



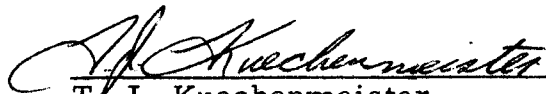
**Aerospace
Systems Division**

Crew Engineering Evaluation of the
Array D MPA Pallet
Crew Engineering Model

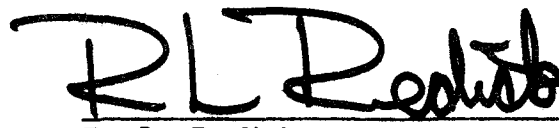
NO.	REV. NO.
ATM-1047	
PAGE <u>1</u>	OF <u>13</u>
DATE	8/11/71

The following ATM presents the results of Crew Engineering evaluation of the ALSEP Array D MPA/MPA Pallet crew deployment tasks.

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NO.	REV. NO.
ATM-1047	
PAGE <u>2</u>	OF <u> </u>
DATE 8/11/71	

I. INTRODUCTION

On July 8, 1971, a partial evaluation of the MPA Pallet design concept was conducted by BxA Crew Engineering. This evaluation included both shirtsleeve and pressure suited tests using Crew Engineering Mockups of the MPA Pallet and Mortar Package Assembly. Since this evaluation was conducted prior to completion of the MPA Pallet design, certain features had not been incorporated in the Pallet Mockup. These include the sun compass, alignment stripe, step marks, Pallet tiedown, Pallet section autodeployment, anchor release and anchor autodeployment. The absence of spring loading for the Pallet and anchors permitted evaluation of a manual deployment alternate to the design.

II. HARDWARE

- MPA Pallet Crew Engineering Mockup
- Mortar Package Assembly (MPA) Crew Engineering Mockup
- Array E Subpackage #2 Crew Engineering Mockup

III. FACILITIES

BxA Crew Engineering Laboratory with simulated lunar surface.

IV. TEST PROCEDURES

- A. Remove pull pin securing MPA Pallet to Subpackage #2 (simulated).
- B. Remove MPA Pallet from Subpackage #2 (Figure 1).
- C. Transfer MPA Pallet to simulated lunar surface.
- D. Remove pull pin securing MPA Pallet sections in stowed configuration (Figure 2).
- E. Manually deploy MPA Pallet sections and verify that the sections are locked in place (Figure 3).
- F. Release anchor release pull ring/lanyard (not evaluated).
- G. Remove pins securing anchors in stowed configuration using pull ring/lanyard (simulated).
- H. Manually deploy MPA Pallet anchors and verify that they are locked in position (Figure 4.).
- I. Emplace MPA Pallet on simulated lunar surface (Figure 5).



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NO.	REV. NO.
ATM-1047	
PAGE <u>3</u>	OF <u> </u>
DATE	8/11/71

- J. Engage UHT in MPA Pallet.
- K. Align MPA Pallet (simulated).
- L. Embed MPA Pallet Anchors by stepping on Pallet (Figure 6.)
- M. Engage UHT in Mortar Package Assembly fixed socket.
- N. Position MPA on MPA Pallet (Figure 7), lower MPA to engage with MPA Pallet and verify that MPA is locked in place.
- O. Remove UHT from MPA fixed socket.
- P. Engage UHT in MPA rotating socket.
- Q. Level MPA/MPA Pallet using UHT (Figure 8) and boot (if required) to $\pm 5^\circ$ with MPA bubble level.
- R. Remove UHT.

V. RESULTS AND RECOMMENDATIONS

- A. MPA Pallet release.

(Simulated).

- B. MPA Pallet removal.

Acceptable. Handle height for removal is well within reach capabilities.

- C. Pallet transfer.

Acceptable.

- D. Pallet section release.

Acceptable.

- E. Manual Pallet section deployment.

Acceptable.



**Aerospace
Systems Division**

Crew Engineering Evaluation of the
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Crew Engineering Model

NO.	REV. NO.
ATM-1047	
PAGE <u>4</u>	OF <u> </u>
DATE 8/11/71	

F. Lanyard release.

(Simulated).

G. Anchor release.

(Simulated).

H. Manual anchor deployment.

Unacceptable. The reach requirements to manually erect the anchors, from the side opposite the anchors, and the desire to keep the Astronaut away from the anchor side of the Pallet preclude this approach. Spring loaded anchors are strongly preferred to provide the easiest and safest deployment.

I. Pallet emplacement.

Acceptable. The Pallet should be rotated to the lunar surface using the UHT (i.e., the UHT handle should be hooked in the Pallet handle while grasping the UHT by the shaft).

J. UHT engagement (Pallet socket).

Acceptable.

K. Pallet alignment.

(Simulated). Although this procedure was not fully evaluated, the need for a 5° bubble level on the MPA Pallet was identified. If the required alignment accuracy is to be attained it is essential that the Pallet be level during this task.

L. Pallet embedding.

Acceptable.

M. UHT engagement (MPA fixed socket).

Acceptable (evaluated previously for MPA).

N. MPA engagement.

Acceptable. The MPA was easily positioned with respect to, and engaged with, the mating hardware on the Pallet.



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NO.	REV. NO.
ATM-1047	
PAGE 5	OF
DATE 8/11/71	

O. UHT removal (MPA fixed socket).

Acceptable (evaluated previously for MPA).

P. UHT engagement (MPA rotating socket).

Acceptable (evaluated previously for MPA).

Q. Level MPA/MPA Pallet.

Acceptable.

R. UHT removal (MPA rotating socket).

Acceptable (evaluated previously for MPA).

VI. CONCLUSIONS

The preliminary evaluation indicates that the MPA Pallet is acceptable from a crew standpoint. However, further testing should be conducted, using an updated Crew Engineering Mockup of the Pallet which fully represents the final design, so that a complete evaluation of the crew interface may be made.

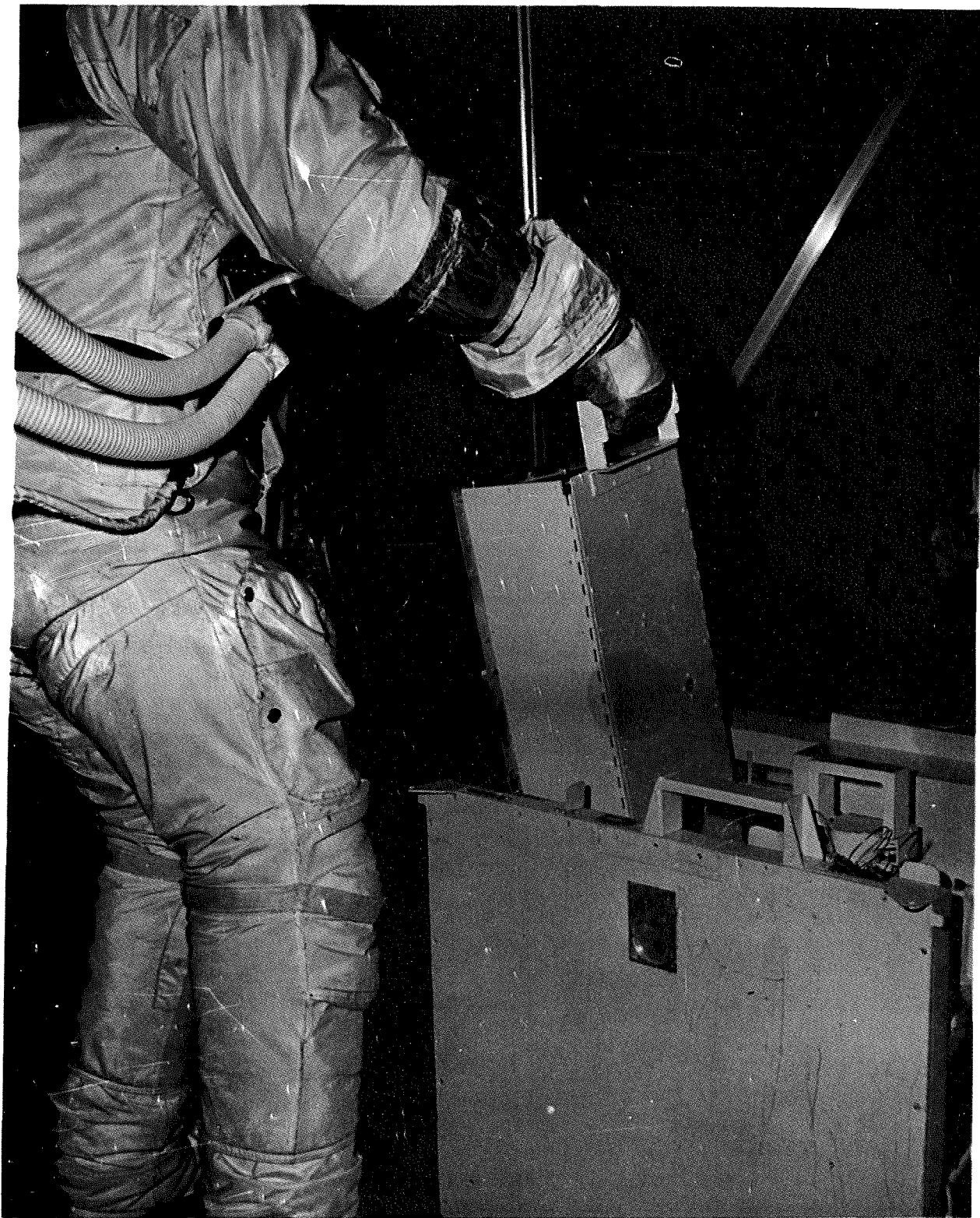


Figure 1. MPA Pallet Removal from Subpackage #2.



Figure 2. MPA Pallet Section Release.

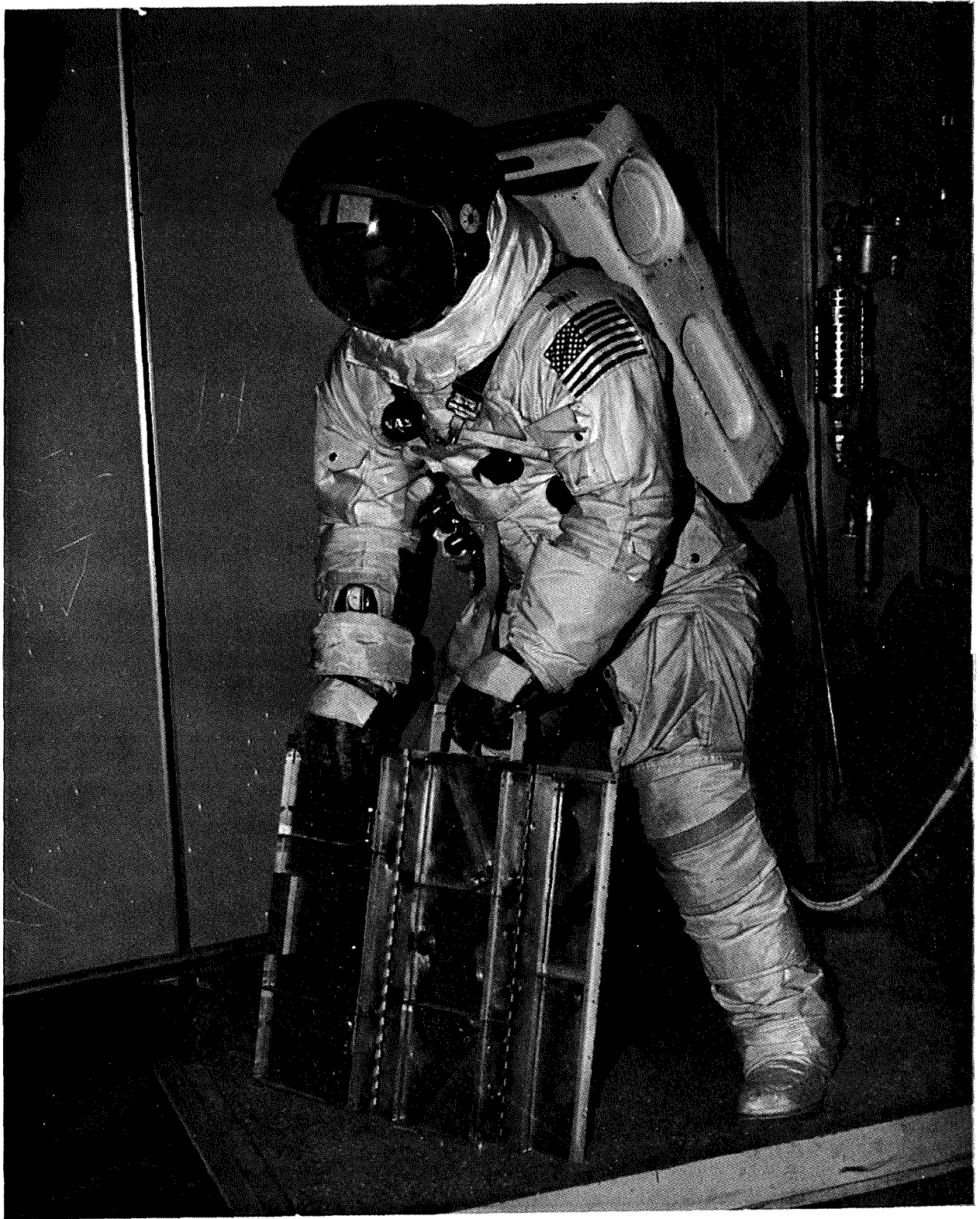


Figure 3. Manual MPA Pallet Section Deployment.

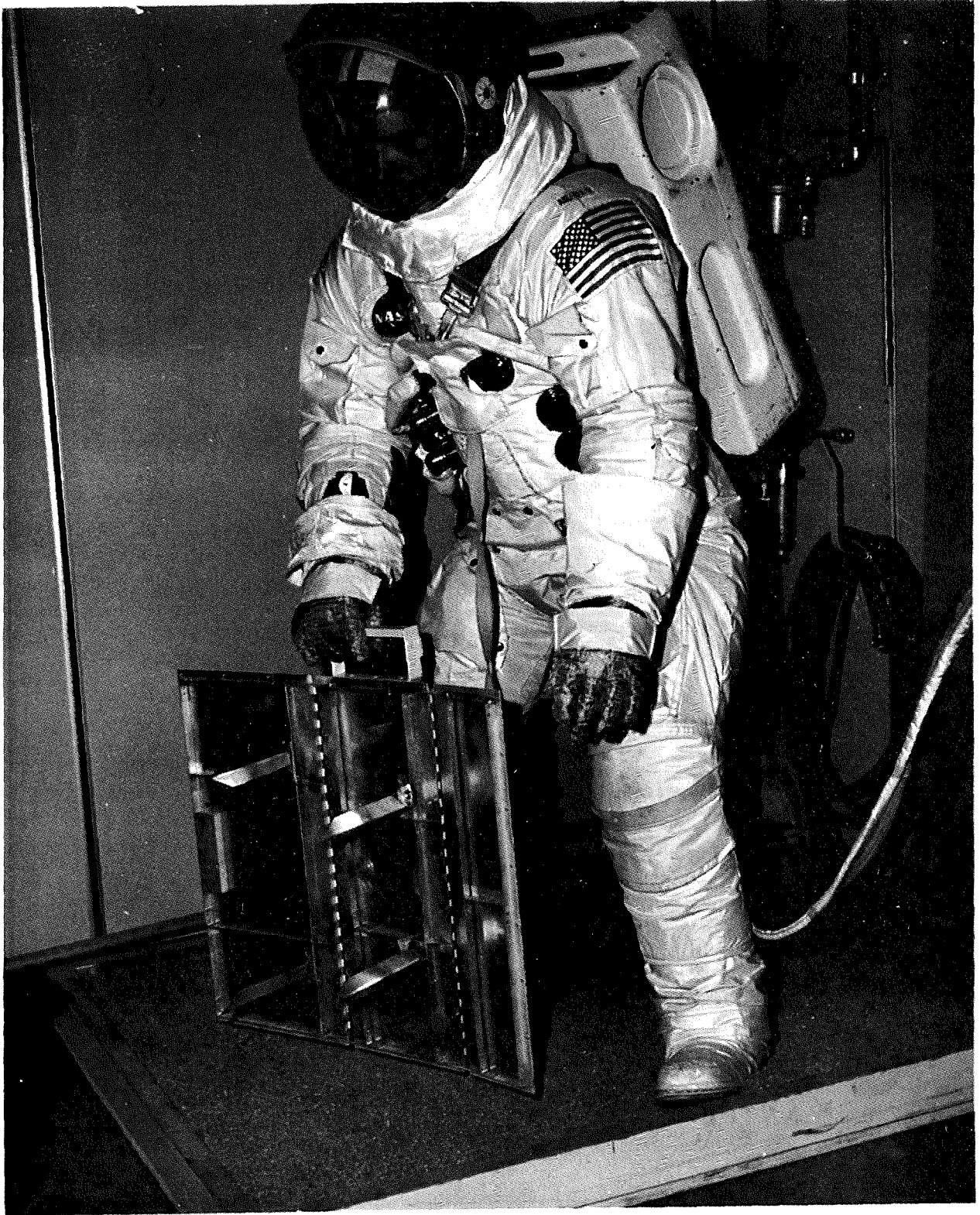


Figure 4. MPA Pallet with Anchors Deployed.

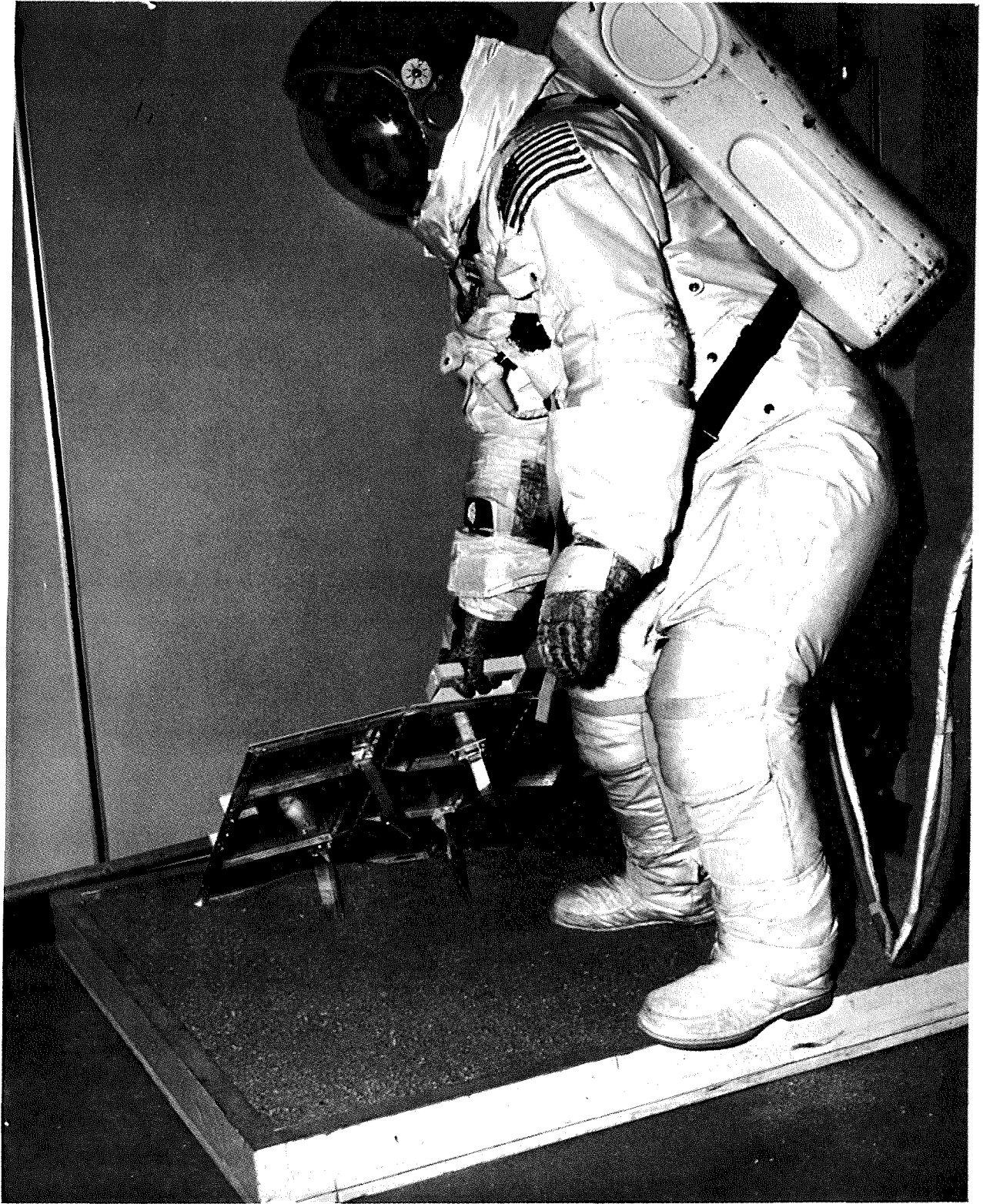


Figure 5. MPA Pallet Emplacement.

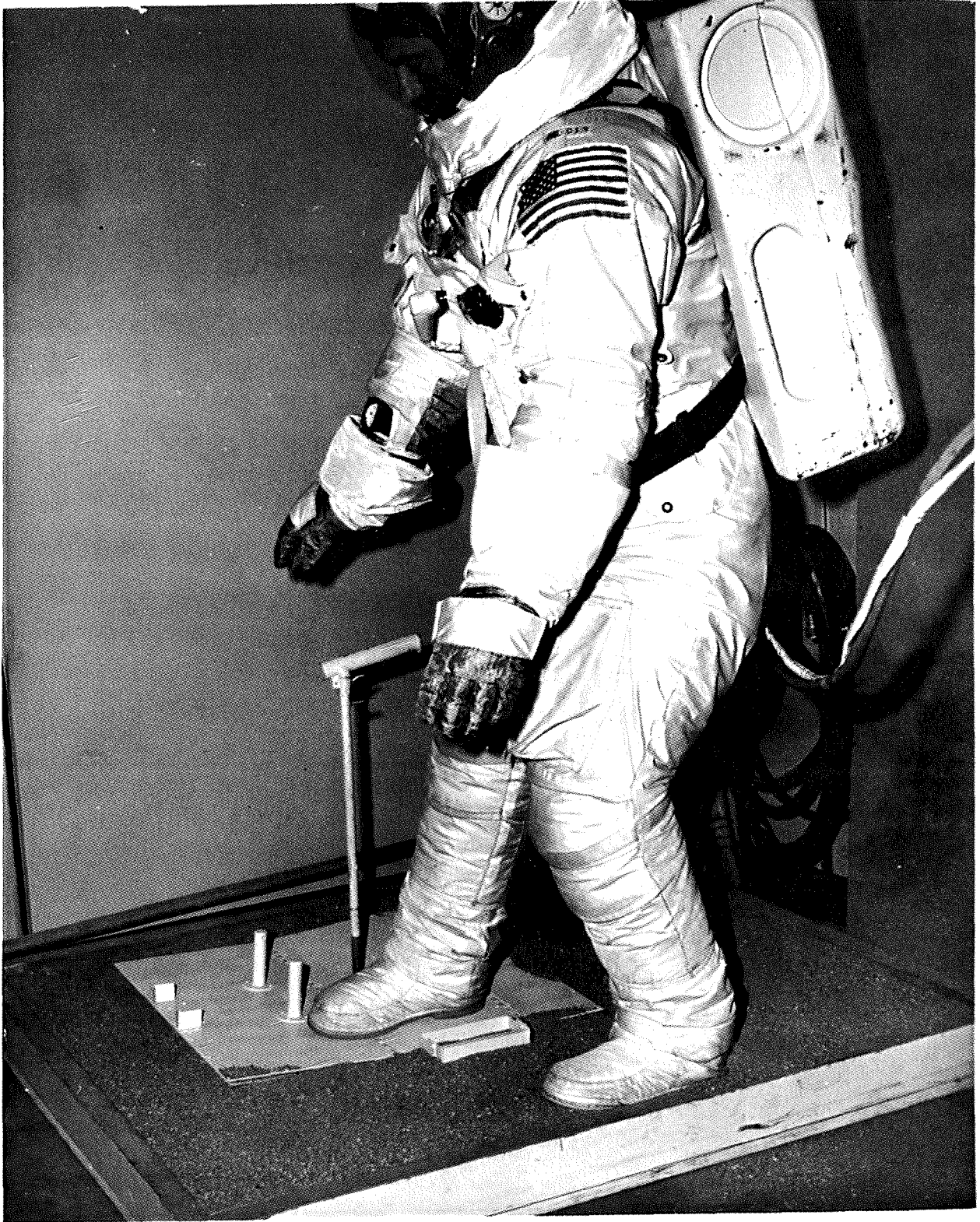


Figure 6. Embedding MPA Pallet.



Figure 7. Mortar Package Assembly Engagement.



Figure 8. MPA/MPA Pallet Leveling.