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REPORT OF MINUTEMAN ACCIDENT  
INVOLVING A MK 11 RE-ENTRY VEHICLE  
AT SITE LIMA II, DECEMBER 5, 1964 ~~(CFRD)~~

R. K. Petersen, 8141-2  
Sandia Corporation, Livermore Laboratory

~~AEC ATOMIC WEAPON DATA SIGMA 1~~

RS 8232-2/6599

January 1965

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~~ABSTRACT (CFRD)~~

At 3:00 PM (MST), December 5, 1964, a retrorocket fired on a MINUTEMAN missile at Site Lima II, Ellsworth AFB, South Dakota. This missile, under the command of the 44 Strategic Missile Wing, was on strategic alert and was fitted with a Mk 11 Re-entry Vehicle containing a Mk 56 Mod 1 warhead. The re-entry vehicle was dislodged and fell approximately 75 feet to the floor of the silo. This report covers the investigation conducted by AEC representatives at the accident site.

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CONTENTS

|                                 | <u>Page</u> |
|---------------------------------|-------------|
| Introduction                    | 3           |
| Investigating Parties           | 3           |
| Condition of Weapon             | 14          |
| Recovery Operation              | 17          |
| Security and Public Relations   | 21          |
| Preliminary Post-Mortem Results | 21          |
| Summary and Conclusions         | 21          |

ILLUSTRATIONS

| <u>Figure</u> |   | <u>Page</u> |
|---------------|---|-------------|
| 1             | Re-entry Vehicle Attitude-Control Rockets                   | 5           |
| 2             | Abrasions on the First and Second-Stage Rocket Motors       | 6           |
| 3             | Arming, Firing, and Attitude Control Assembly (Top View)    | 7           |
| 4             | Arming, Firing, and Attitude Control Assembly (Bottom View) | 8           |
| 5             | Arming, Firing, and Attitude Control Assembly (Side View)   | 9           |
| 6             | Re-entry Vehicle on Silo Floor                              | 10          |
| 7             | Evidence of Fired Retrorocket                               | 12          |
| 8             | Aft End of Re-entry Vehicle                                 | 13          |
| 9             | Forward End of Re-entry Vehicle                             | 15          |
| 10            | Step Joint in Flare Section                                 | 16          |
| 11            | Re-entry Vehicle Clearing Silo                              | 18          |
| 12            | Re-entry Vehicle During Transfer to Van                     | 19          |
| 13            | Re-entry Vehicle in Van                                     | 20          |



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REPORT OF MINUTEMAN ACCIDENT INVOLVING  
A MK 11 RE-ENTRY VEHICLE AT SITE LIMA II, DECEMBER 5, 1964

Introduction

At 3:00 PM (MST), December 5, 1964, a retrorocket fired on a MINUTEMAN missile at Site Lima II, Ellsworth AFB, South Dakota. This missile, under the command of the 44 Strategic Missile Wing, was on strategic alert and was fitted with a Mk 11 Re-entry Vehicle (RV) containing a Mk 56 Mod 1 warhead. The RV was dislodged and fell approximately 75 feet to the floor of the silo. The missile, warhead, and Arming, Firing, and Attitude Control components (AF/AC), were in the safe condition at the time of the accident.

Investigating Parties

Around 8:00 PM (MST), December 5, Mr. D. P. Dickason, ALO, was notified by the Director of Nuclear Safety at Kirtland AFB that some squibs had fired on a MINUTEMAN missile and that a potential Broken Arrow had been declared. Mr. Dickason subsequently notified Lawrence Radiation Laboratory (LRL) and Sandia Corporation (SC) of the situation.

By midnight it was still unclear if any action by the laboratories was needed. At 6:00 AM (PST), December 6, 1964, Mr. D. M. Olson, Sandia Corporation, Sandia Laboratory (SCSL), and Mr. Dickason called Mr. R. K. Petersen, Sandia Corporation, Livermore Laboratory (SCLL), and stated that the RV had fallen 75 feet to the silo floor. They informed him that the Director of Nuclear Safety at Kirtland AFB was sending a team of observers to Ellsworth AFB and that AEC/DMA wanted an ALO representative to accompany them. It was decided that an SCLL representative should meet the team in Denver and proceed to Ellsworth AFB.

It was also decided at this time that an LRL representative probably was not required. Mr. M. D. Martin, LRL, who had been previously informed of the situation, was contacted and concurred. He asked to be notified of the conditions at the silo and stated that he would then send someone if the situation warranted it.

The group of observers consisted of Mr. D. P. Dickason, AEC/ALO; Lt. Col. J. O. Mitchell, USAF/DNS; Maj. H. B. Lacy, USAF/DNS; Capt. D. J. Loosley, USAF/AFWL; and Mr. R. K. Petersen, SCLL. The group arrived at Ellsworth AFB, South Dakota, at 3:45 PM (MST), December 6, 1964, and went immediately to the office of Lt. Col. J. W. Eskridge, Director of Safety, 44 Strategic Missile Wing. There the group was briefed, as follows:

At 2:00 PM (MST) December 5, 1964, two airmen entered Lima II to investigate an IZ (inner zone) security alarm. They opened the personnel access door and descended to the equipment room to conduct a routine check of the IZ and

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OZ (outer zone) security circuitry. The check consisted, in part, of removing a fuse and observing the operation of a relay to determine continuity. When the fuse had been removed and reinserted the third time there was a violent explosion. This explosion occurred at approximately 3:00 PM (MST). About one hour later the two airmen returned in the company of a third airman and after a cursory inspection through openings in the launch tube reported that the RV was missing.

The group of observers then reported to the Command Post and Col. V. M. Cloyd, Commander, 44 Strategic Missile Wing. Here they were able to monitor, via remote hookup, the progress of the explosive ordnance (EOD) team as it entered the silo at 5:00 PM (MST). The EOD team was to:

1. Safe the ignitors on the missile;
2. Disconnect the ignitor batteries at the J-Box;
3. Safe and remove the RV attitude-control rockets (which were still lying on top of the missile) (Figure 1); and
4. Inspect the RV at the bottom of the silo. (This was the first close look at the RV.)

After completion of items 1, 2, and 3 Capt. M. M. Costa, 2701 EOD, Ellsworth AFB, and Capt. E. S. Tschirhart, OOAMA, Hill AFB, descended to the bottom of the silo. They reported:

1. Some abrasions were present on the first and second stage rockets (Figure 2);
2. Debris from the exit nose cone was present at the missile support ring Number 1;
3. The "firing set" was lying on the floor 6 feet from the RV (this was later identified as the AF/AC) (Figures 3, 4, and 5);
4. No contamination was indicated by monitoring equipment; and
5. The RV was damaged and lying partially under one of the base legs of the missile support ring. (Figure 6)

After completion of this operation the silo was secured and the observers adjourned for the day.

At 8:00 AM December 7, the observers met with Col. J. V. Farley, 341 SMW, Malmstrom AFB, and offered their services. Col. Farley was President of the 15th Air Force Accident Investigation Board that had been formed to investigate this accident. He invited the group to attend the briefing the EOD was about to present.

The EOD team leader, Capt. Tschirhart, presented his group's observations with the aid of color slides taken during the inspection the previous night.

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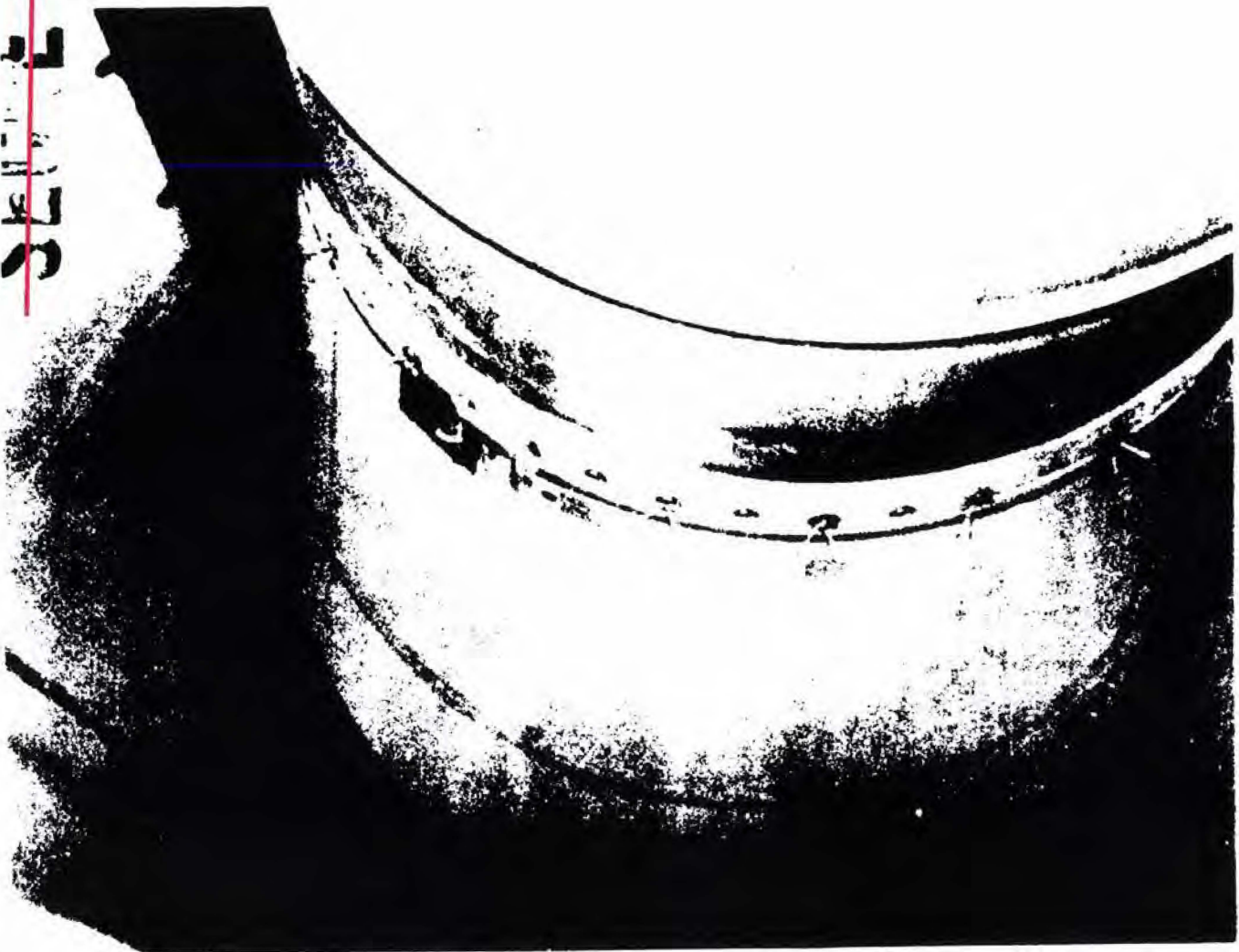
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Figure 1. Re-entry Vehicle Attitude-Control Rockets





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Figure 2. Abrasions on 90° First and Second-Stage Rocket Motors



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Figure 3. Arming, Firing, and Attitude Control Assembly (Top View)

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Figure 4. Aiming, Firing, and Attitude Control Assembly (Bottom View)





Figure 5. Arming, Firing, and Attitude Control Assembly (Side View)



Missile Support  
Rate Log

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Figure 9. Re-entry Vehicle on Test Floor

Capt. Tschirhart reported that one retrorocket had fired (Figure 7) and stated that this had caused the RV to separate and fall to the bottom of the silo. He reported that the "firing set" had broken loose and that the tritium bottle was exposed to view but seemed intact. Further, Capt. Tschirhart was certain that the warhead high explosive (HE) had broken up.

Deleted

(During this presentation, a faulty slide projector prevented the color slides from showing a clear picture of the situation.) Capt. Tschirhart recommended removing the RV with modified RV handling equipment and then disassembling and disposing of it somewhere at Ellsworth AFB.

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After the briefing, Mr. Martin and Mr. N. D. Benedict of LRL were contacted. By using an EOD manual at each end of the telephone conversation, the following information was relayed:

1. The "firing set" had separated from the RV and was lying about 6 feet away;
2. Some water containing a yellow substance (perhaps sodium dichromate from the cooling system) was on the floor of the silo;
3. All monitoring equipment registered low readings (i. e., background only);
4. Avcoating and ablative material were shattered;
5. Deleted
6. The reservoir was intact;
7. Deleted
8. The sides of the case were not ruptured;
9. The nose of the RV was off and the forward end of RV was caved in and split;
10. Impact crystals were visible and some had peeled away;
11. The warhead was visible through the RV shell;
12. There was no apparent damage to the HE nuclear outer structure; however, the HE had probably fractured, and
13. The missile showed abrasive marks but no punctures.

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It was apparent that items 1, 5, 6, and 7 did not correlate. It was also apparent to Mr. Martin and Mr. Benedict that item 12 might not be a good estimation of the situation. Mr. Benedict did not think that the HE had fractured but he felt other damage might have been done. They asked if a better look at the slides could be obtained.



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Figure 7. Evidence of Fired Retrorocket

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Figure 14. An Early Re-entry Vehicle

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Another slide projector was located and the slides reviewed. [REDACTED]

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Mr.

Martin subsequently requested that the RV not be moved until Mr. Benedict arrived to assay the situation. The request was relayed and the Air Force agreed to wait.

Mr. Benedict arrived at 8:00 PM (MST) December 7, 1964. He was briefed and was shown the slides of the RV. The group of observers received permission to enter Lima II the next morning to conduct a first-hand investigation.

#### Condition of Weapon

On Tuesday, December 8, 1964 the observers went down the silo at Lima II. The following observations were made:

1. The missile had some minor abrasions on the side of the second and first stages;
2. The gas reservoir was intact but leaning to one side;
3. [REDACTED] Deleted
4. The electrical component deck had moved forward 1 to 2 inches and was dented;
5. [REDACTED] Deleted
6. The outer portions of the firing set had been blackened; and
7. The flare was flattened (with a major diameter of approximately 30 inches and a minor diameter of approximately 26 inches).

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Mr. Benedict decided that the only way to bring the unit up would be nose down in a cargo net with the net strapped to the unit. [REDACTED]

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[REDACTED] Deleted Any render-safe procedures would be done at a magazine, thereby minimizing personnel hazards.

The Accident Investigation Board met at 8:30 PM. Mr. Benedict briefed them as follows regarding his opinion of the condition of the warhead:

1. The step joint in the flare section had opened 30 to 50 mils, either because of sheared rivets, elongated holes, or both (Figure 10);



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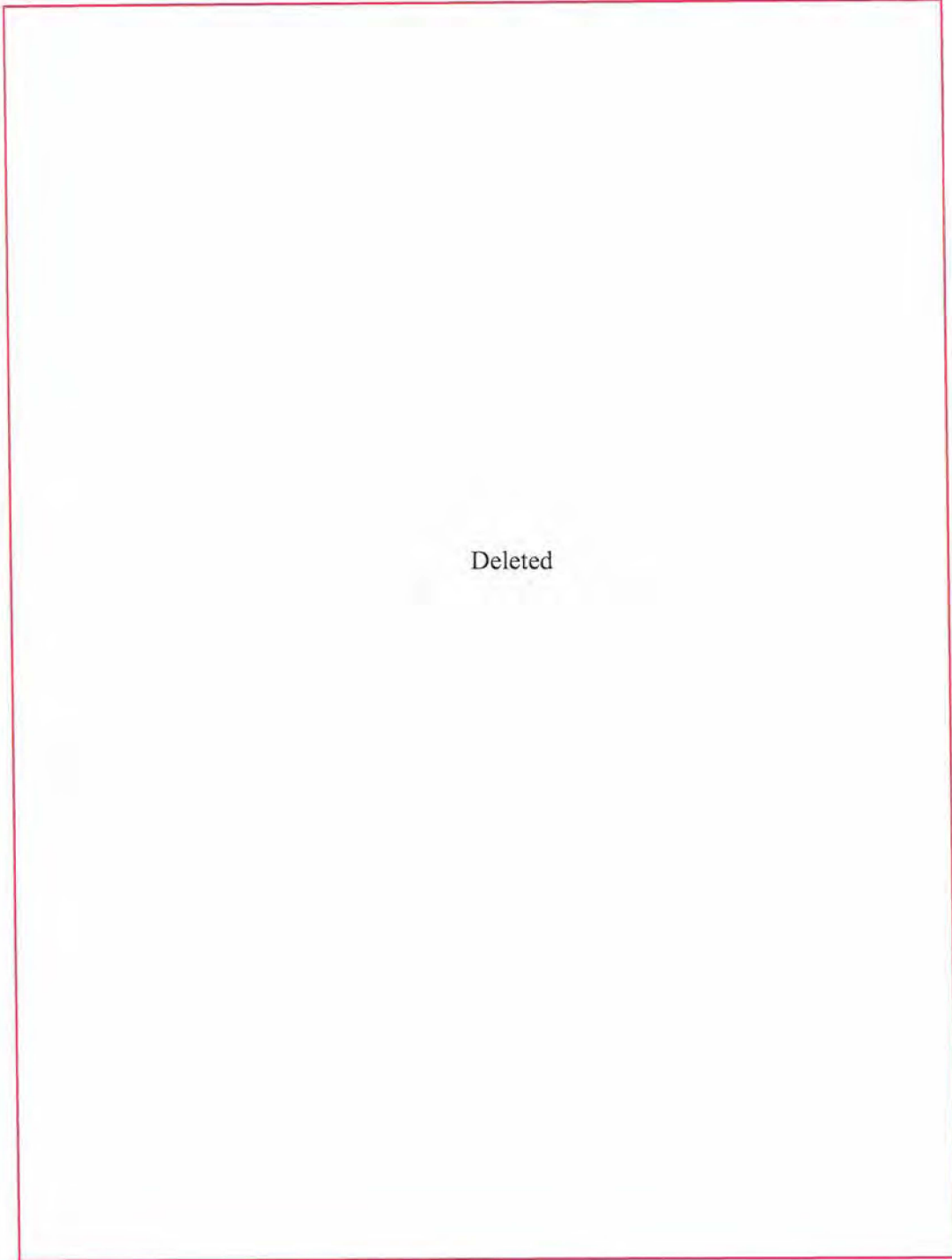


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Figure 2. Forward End of Re-entry Vehicle



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2. The warhead pit seal had probably not opened (no alpha);
3. The reservoir was intact; and
4. Deleted DOE  
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The Board was also informed that the warhead was electrically inert since the power supplies had been torn away and there was no reason to suspect that any residual electrical charges were present.

#### Recovery Operation

Mr. Benedict presented his plans for RV recovery to the Accident Investigation Board. In conjunction with Mr. Benedict's plan, outlined previously, Mr. Petersen had recommended that the warhead should come up isolated electrically from the hoisting crane and other ground points since circulating ground currents in the area were undetermined. The rocket engineers now became alarmed at the possibility of static discharge, due to the cold, dry climate and the nylon cargo net. Mr. Petersen then recommended a high-resistance grounding circuit and confirmed its adequacy with Mr. J. S. Anderson, SCLL. The EOD built the device for attachment to the RV and the Board approved its use.

SAC, 15th Air Force, BSD, and others approved the plan for removal of the RV on December 9. A mobile crane was positioned over the silo. The RV was manually moved to a hoisting position and then raised slightly with the crane and a strap. A heavy nylon cargo net was slipped under the RV and securely strapped to the unit. The grounding cable and a safety rope were attached. The RV was then hoisted out in a nose-down attitude and cleared the silo at approximately 4:50 PM (MST) December 9, 1964 (Figure 11).

The RV was immediately transferred to an RV van, where it was suspended from an overhead, track-mounted hoist (Figure 12). The nose was rested on mattresses with the hoist used to maintain vertical alignment and cargo tie down straps used to prevent lateral motion (Figure 13). The RV was moved from Lima II to Ellsworth AFB on December 10.

Mr. Benedict had requested radiographers, a radiation safety specialist and their equipment, from LRL. Mr. W. T. Fritts and Mr. F. F. Sojka were the radiographers and Mr. G. E. Costella was the radiation safety specialist.

The RV arrived at Ellsworth AFB at 4:30 PM December 10 and was taken to a magazine for the render-safe procedures. At 9:00 PM the DT reservoir was removed and radiographs were taken to determine the condition of the internal parts. The radiographs were reviewed in the early hours of December 11 and indicated no cracked HE and no deformation of the pit. Deleted DOE  
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It was concluded that with some further disassembly and proper packaging the unit was safe for shipment to Medina.



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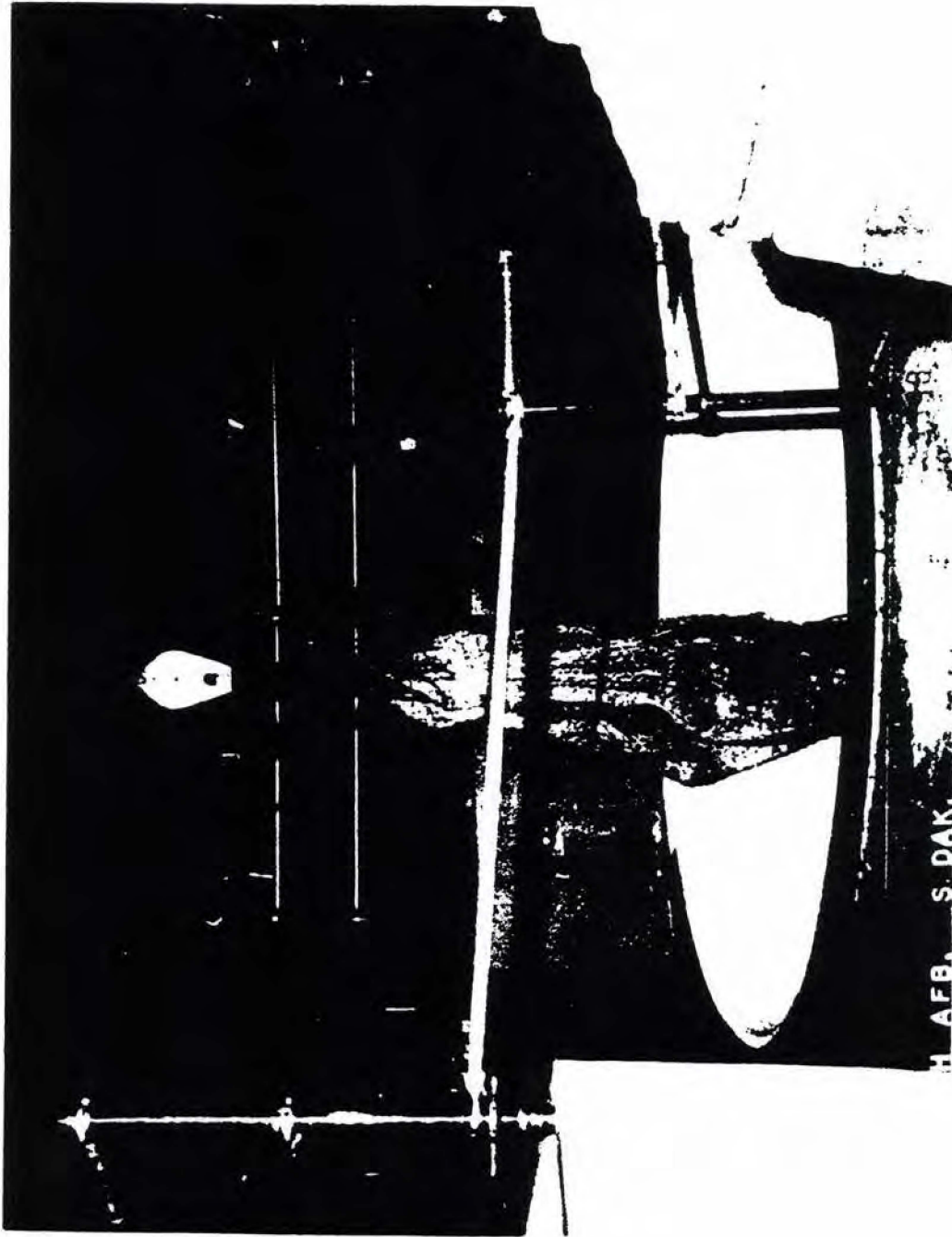
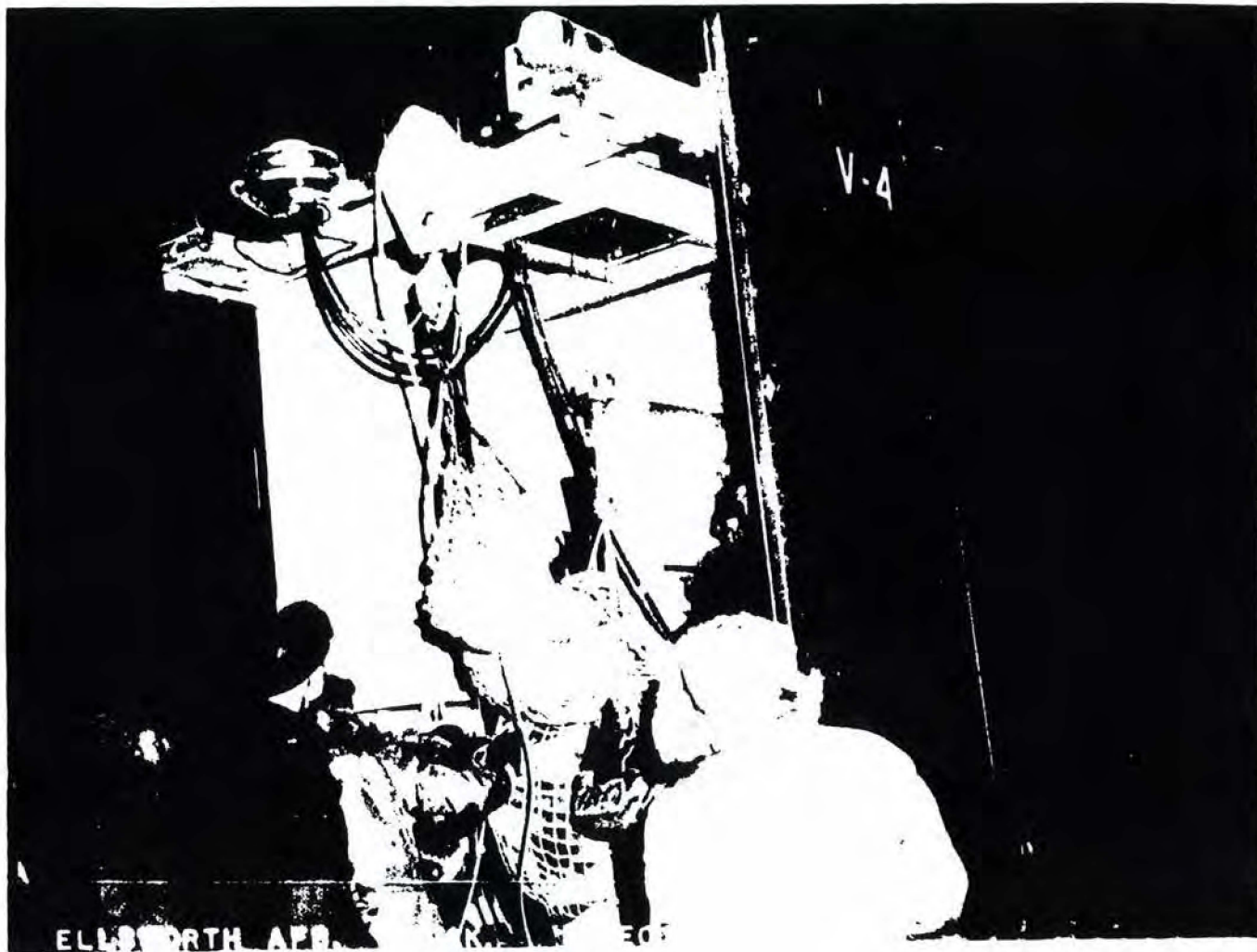


Figure 11. Recovery Airlift in C-130.

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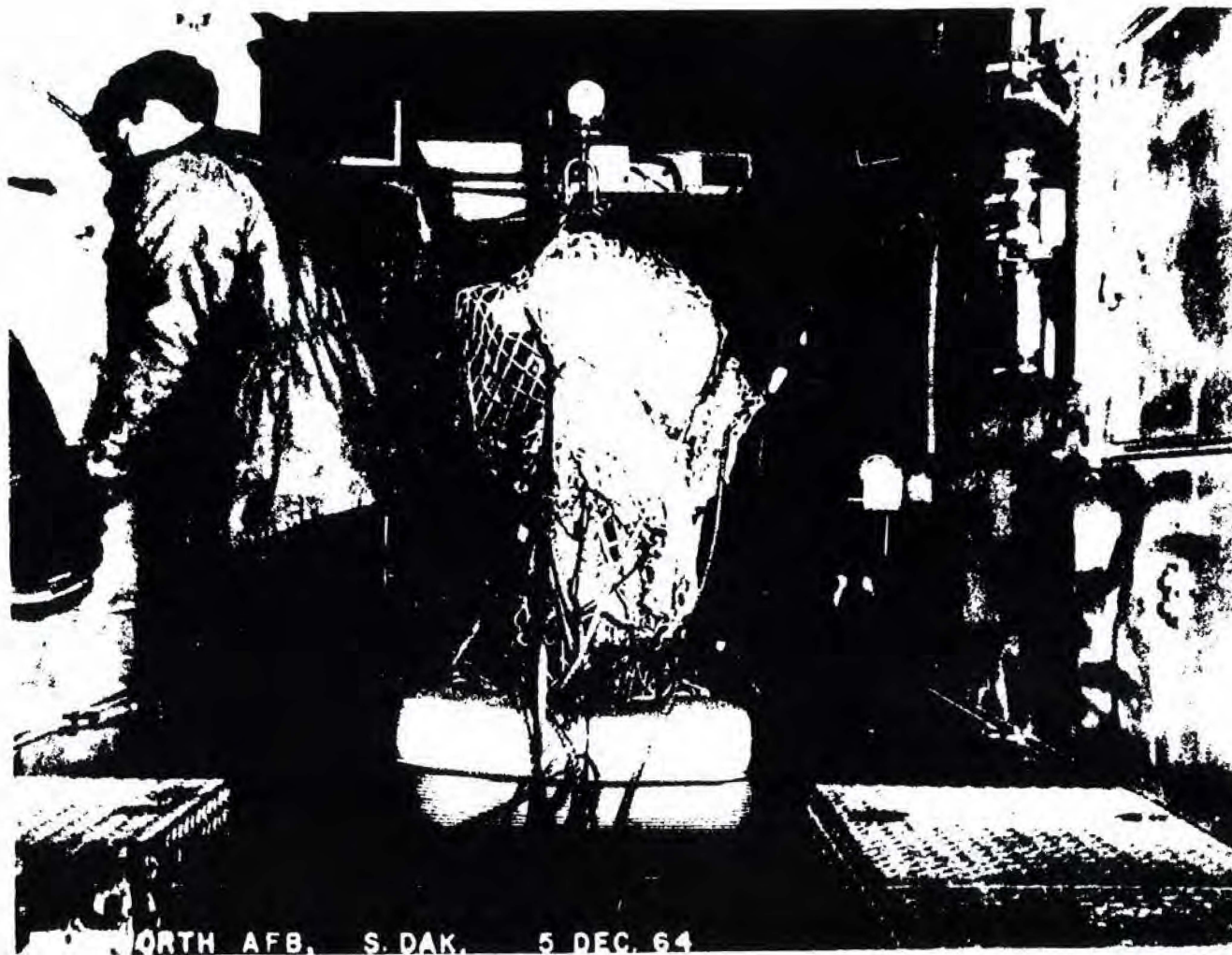


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Figure 12. Rescue Vehicle During Transfer to Van



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WORTH AFB, S. DAK, 5 DEC, 64

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FIGURE 13. Re-entry Vehicle (Van)

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This was subsequently done by the

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EOD at Ellsworth AFB.

The group of observers, except for Mr. Benedict, left Ellsworth AFB at 2:45 PM (MST) on December 11. Mr. Benedict stayed to make arrangements for packing and shipping the unit to Medina.

#### Security and Public Relations

Security and public relations were handled by the 44 Strategic Missile Wing and Ellsworth AFB. No release concerning this incident was made to the press. The entire operation was handled in such a way that the nearby communities were not aware of and did not exhibit even a mild interest in the operation.

#### Preliminary Post-Mortem Results

At the time of this writing, a post-mortem had not been conducted. There is no reason to suspect that any of the warhead electrical components were actuated.

The warhead component deck will be shipped to SCLL from Medina for post-mortem of components by the design group responsible.

#### Summary and Conclusions

This accident shows, as do all others, that circumstances make each accident unique. The warhead had been designed to withstand and remain safe in all conceivable situations. Even so, after this accident the warhead was in such a condition that an improper recovery procedure could have had serious consequences. If not actually leading to a detonation, an improper procedure could perhaps have placed the nuclear system in a more critical state.

The Air Force never requested the assistance of the design agencies and was prepared to recover on its own. The fact that the agencies responded of their own accord, and were in fact utilized immediately, points out that they were needed.

A recommendation as to how to prevent this type of accident cannot be made here; but, a recommendation is made that the AEC laboratories respond, whether requested or not, at the first indication of trouble.

The EOD teams seem competent enough to handle most of the situations, but, in this instance, as in others, there are always those peculiar circumstances which should be viewed by persons intimately familiar with the weapon design.

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