated below and described on the following page.

REVIEW ITEM	APPROVED			DISAPPROVED	
	UNLIMITED	CERT. DEVIATION	LIMITED PERFM.	ADD DATA	ADD TEST
1. CERTIFICATION REQUIREMENTS	✓				
2. TEST ARTICLE CONFIGURATION	✓				
3. PERFORMANCE OF TEST: A. TEST SET-UP B. TEST LEVELS C. TEST DURATION D. TEST ARTICLE PERFORMANCE	✓ ✓ ✓				
4. ANOMALIES RESOLUTION	N/A				
5. STRESS ANALYSIS C. J. Kirsten 4/27/90	✓				
6. CERTIFICATION REPORT	✓				

Except as indicated above, the certification requirements are satisfactory for use in accomplishing certification of the design.

Robert A. Brown Jr. 4/27/90
NASA SSM DATE

H. C. Kava 4/27/90
ES2/STRUCTURAL MECHANICS BRANCH
(REQUIRED FOR ENGINEERING DIRECTORATE HARDWARE ONLY)

Greg Weiler C. J. Kirsten 4/27/90
NASA/JSC/RELIA. DIV. DATE

HOU 324A

NASA-

LOG NO. _____

Document No.: 10107-70935
Release Date: 3/14/91
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JOHNSON SPACE CENTER GFE CERTIFICATION REPORT REVIEW SHEET

COMMENTS: Certification By Test/Analysis

The IWCS is certified by the data contained in 10107-70904. Pushoff load certification is limited to 83lbs. A 83lb. load applied at the thigh restriant bar may peel the IWCS from its velcro attach points on the floor. A 17 to 24 lb force can bend the thigh bar restraint.

This item is stowed in a Airlock Stowage Bag for launch and landing.

Materials used in the IWCS have been approved by ESS.

The IWCS meets the push off requirements of NSTS 21096

This certifaction covers the following:

Improved Waste Collection System
10178-10078-01
Wiper Frame Container
101078-20057-01
IWCS Stowage Pouch
101078-20065-01
IWCS Privacy Curtain
10108-10113-01

334/46

JOHNSON SPACE CENTER SPACE GFE CERTIFICATION REPORT REVI

LOG NO. SP- [redacted] 10108-10102

CERT. PLAN 10107-70814

PART NAME AC Power Cable Assy.

TEST COMPLETION DATE 4/17/90

TEST ARTICLE P/N 10108-10102

FLIGHT P/N 10108-10102-13

DOCUMENTS REVIEWED FE 10108-10102

CERTIFICATION APPLICABILITY				
OV102	OV103	OV104	OV105	OTHER
✓	✓	✓	✓	

EVA	LOCATION STOWED/INSTALLED	MISSION CONSTRAINT
N	Cabin	0315

MISSION DURATION	MISSION/LIFE DUTY CYCLE	TOTAL MISSION
310	Nominal	1010

Anything other than unlimited approval will require completion or corrections to actions indicated below and described on the following page.

REVIEW ITEM	APPROVED			DISAPPROVED	
	UNLIMITED	CERT. DEVIATION	LIMITED PERFM.	ADD DATA	ADD TEST
1. CERTIFICATION REQUIREMENTS	✓				
2. TEST ARTICLE CONFIGURATION	✓				
3. PERFORMANCE OF TEST:					
A. TEST SET-UP	✓				
B. TEST LEVELS	✓				
C. TEST DURATION	NAT				
D. TEST ARTICLE PERFORMANCE	✓				
4. ANOMALIES RESOLUTION	N/A				
5. STRESS ANALYSIS C. J. Kotzian 4/24/90	N/A				
6. CERTIFICATION REPORT	✓				

Except as indicated above, the certification requirements are satisfactory for use in accomplishing certification of the design.

Lin Hay 4/24/90
NASA SSM DATE

N/A
ES2/STRUCTURAL MECHANICS BRANCH
(REQUIRED FOR ENGINEERING DIRECTORATE HARDWARE ONLY)

4/24/90
Greg Wright 4/24/90
NASA JSC/RELIA. DIV. DATE

HOU 324A

NASA-JSC

LOG NO. _____

Document No.: 10107-70935
Release Date: 3/14/91
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JOHNSON SPACE CENTER GFE CERTIFICATION REPORT REVIEW SHEET

COMMENTS: Certification By Test/Similiarity

The AC Power Cable is certified by the data contained in FE 10108-1002. The only difference between the -13 and -04 cables is that a ground wire has been added to the -13 cable. EMS/EMC requirements for the -13 cable are met by similiarity to the -04 Materials used in the above item have been approved by NASA ESS materials group.

This certification covers the following

AC Power Cable Assy.

10108-10102-13

The above item is stowed except for on-orbit use