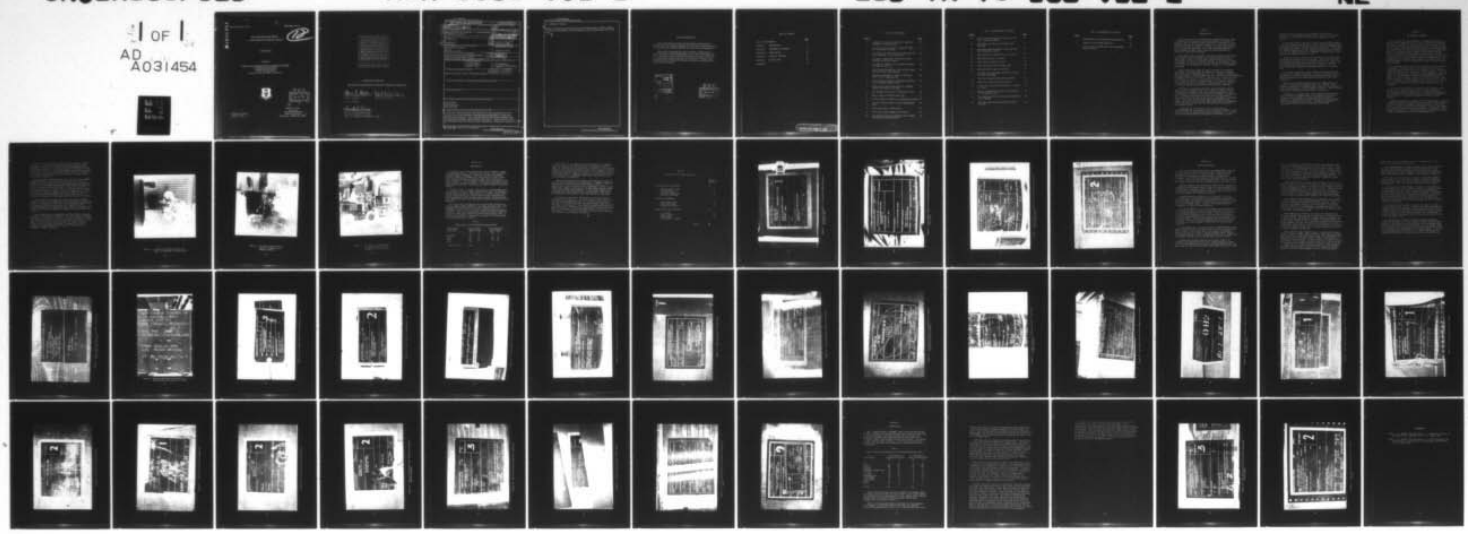
AD-A031 454 MITRE CORP BEDFORD MASS F/G 9/2
MAC AIR CARGO DATA ENTRY: 2. PHOTOGRAPHY OF SHIPPING LABELS.(U)
AUG 76 S L SMITH F19628-76-C-0001
UNCLASSIFIED MTR-3066-VOL-2 ESD-TR-76-162-VOL-2 NL

1 OF 1
AD A031454



END

DATE FILMED
12-76

ESD-TR-76-162, Vol. II

MTR-3066, Vol. II

MAC AIR CARGO DATA ENTRY:
2. PHOTOGRAPHY OF SHIPPING LABELS

AUGUST 1976

Prepared for

DEPUTY FOR COMMAND AND MANAGEMENT SYSTEMS
ELECTRONIC SYSTEMS DIVISION
AIR FORCE SYSTEMS COMMAND
UNITED STATES AIR FORCE
Hanscom Air Force Base, Bedford, Massachusetts

Project No. 515B
Prepared by
THE MITRE CORPORATION
Bedford, Massachusetts
Contract No. F19628-76-C-0001

REVIEW AND APPROVAL

This technical report has been reviewed and is approved for publication.

Thomas F. Bashara

THOMAS F. BASHARA, GS-12
Project Engineer

Robert S. Phillips

ROBERT S. PHILLIPS, Lt Col, USAF
MAC Liaison Office

FOR THE COMMANDER

Frank J. Emma

FRANK J. EMMA, Colonel, USAF
Director, Information Systems
Technology Applications Office
Deputy for Command & Management Systems

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: ESD-TR-76-162-Vol II-2	2. GOVT ACCESSION NO.
3. RECIPIENT'S CATALOG NUMBER	
4. TITLE (and Subtitle): MAC AIR CARGO DATA ENTRY: 2. PHOTOGRAPHY OF SHIPPING LABELS.	5. TYPE OF REPORT & PERIOD COVERED: Technical rept.
6. PERFORMING ORG. REPORT NUMBER: MTR-3066-Vol II-2	
7. AUTHOR(s): S. L. Smith	8. CONTRACT OR GRANT NUMBER(s): F19628-76-C-0001
9. PERFORMING ORGANIZATION NAME AND ADDRESS: The MITRE Corporation, Box 208, Bedford, MA 01730	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS: Project No. 515B
11. CONTROLLING OFFICE NAME AND ADDRESS: Deputy for Command and Management Systems, Electronic Systems Division, AFSC, Hanscom Air Force Base, Bedford, MA 01730	12. REPORT DATE: August 1976 13. NUMBER OF PAGES: 52
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office): 54p.	15. SECURITY CLASS. (of this report): UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited. AF-515B

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DATA ENTRY
IMAGE QUALITY
PHOTOGRAPHY

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

In April 1975, MITRE personnel visited the MAC air cargo terminal at Dover Air Force Base to test the possibility of photographing shipping labels of cargo being unloaded at the truck dock. This report describes the photographic technique used, the image quality obtained, and the problems encountered. Various factors are cited that contributed to the few instances of poor image quality. Statistics are presented →

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

235050

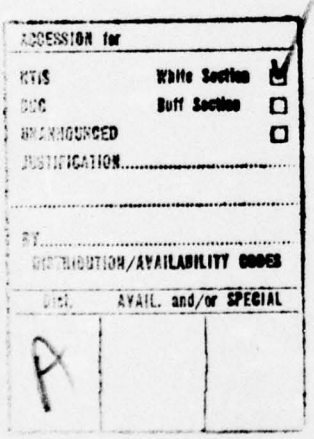
20. ABSTRACT (Cont'd)

relative to data items sometimes missing from shipping labels, to assist in future comparison of photography with other alternative modes of data capture at the truck dock.

ACKNOWLEDGMENTS

This report has been prepared by The MITRE Corporation under Project 515B. The contract is sponsored by the Electronic Systems Division, Air Force Systems Command, Hanscom Air Force Base, Massachusetts.

The pictures illustrating this report represent a small sample of almost 500 taken by MITRE photographer Louis C. Nocca during a two-day visit to the MAC air cargo terminal at Dover Air Force Base. This work was accomplished with the cooperation of Colonel Ruel J. Neeley, USAF, Commander of the 436 Aerial Port Squadron at Dover, and with the help of his men on the truck dock.



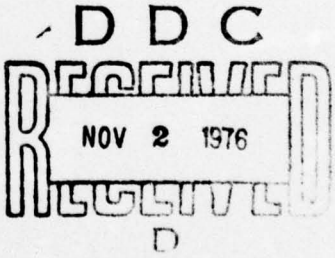


TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS (Continued)

LIST OF ILLUSTRATIONS (Concluded)

SECTION I

INTRODUCTION

In the Military Airlift Command (MAC) the handling of air cargo is accompanied by a great deal of data processing. All cargo is important, and so records are kept concerning its disposition while moving through the air transport system. It is vital that this data processing be made as efficient as possible, so that record keeping will not slow cargo handling. In the MAC Integrated Management System (MACIMS) program, various ways are being considered to improve air cargo data processing.

Preliminary analysis indicates that data processing at MAC's air cargo terminals can be improved by facilitating data entry at the truck docks. Here at the truck dock, cargo destined for export first comes into MAC's air transport system. As each piece of cargo is unloaded, its shipping label must be examined to determine proper disposition, and pertinent data recorded in some way for subsequent processing.

Several alternative modes are being considered for improving data entry at the truck dock, as discussed in the first volume of this report series (ESD-TR-76-162, Vol. I). It might be possible to provide a member of each unloading crew with some kind of keyboard/display, for example, which he could use to input data over a direct, on-line connection to a computer. Alternatively, he might record shipping data in some way, perhaps by keying items into a digital recorder or simply writing them on a checksheet, with subsequent data input to the computer delayed until truck unloading has been completed.

Other modes of data entry which are being considered involve image capture of shipping label data at the truck dock, either by conventional photography or by video recording techniques. Such alternatives, if feasible, offer potential advantages in truck dock use. A complete set of data about each piece of cargo could be recorded in the few seconds it might take to photograph its shipping label. There would be, of course, some disadvantages as well, notably the delay incurred before imaged data could be processed and then transcribed into digital form for subsequent availability in the computer system.

Photography may not prove the mode of choice when all considerations have been weighed, but the potential benefits of that approach warrant at least a preliminary investigation. On 1-3 April 1975 several MITRE personnel visited MAC's mechanized air cargo

terminal at Dover Air Force Base, Delaware, to explore the feasibility of photographing shipping label data in the truck dock environment. The results of that visit are summarized in this report.

A second objective of the visit to Dover was to obtain a corpus of several hundred photographs to be used as facsimile shipping labels in laboratory testing of alternative data entry modes at MITRE. These photographs were used to simulate truck dock data entry in an initial test program comparing an on-line handheld keypad/display, a digital recorder, and manual checksheets, documented in volume three of this report series (ESD-TR-76-162, Vol. III).

During the visit to Dover, one day was spent at the truck dock photographing the labels of arriving cargo. Another day was spent photographing the labels of all accessible cargo at the pallet pits and in temporary storage areas about the floor of the terminal. The photographic technique used is described in Section II of this report, along with comments on problems encountered in equipment use.

In general, photographs of good quality were obtained, as the pictures in this report will attest. Section III presents sample photographs of different image quality, and discusses those factors which contributed to the relatively few instances of poor image legibility.

Many of the problems contributing to poor image quality have nothing to do with the photography itself, but instead reflect deficient preparation of shipping labels, their poor positioning on oddly shaped packages, and their damage in transit. These practical problems are illustrated and discussed in Section IV.

Occasionally a shipping label may be prepared with some data items missing, or possibly wrong. That problem is discussed in Section V. The incidence of missing data may influence the comparison of photography with other alternative data entry modes. That is the purpose of this report, to establish a baseline of observations from which such a comparison can be made.

SECTION II

PHOTOGRAPHIC TECHNIQUE

As it turned out, the photography of shipping labels proved a fairly straightforward matter. At the truck dock the photographer worked with a cooperative unloading crew. As each piece of cargo was removed from the van, by hand or by forklift, a photo was taken of its shipping label before the piece left the unloading platform. This process did not seem to delay unloading operations appreciably, since the photography was much faster than the cargo handling itself. As a characteristic example, in one measured instance it took six minutes for the forklift to haul out a group of five pieces of cargo, but only one and one-half minutes to photograph all five shipping labels. Sometimes cargo stacked on a forklift had to be shifted somewhat in order to photograph a label, but such problems were infrequent.

The equipment used was what one would expect from a professional photographer. The camera was a 35 mm Pentax with a 50 mm lens. Illumination was provided by two 75 W reflector bulbs. Camera and lights were mounted on a special rig, a metal frame which could be braced against each piece of cargo to be photographed, as shown in Figure 1. This arrangment permitted steady positioning of the camera at a fixed distance of about 45 cm from the shipping label. At tnat distance, the larger labels filled almost the full field of view. The standard label is approximately 10 cm by 14 cm in size, not counting its border, but there is some variation about that standard.

The film used was Tri-X, a relatively fast film with an ASA rating of 400. Exposures were 1/60 sec at f/8, probably a satisfactory setting for general use, although some adjustment to that speed/aperture combination might occcasionally be desirable to increase depth of field when photographing labels on curved surfaces.

Standard processing was employed for film development. Negative images were enlarged to produce prints approximately the actual size of shipping labels, although no attempt was made to control size exactly. In any routine use of photography to capture label images, it is probable that no prints would be made. The negatives would simply be projected to a size large enough for comfortable viewing during the subsequent key entry of photographed data.

In routine use, the camera itself could be a simpler, cheaper instrument. It could have fixed focus, shutter speed and lens aperture, optimized for the single task of photographing labels, along with an automatic film advance, which would simplify its use to the point where even a novice photographer could hardly go wrong. In practice, of course, it might prove more expensive to procure such a special, simple camera than to purchase a standard model of more general capability.

The photographic rig devised for this trial run proved somewhat cumbersome in use. Aiming the camera was sometimes clumsy for labels in difficult positions, as suggested by the scene shown in Figure 2. For convenient positioning, occasionally the camera had to be held upside down in relation to a label. This would not matter, of course, if the final product of photographic processing were a stack of separate prints. But if the final product is to be a film strip of negative images, which would seem more practical, then the occasional appearance of an inverted label in the projection of images for data transcription would prove disturbing.

The trailing cable to power the lights also proved a bother, tending to hinder the photographer as he moved about among piles of cargo. For routine use, such a rig could be made more compact, with self-contained lighting battery-powered to improve mobility. Assuming automatic film advance, one could imagine an operator doing no more than placing his "photo-box" against a label and pushing a button.

A more compact photo kit would also be less subject to various hazards in the truck dock environment. It could be worn slung over the shoulder, safely out of the way of boots and forklifts. MITRE's test rig was too unwieldly to be carried about continuously. It is shown in the lower right corner of Figure 3, lying on the dock beside two dollies which look robust by comparison. In such a situation, the photographer must stay alert to retrieve his equipment if danger threatens.

Figure 1. A special rig positions camera and lights to photograph a shipping label

Figure 2. For less accessible labels, aiming the camera can be somewhat difficult

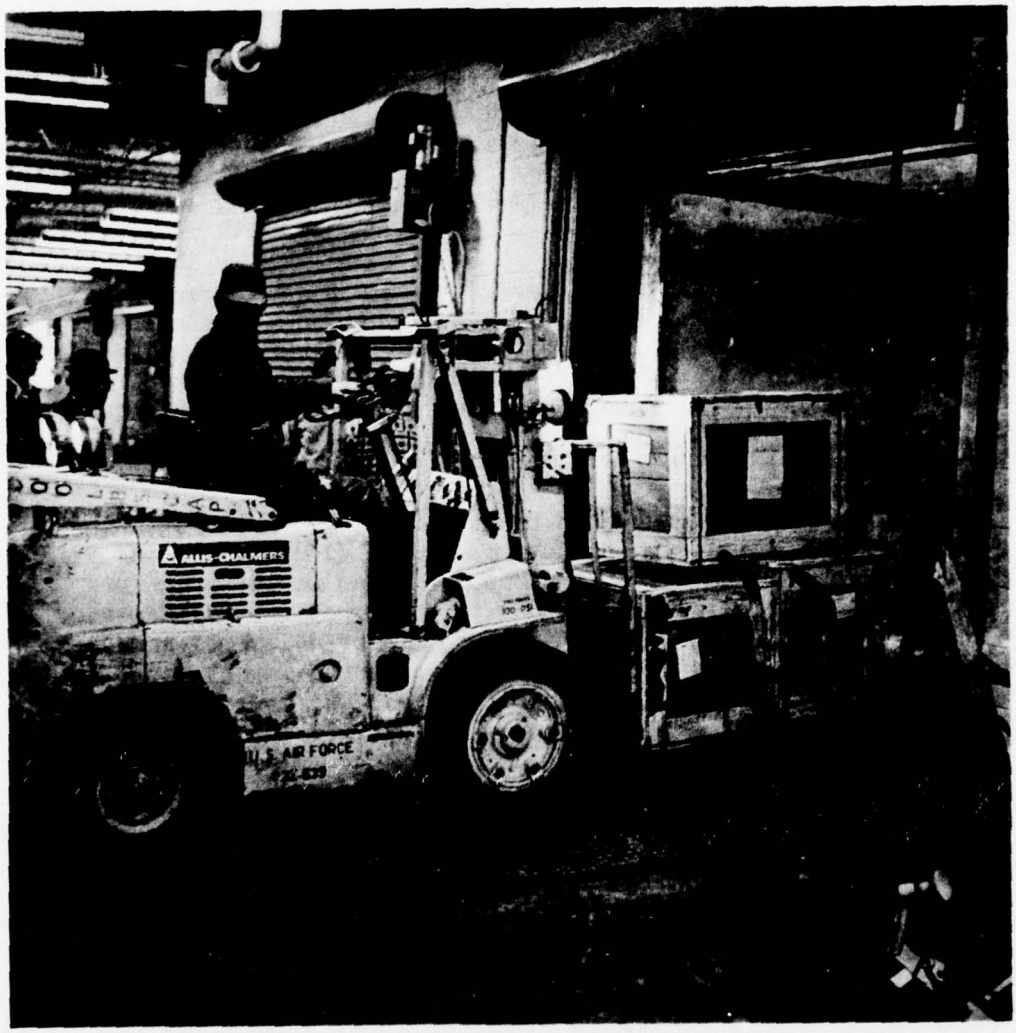


Figure 3. The camera rig looks fragile in comparison with other equipment on the truck dock

SECTION III

IMAGE QUALITY

Altogether, labels were photographed from 410 pieces of cargo, not counting duplicates. Of this total, all but a very few labels produced legible photographs. Image quality did vary somewhat, primarily because of differences in label quality. From a clean label carefully prepared an excellent image can be obtained, as shown in Figure 4. Even a somewhat rumpled label can provide a good legible image, as shown in Figure 5. For cargo photographed at the truck dock, 55 percent of the pieces had labels of good or excellent quality.

For many pieces, of course, image quality of photographed labels will be poorer. Figure 6 shows a curved label, which is somewhat scuffed, but which can be read fairly well. Figure 7 shows another type of image degradation, a label which has been shellacked for protection against rough handling; image contrast has been reduced and a pattern of ridged dirt obscures the picture, resulting in poor legibility.

All of the label photographs taken at Dover were reviewed and rated in terms of image legibility, as either excellent, good, fair (readable with some difficulty) or poor (readable with much difficulty, or not at all). A count of those ratings is presented in Table 1. Most of the labels were from truck-delivered cargo for export, but some labels were from air-transported import cargo in transit at the terminal. Ratings for the labels from import cargo are listed separately in Table 1.

Table 1

Image Quality of Photographed Shipping Labels

Rated Image Legibility	Truck-Delivered Export Cargo		Air-Transported Import Cargo	
	No.	%	No.	%
Excellent	46	13	5	8
Good	145	42	14	22
Fair	113	33	38	59
Poor	40	12	7	11
Total Pieces	344		64	

There seems to be a tendency for label quality to be somewhat lower for import cargo than for export. Comparing the relative number of excellent and good labels with the number of fair and poor labels for the two cargo categories, statistical analysis confirms a significant difference ($X^2=14.53$, $p<.001$). It is possible that the shipping personnel of commercial vendors, who supply a good portion of the export cargo, package and label cargo more carefully than their government counterparts.

Labels with images of poor quality were examined in order to classify the various causes of illegibility. A number of different problems were discerned, and these are listed in Table 2. No labels came out poorly because of poor photography. Images of poor quality were caused by deficiencies in label preparation or damage to the label during cargo handling. If the labels themselves are illegible, their photographs will be illegible also. That point is illustrated in some detail in the next section of this report.

One particular problem of photography at the truck dock was anticipated to be vibration. The floor itself is quite solid, but some cargo was photographed while on a forklift with its engine running. It was feared that the resulting vibration might blur the label image. No evidence of this potential problem was observed in the final prints. Pernaps it was counteracted by bracing the camera against the packages, so that the camera shared the vibration of their labels, or it may have been simply that the shutter speed was fast relative to the vibration frequency.

Table 2

Reasons for Poor Image Legibility

	Number of Instances
Deficient label preparation	19
blurred carbon copies	11
bad handwriting	6
defective typewriter	1
defective handstamp	1
Problems of packaging	8
bent/curved labels	4
shellacked labels	2
banding over labels	2
Damage during cargo handling	20
torn labels	11
smudged labels	6
water damage	2
re-labelled in transit	1
Total:	47

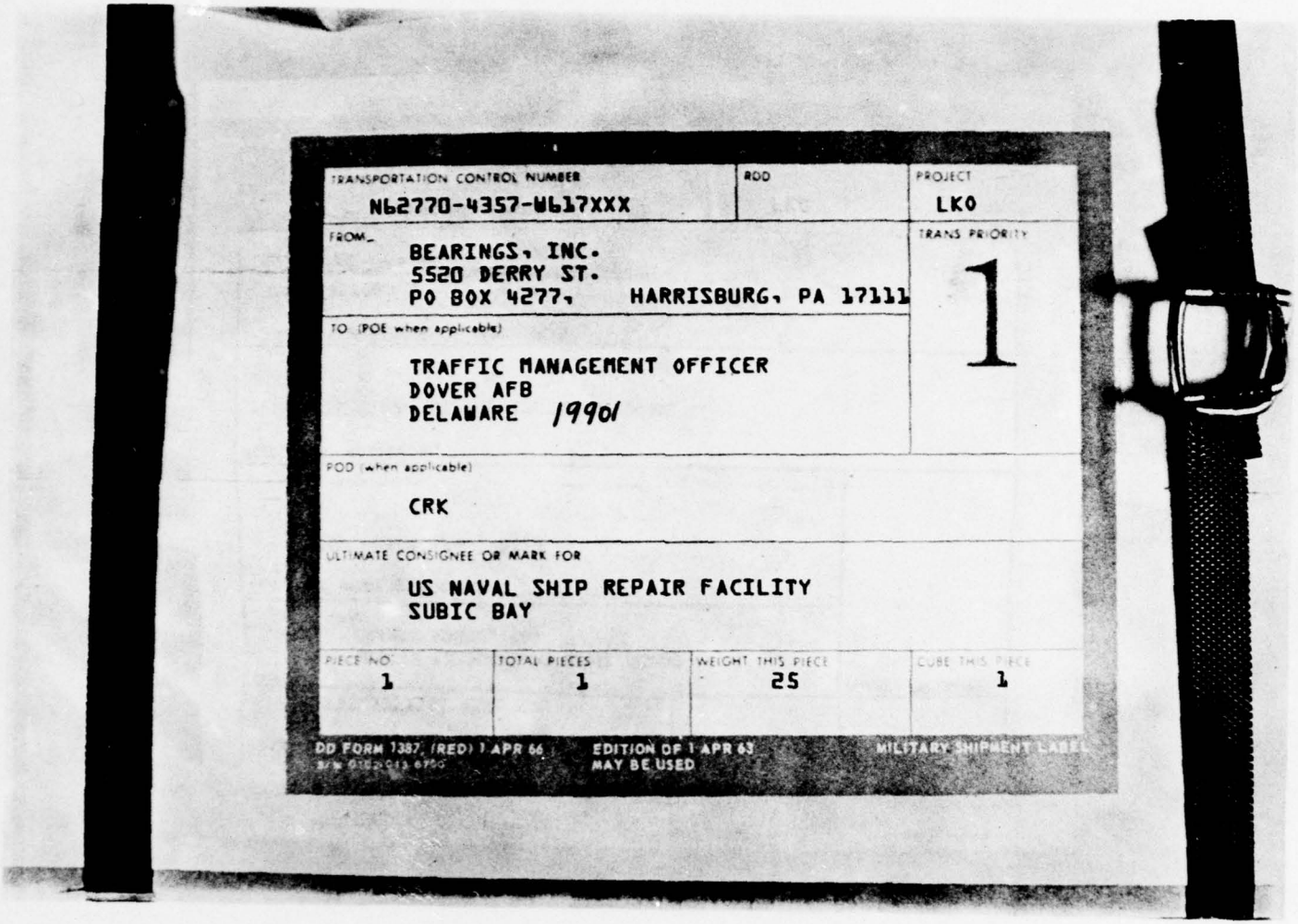


Figure 4. In terms of legibility, an excellent label provides an excellent image

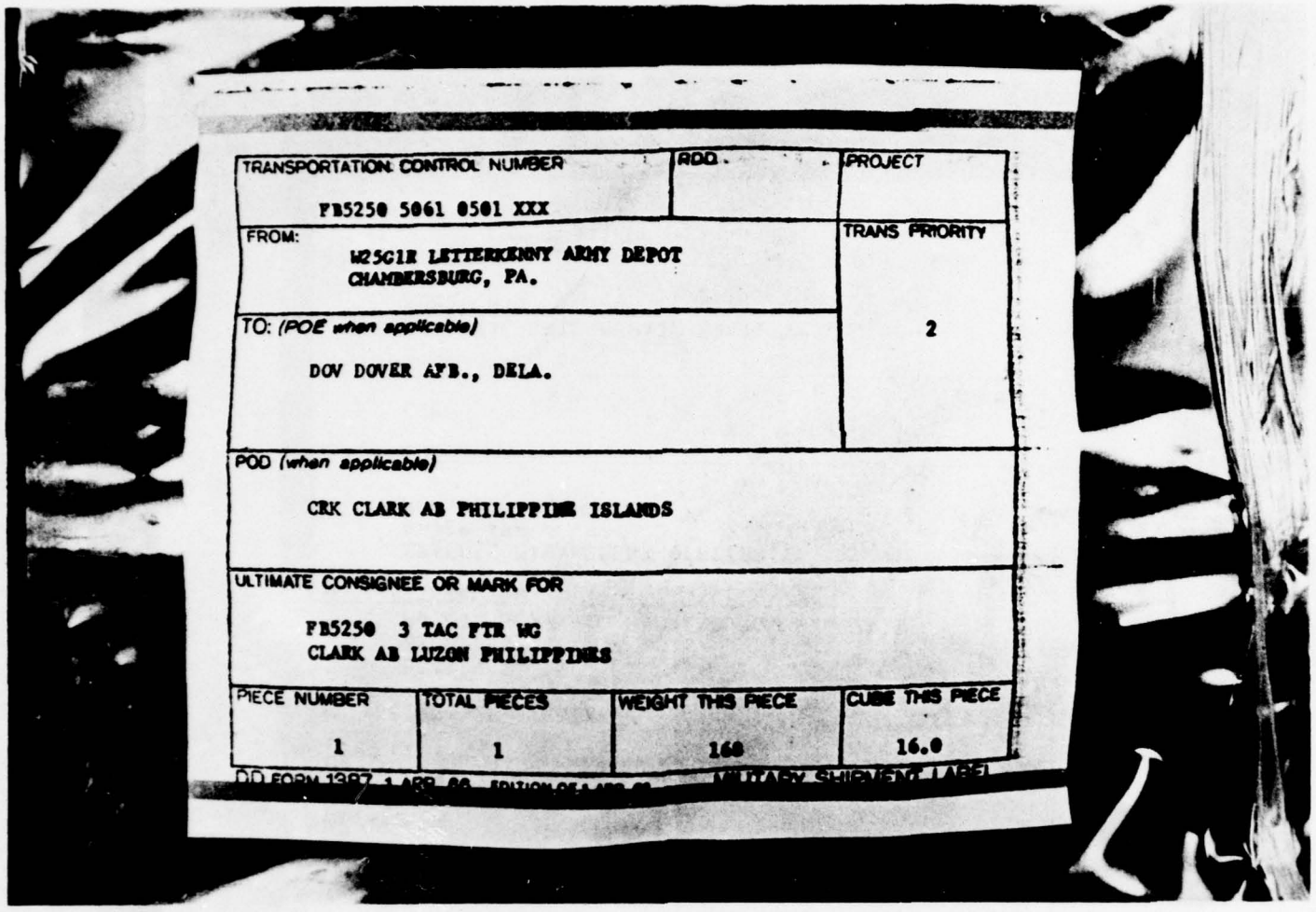


Figure 5. Good quality images can be obtained even when the label is not flat

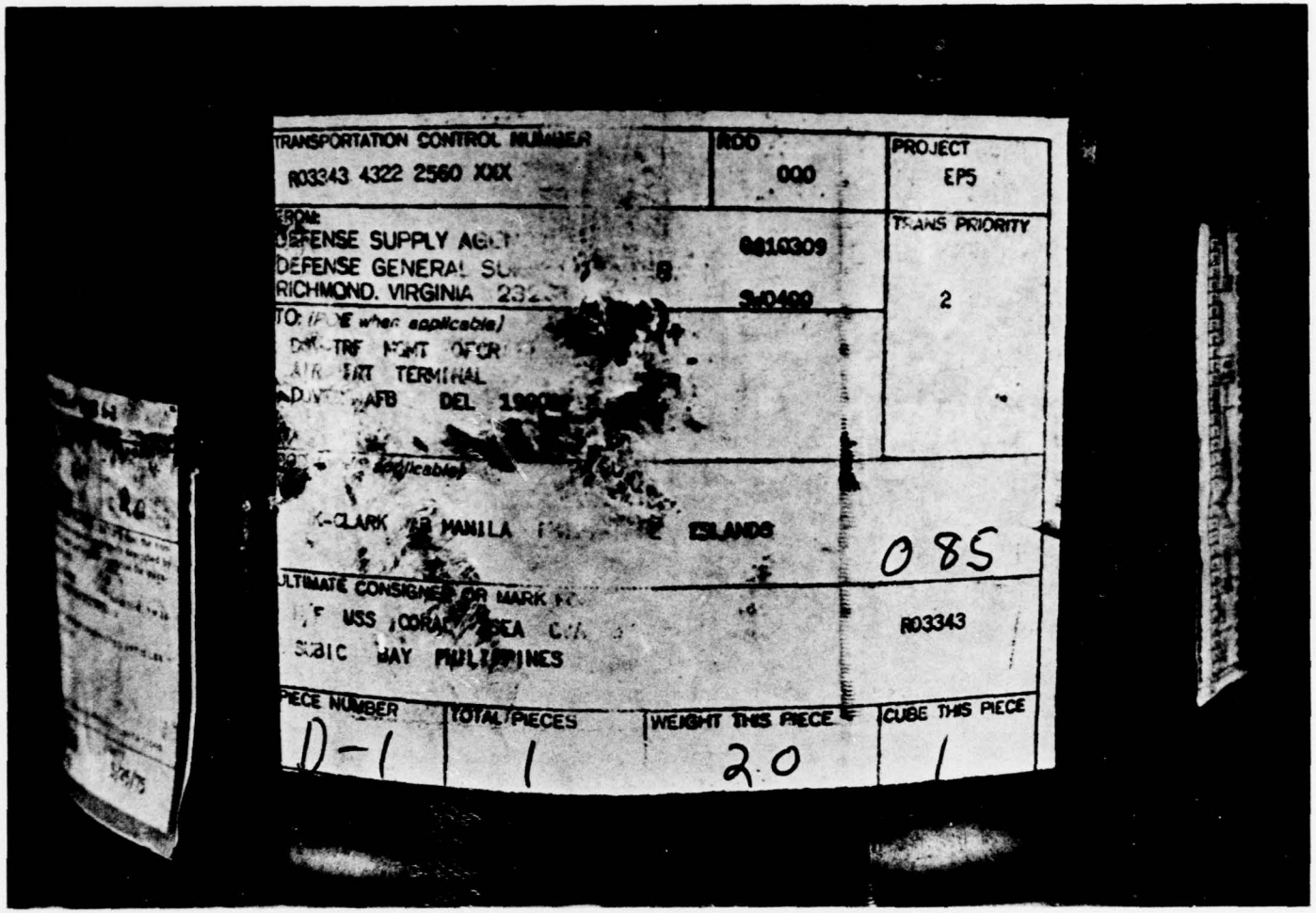


Figure 6. Curved labels can provide a fair quality image even after some rough handling

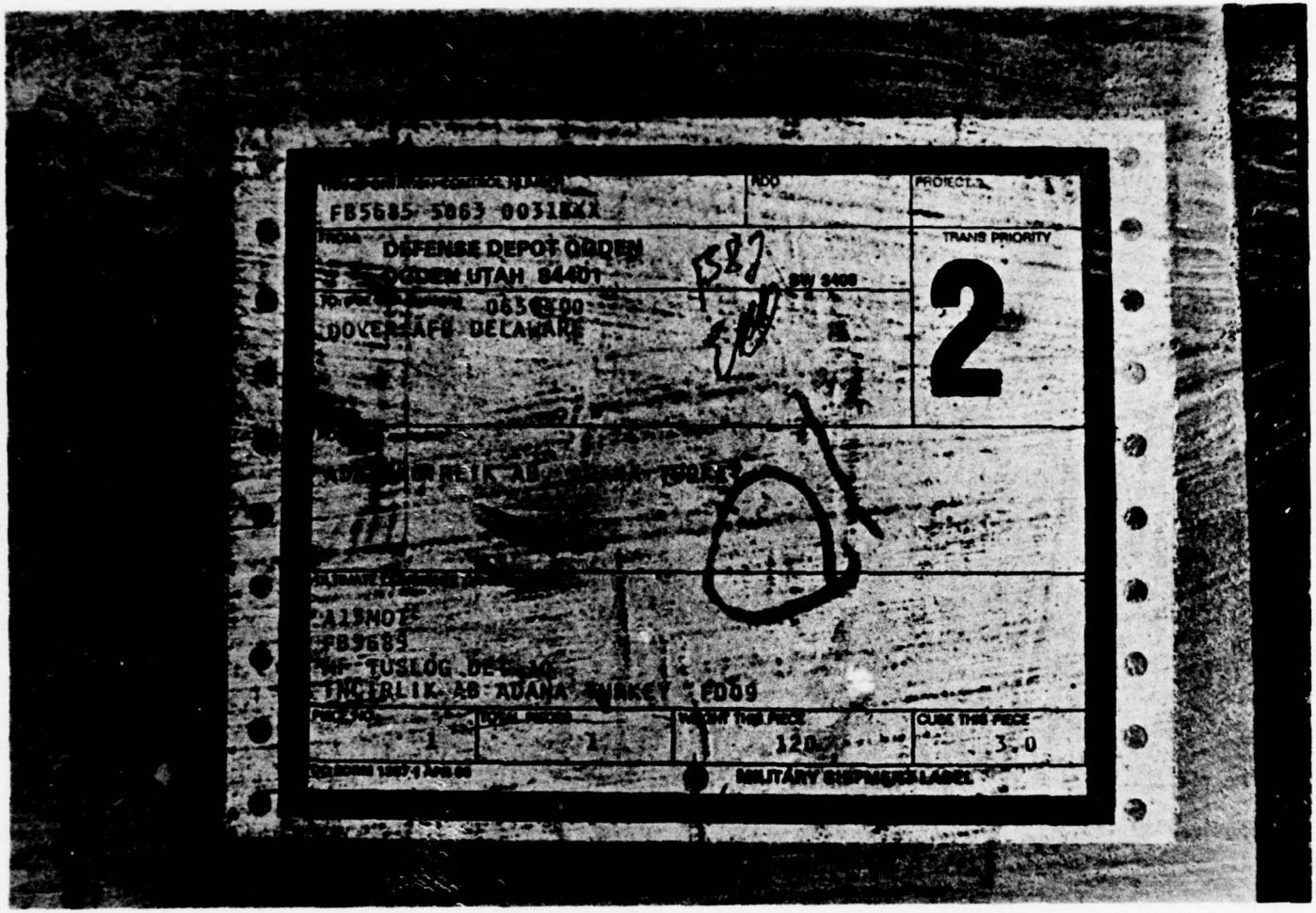


Figure 7. Shellacking intended to protect a label may result in poor image quality

SECTION IV

PRACTICAL PROBLEMS

Some minor problems associated with the photographic technique were discussed in Section II of this report. More significant problems, however, have to do with the ways in which shipping information is displayed on labelled cargo, or perhaps not displayed. If the necessary data were always available in the form of a neat, clean, flat and intact shipping label, all would be well. Some cargo is labelled in such a satisfactory way, but some is not.

Commercial vendors are required under MIL-STD-129 to apply the standard military shipment label, DD Form 1387, when packaging goods for shipping. Occasionally, some vendor will create an approximate facsimile of the standard label, as shown in Figure 8, which proves perfectly adequate for photographic purposes.

Government agencies, however, are not required to use the "standard" label, although its use is recommended in DoD manuals. As a consequence, many pieces of cargo seen at the terminal, as for example the personal effects of transferred military personnel, do not have the standard label. Instead, the necessary shipping information is supplied in some other way.

One common expedient is to stencil shipping data across the side of a carton, as shown in Figure 9, which may result in a symbol array extending perhaps 60 to 90 cm high. Faced with such a case, an experienced photographer could simply step back a few paces, adjust his camera appropriately, and still take a good picture, as illustrated here. The novice photographer may not find that quite so simple. Certainly the idea proposed earlier of a push button photo-box to be pressed against a label would not work in this situation.

If photography were to be chosen as the preferred means of data capture for use at the truck dock, some way of solving this problem must be found. One solution would be to require all shippers, military and civilian alike, to use the standard label. Another alternative might be to affix a handprinted label at the truck dock, on packages lacking a label, and then take a picture of that.

An expedient sometimes employed for military cargo is to configure the shipping label as a tag. MITRE observers at Dover noted one elaborate effort in which a full-size standard label had been glued to a plywood plaque that was attached by wire to a duffel

bag. A variation on this idea is to shrink the "standard" label somewhat and rearrange its data to fit on a smaller tag, as shown in Figure 10. Its photographed image is still fairly legible. More difficult for the photographer is the case where a standard label has been folded around a tag. Here two photos must be taken, front and back, to record the necessary data, as shown in Figures 11 and 12. That solution need cause no confusion in subsequent data transcription provided that the two adjacent images on the film strip do not become separated.

To balance the fact that some pieces of cargo do not have any shipping label, other pieces may arrive with extra labels of various kinds. Some of those labels, of course, are not shipping labels but provide supplementary data of one sort or another. Figure 13 shows a special handling label (DD Form 1387-2), Figure 14 a customs inspection label, and Figure 15 an inspection for serviceability label. There is no harm in photographing such auxiliary labels provided that the shipping label itself is not omitted by mistake.

Some pieces of cargo display multiple shipping labels, perhaps as many as three or four on different sides of a box. These are generally duplicates, affixed by a cautious shipper to provide redundancy in case one label is lost or scarred. This practice poses no problem to the photographer, and indeed may make his job easier since he would be less likely to have to move cargo to find a conveniently photographable label.

What might pose a problem is the occasional instance where multiple shipping labels are <u>not</u> the same, as on a container which is being re-used. Generally, old shipping labels are painted over, or defaced in some way as shown in Figure 16. MITRE observers at Dover, however, noted one box of personal effects with two different shipping labels, neither of which had been painted over. If the photographer should happen to notice such an instance, he would have to scan the contents of each label to decide which was the old one and which displayed current data.

Oddly shaped packages sometimes result in oddly bent shipping labels. Figure 17 shows a label curved so tightly that one picture does not provide a completely legible image. Two photographs taken from either side of this label would be needed to ensure that all shipment data could be read. If aimed properly, the camera can see fairly well around corners, as shown in Figure 18. There are limits to this capability, however, as shown by the bent label in Figure 19, whose top line is out of focus and blurred. If the camera is not aimed properly, some of the data on bent labels may be lost. Figure 20 shows the direct frontal view of a label which has a

double bend to fit its package; a line of consignee data on the label is not visible in this picture.

If photography were to become a standard mode of data capture at the truck dock, presumably shippers could be instructed to put labels on reasonably flat surfaces where possible, and to orient labels lengthwise on curved surfaces. Some bending of packages and labels may occur in transit, however, as illustrated in Figure 21.

If a label does not get bent in transit, it may get smudged, as shown in Figure 22, or suffer water damage, as shown in Figure 23. Shellacking the label to protect it from such hazards can degrade image quality in other ways, as illustrated earlier in Figure 7.

If a label does not get smudged in transit, it may get torn. Sometimes data may be lost, as shown in Figure 24. Sometimes tears can be repaired: the label shown in Figure 25 was subsequently flattened back in place to yield a legible photograph. An unlucky tear may reveal data from an older label in place of the data torn away, as shown in Figure 26. An extensive tear can leave very little data behind, as shown in Figure 27. The best means of protecting shipping data in transit is probably the use of redundant labels as noted earlier.

Sometimes the shipping label is intact but some of its data items are inaccessible. Figure 28 shows a steel band tightened over a shipping label, a frustrating note for anyone who wants to check its data. Figure 29 illustrates a different sort of irony, showing a piece on which some cargo handler working for an intermediate carrier has chosen the shipping label as the one best place to glue on his own special label.

In concluding this recital of special problems, two points should be emphasized. First, the difficult cases illustrated here represent rare exceptions to the great majority of shipping labels which were photographed without difficulty. Second, damaged labels and lost data would tend to hinder other modes of data entry as well as photography, although perhaps not to the same degree. It is not the photography which is at fault here. Indeed, the pictures of damaged labels came out quite well, even when the labels did not.

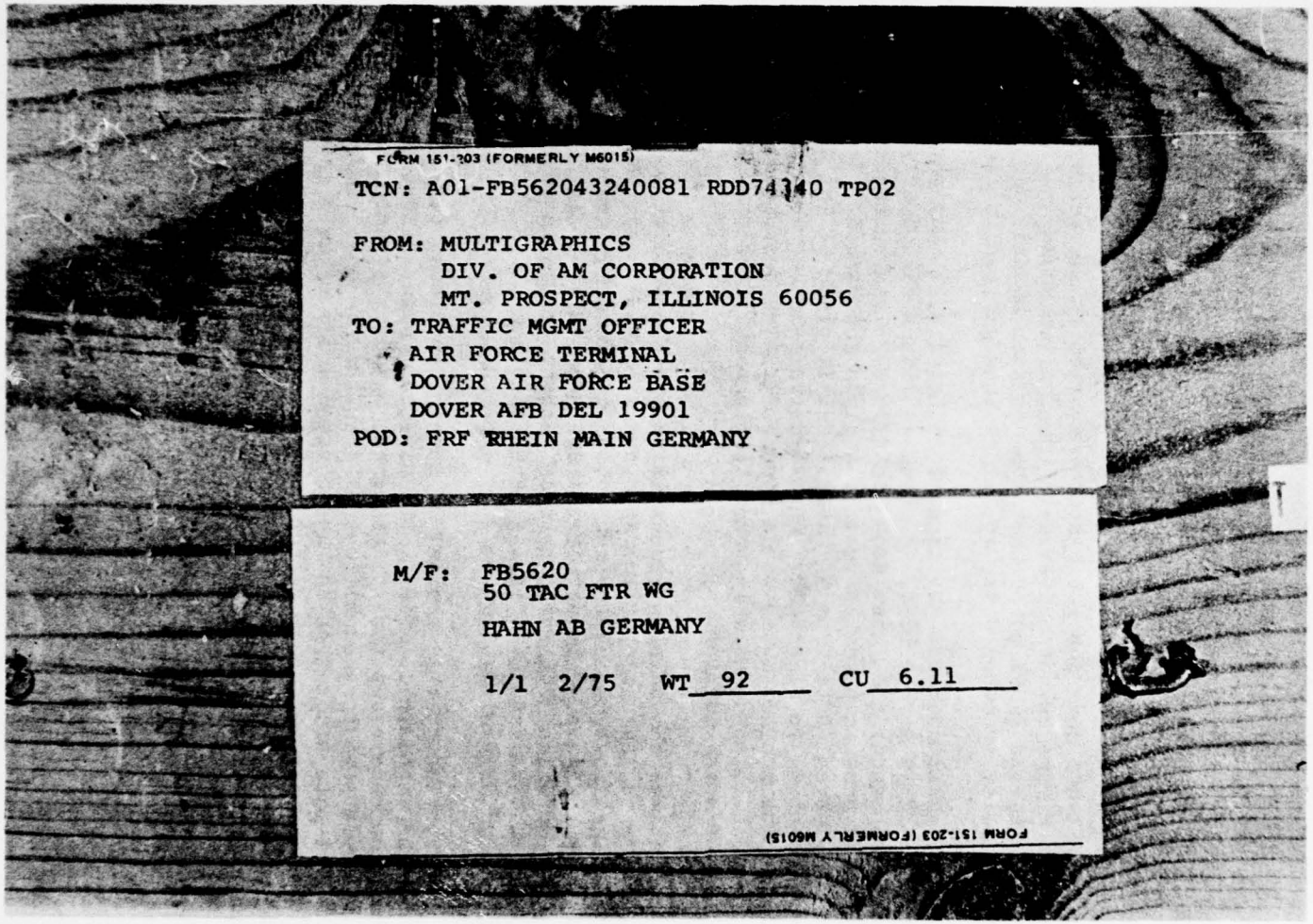


Figure 8. Some vendors may create a reasonable facsimile of the standard shipping label

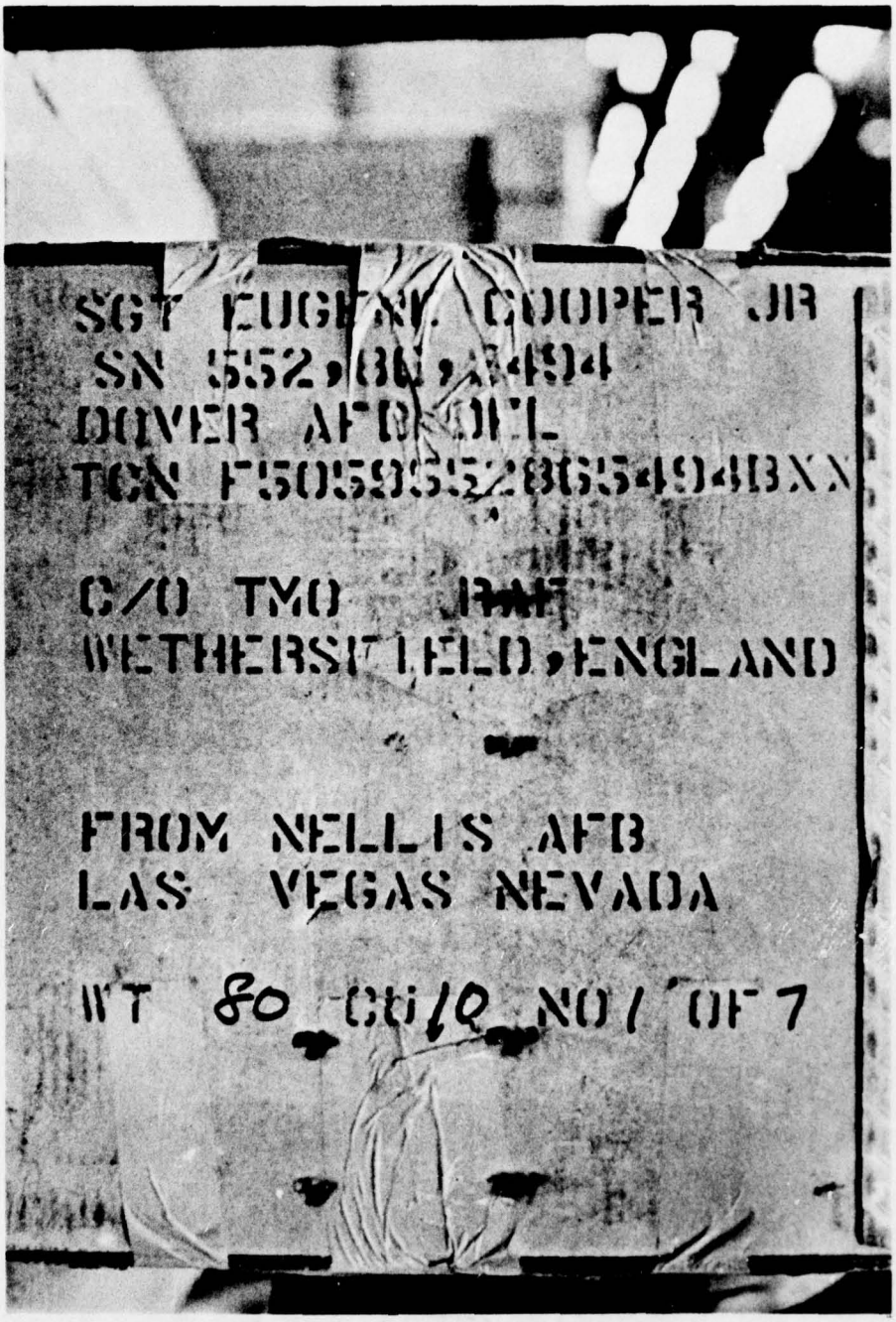


Figure 9. Shipping data may be stencilled on a package rather than typed on its label

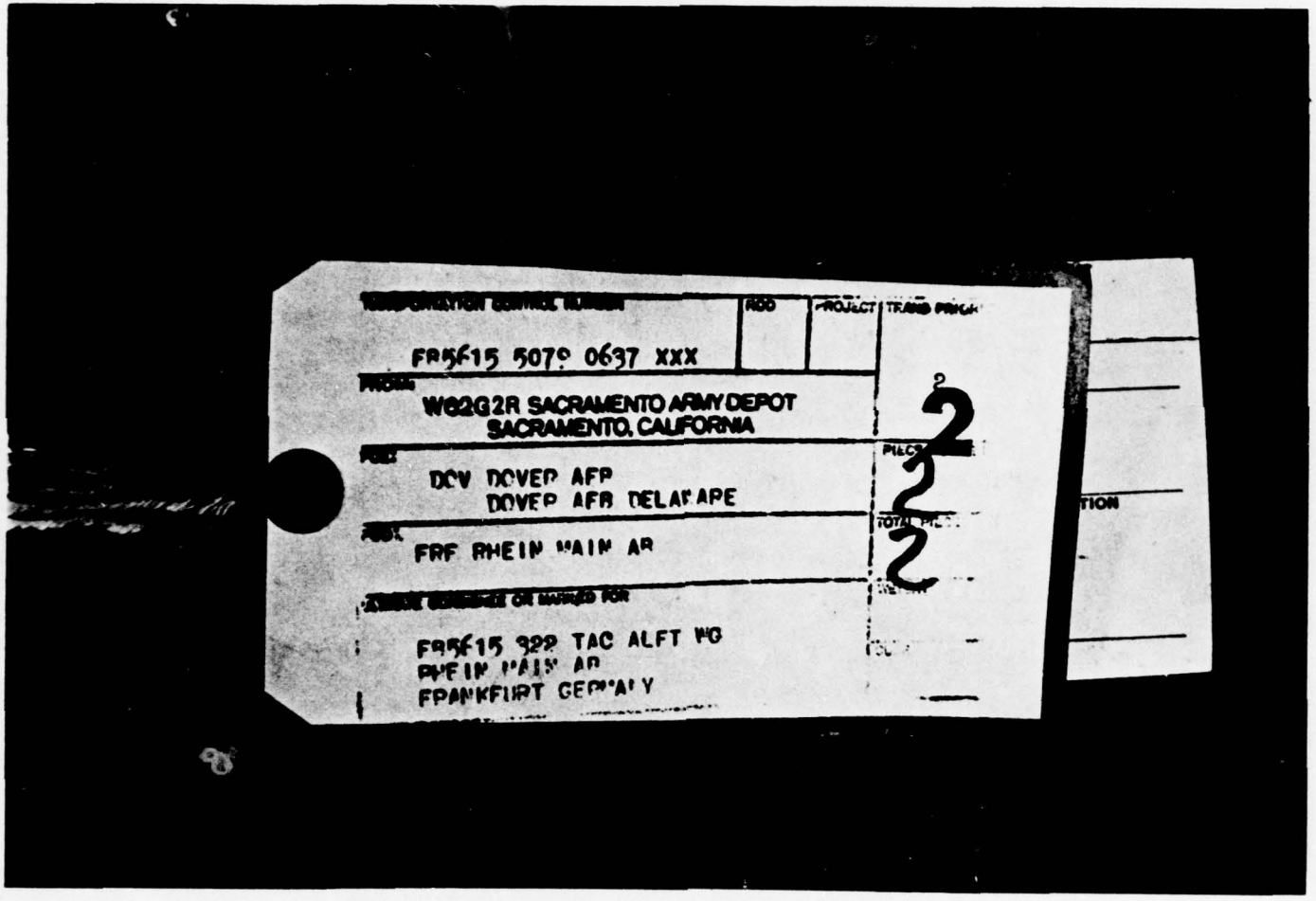


Figure 10. The shipping label can be configured as a tag

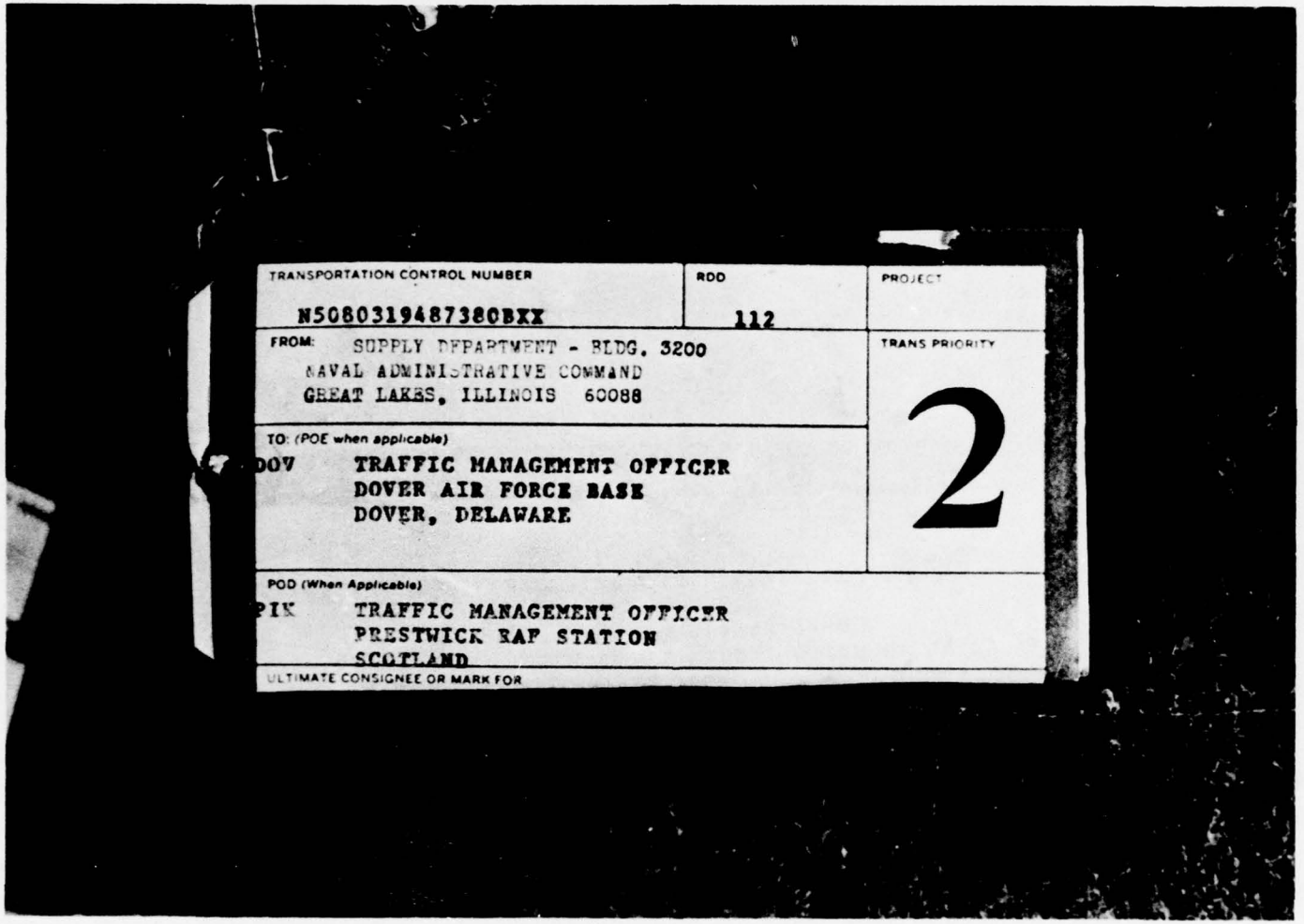


Figure 11. When a label is folded around a tag

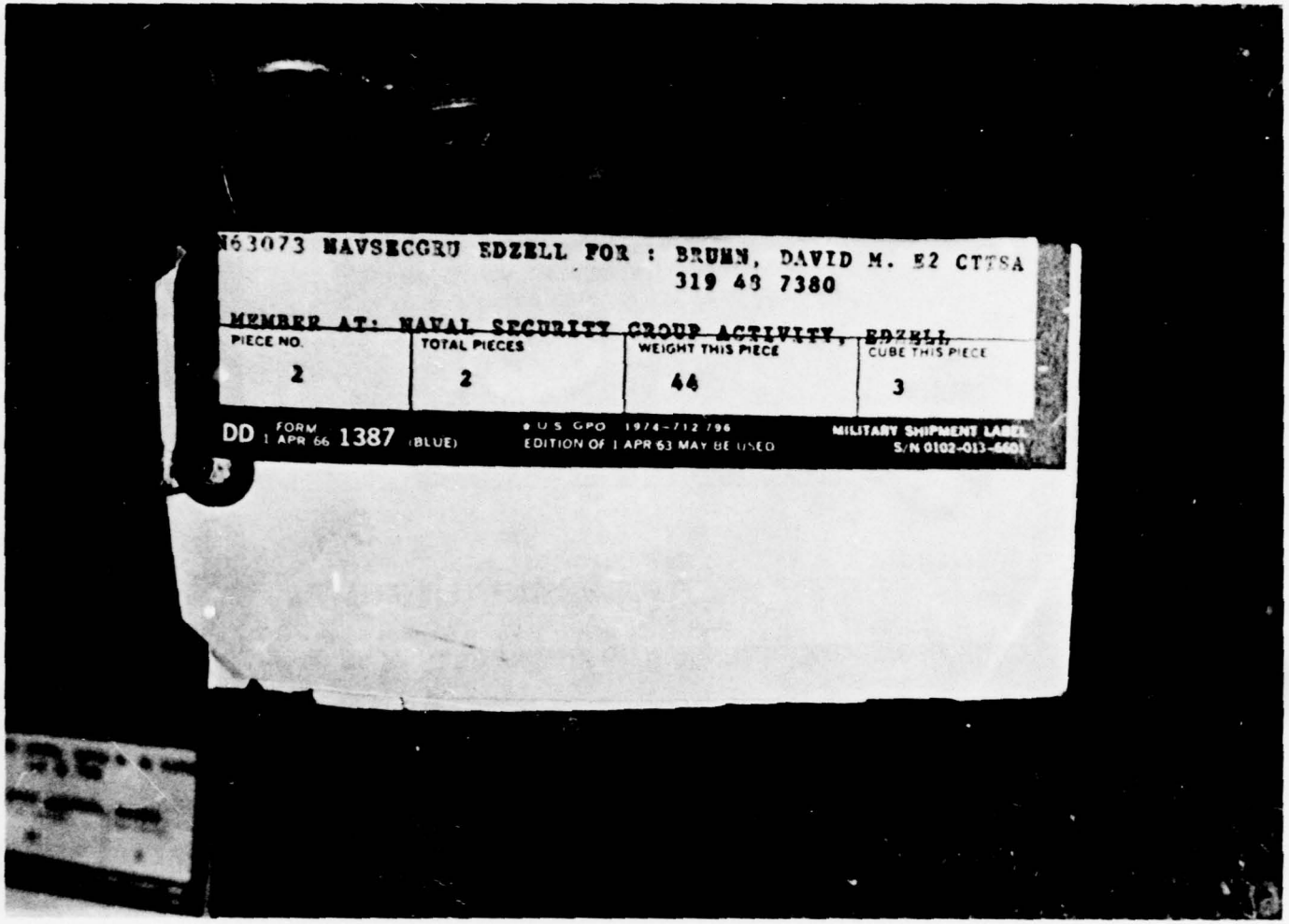


Figure 12. A second image is required to complete the picture

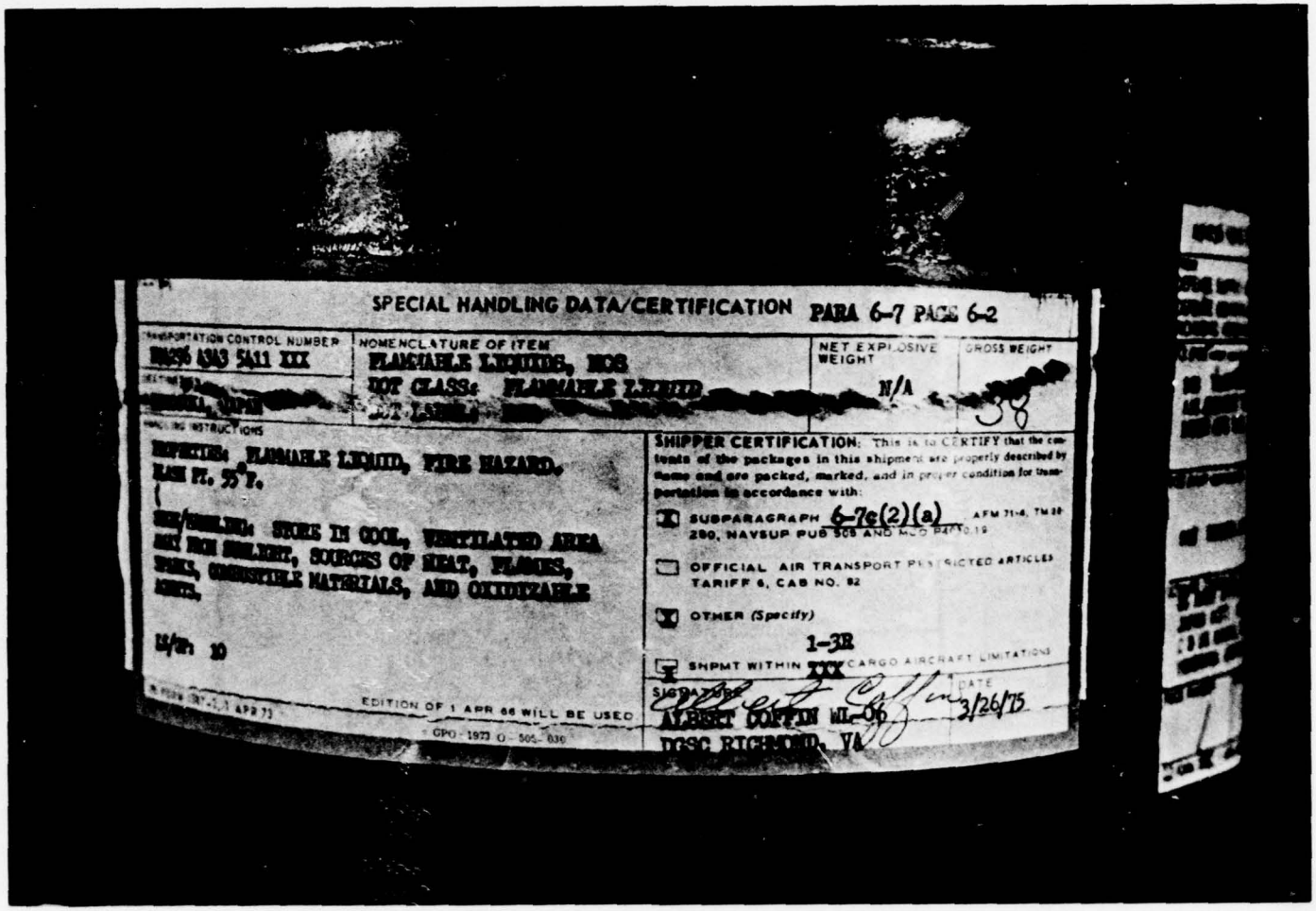


Figure 13. A special handling label carries supplementary data

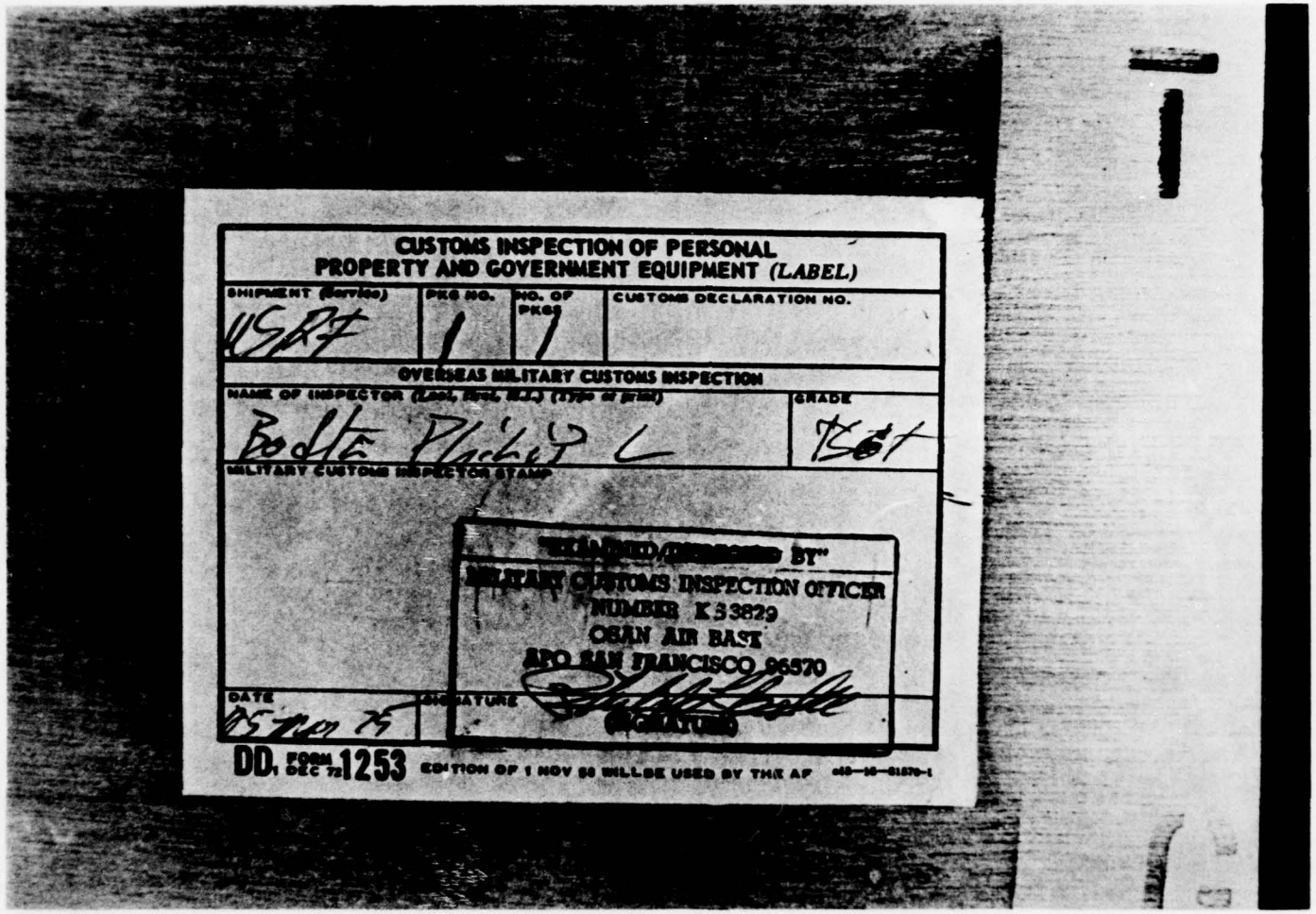


Figure 14. Some cargo bears a customs label

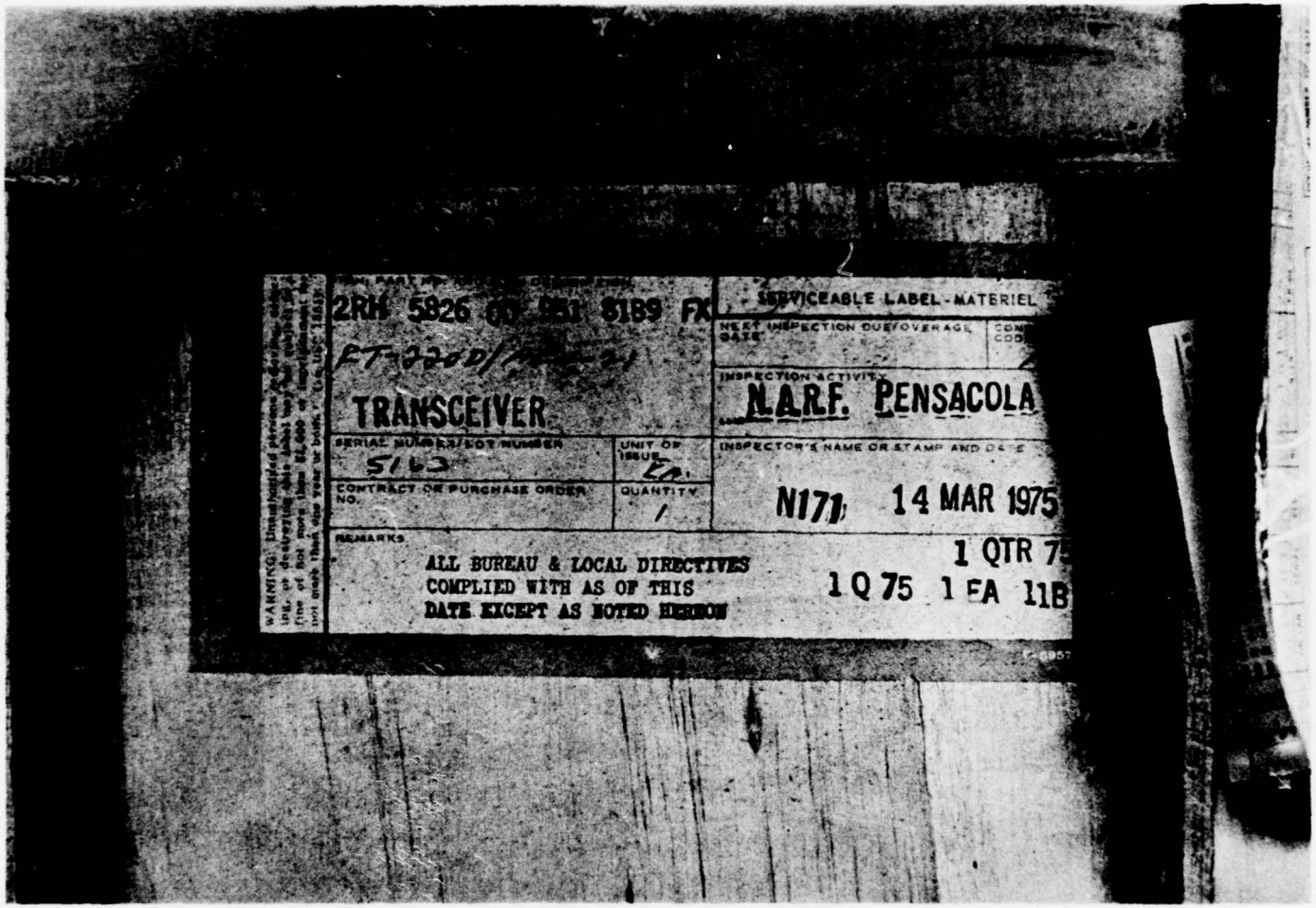


Figure 15. Still other labels compete for attention

Figure 16. Old shipping labels are sometimes still legible although deliberately defaced

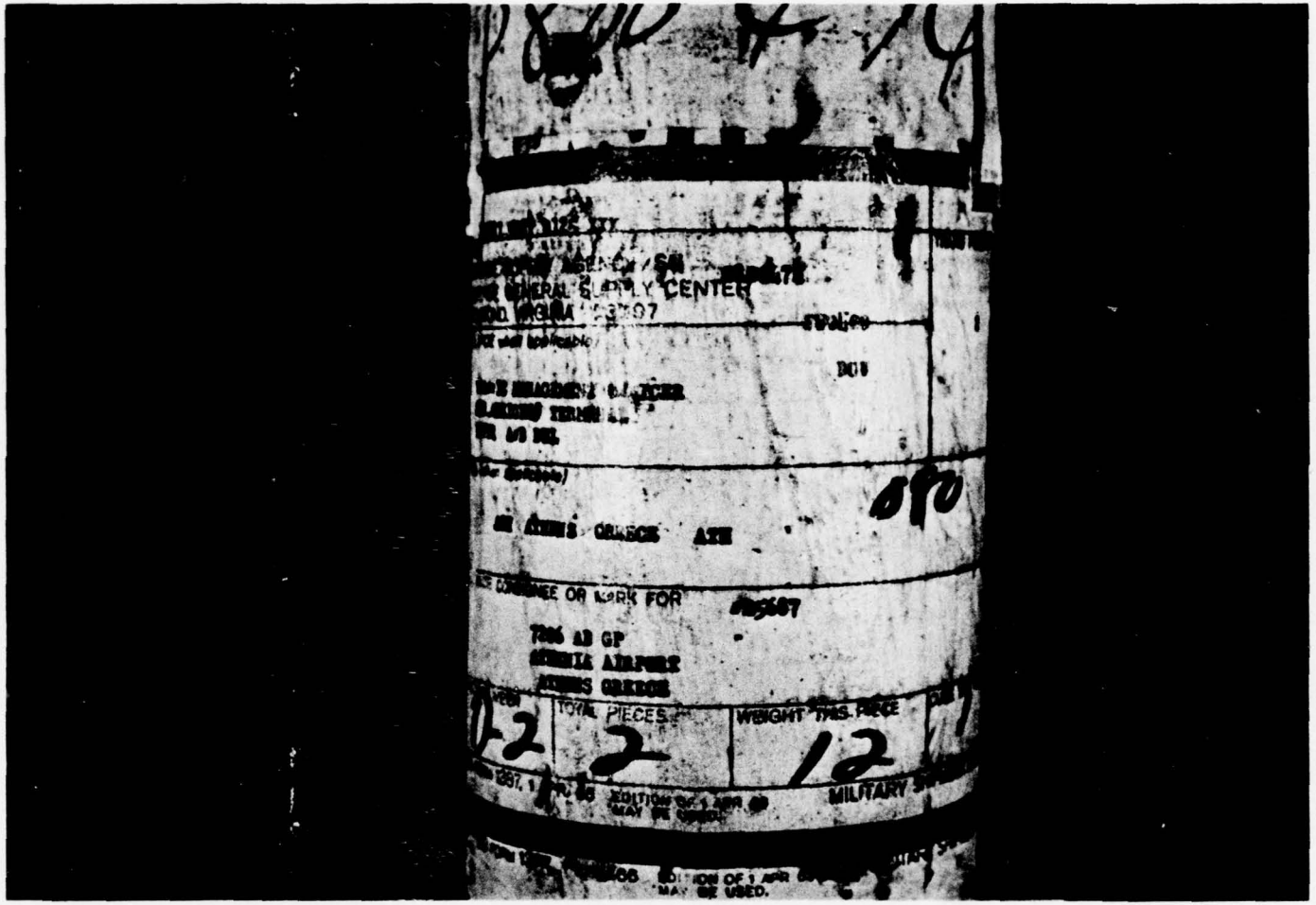


Figure 17. A label curved too much may be hard to read from a single photograph

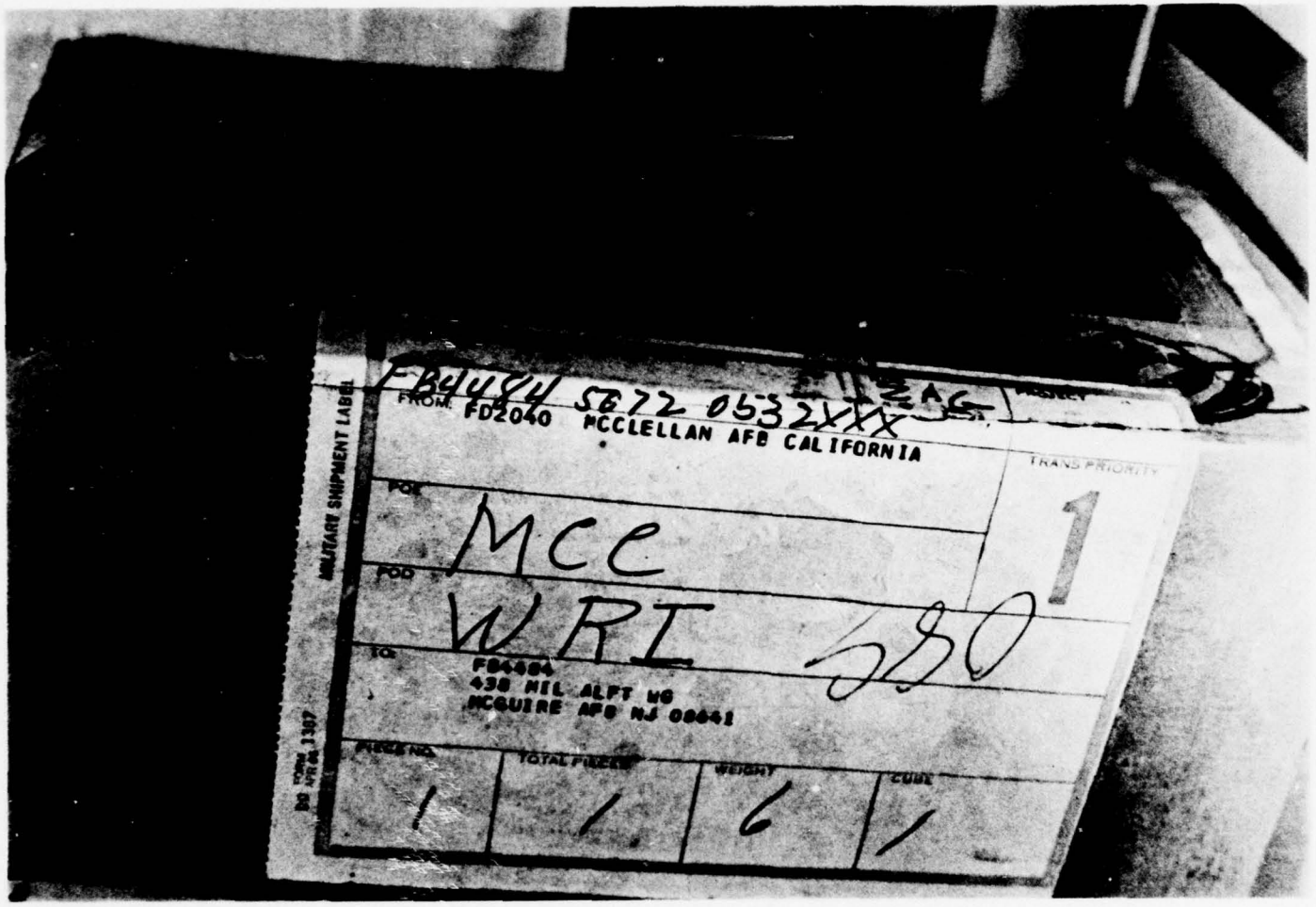


Figure 18. Some labels are bent over an edge of the container

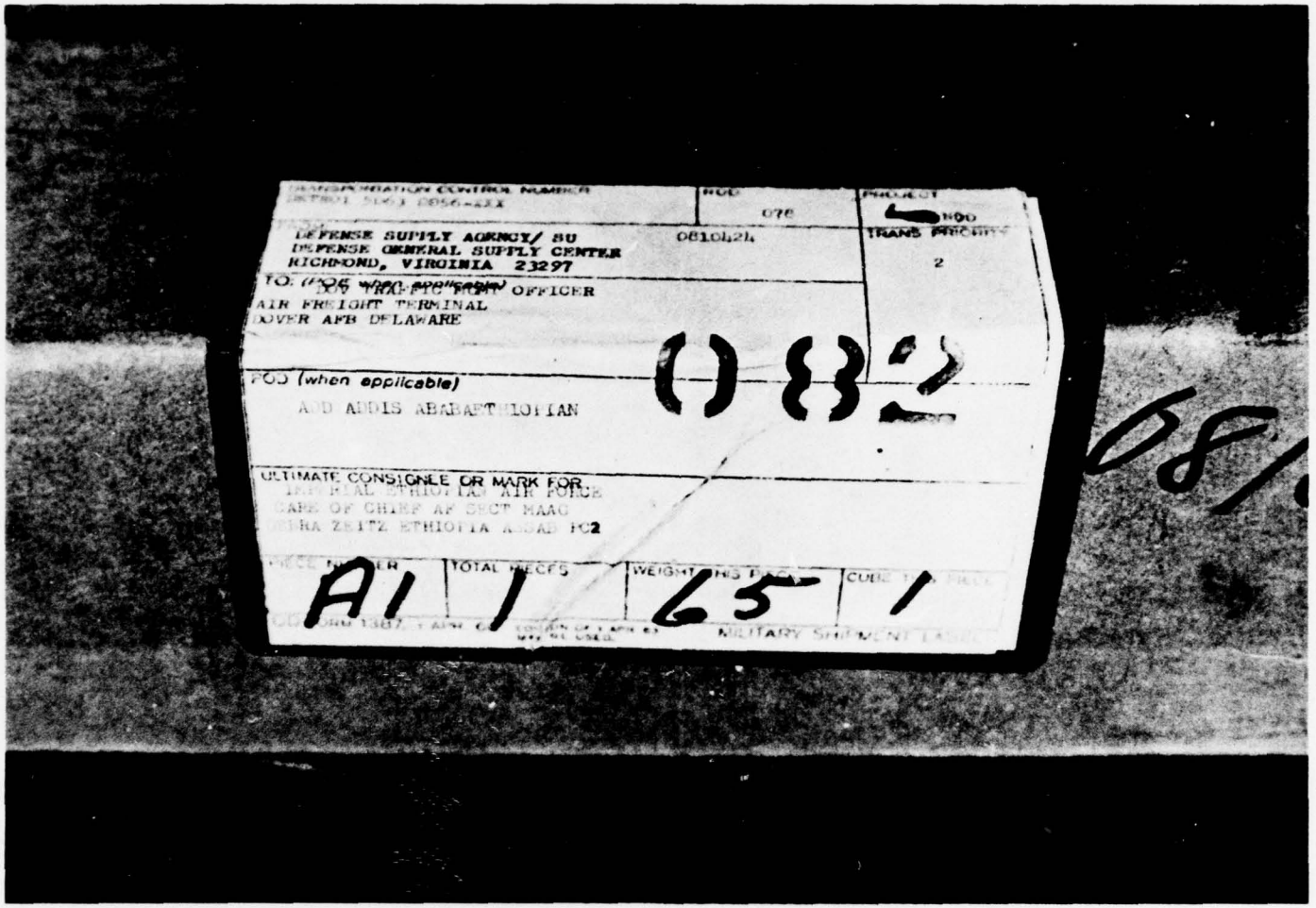


Figure 19. Two images would be needed to make this bent label completely legible

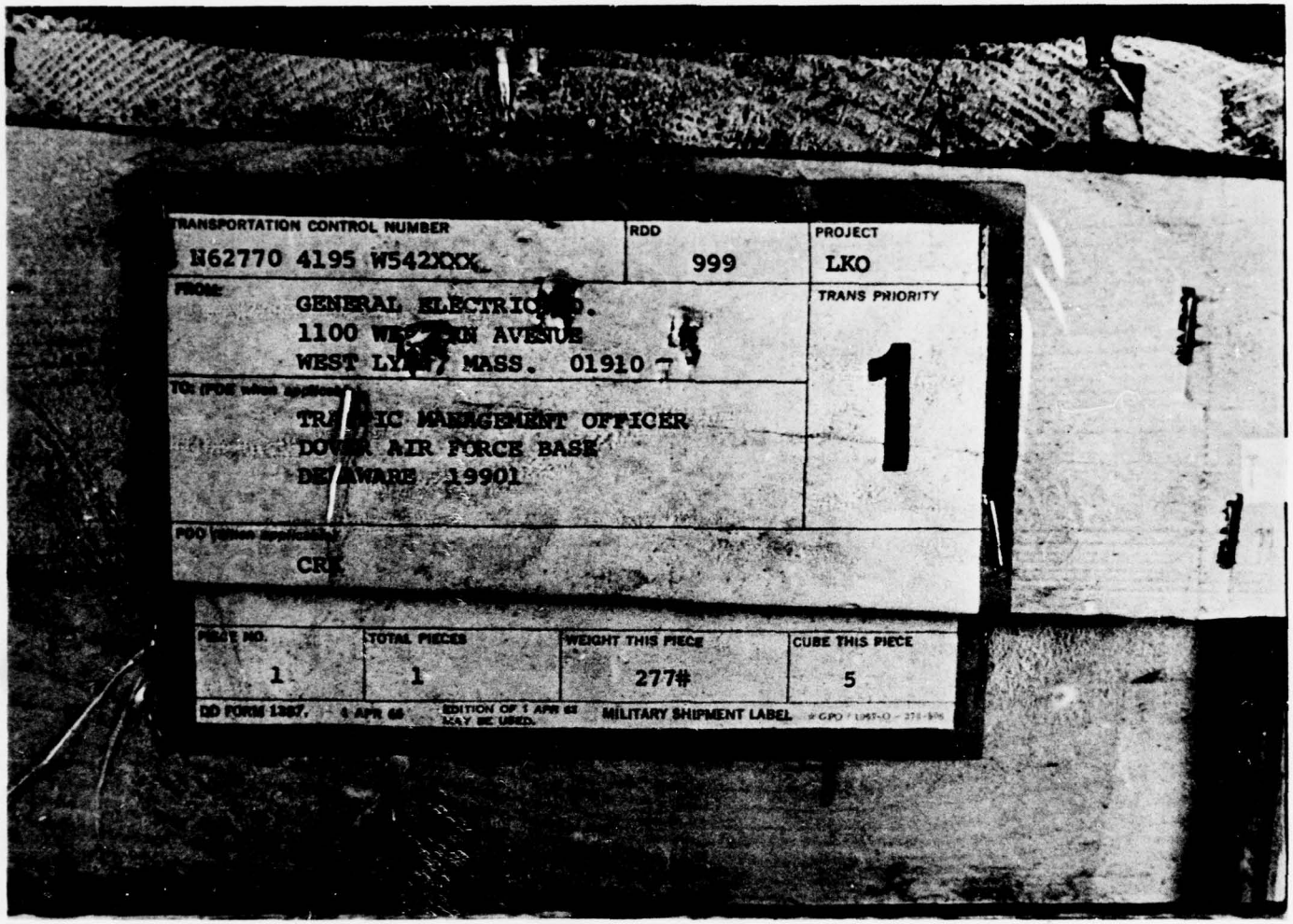


Figure 20. This label has to bend twice to fit its box

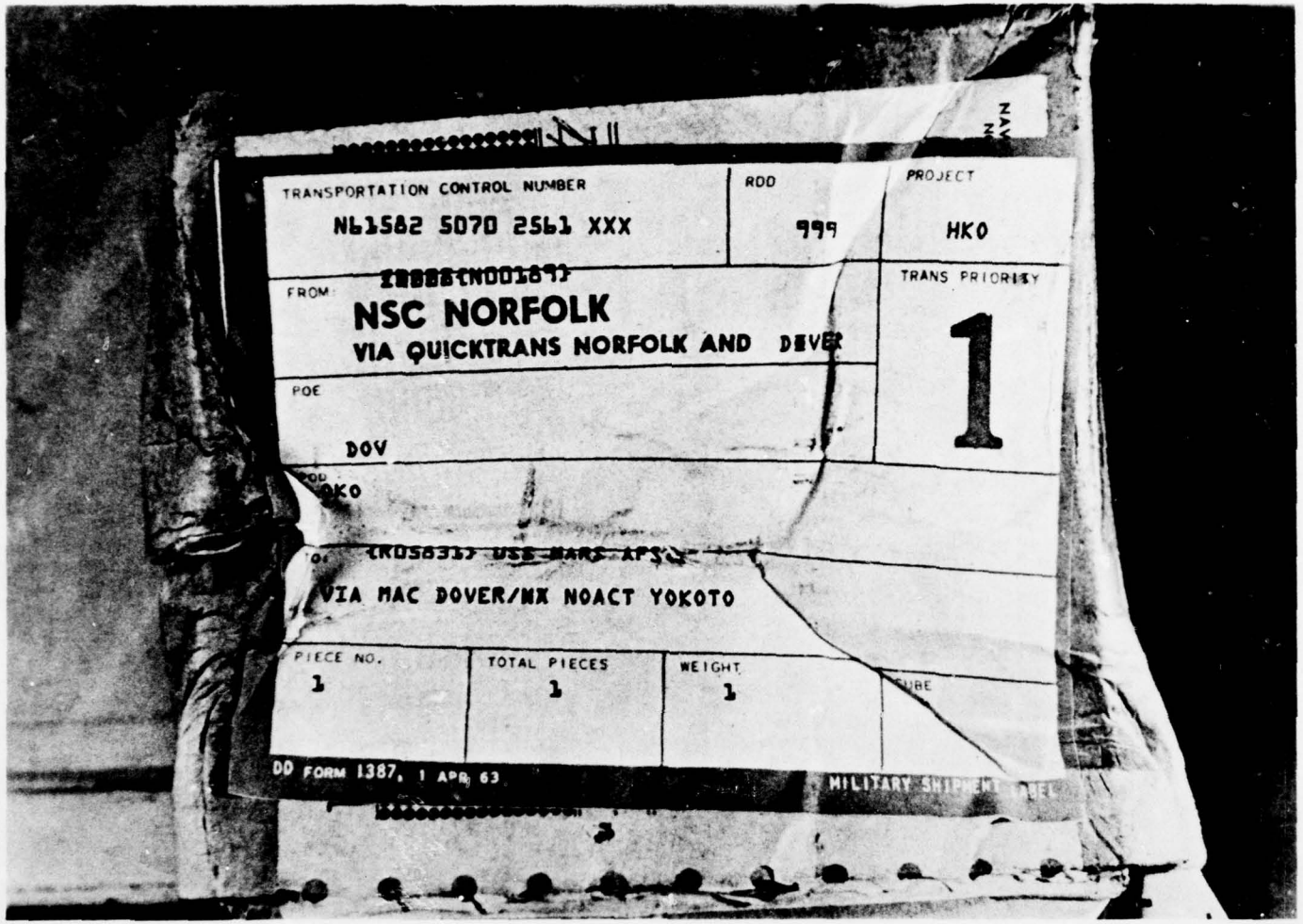


Figure 21. Some bending occurs in transit

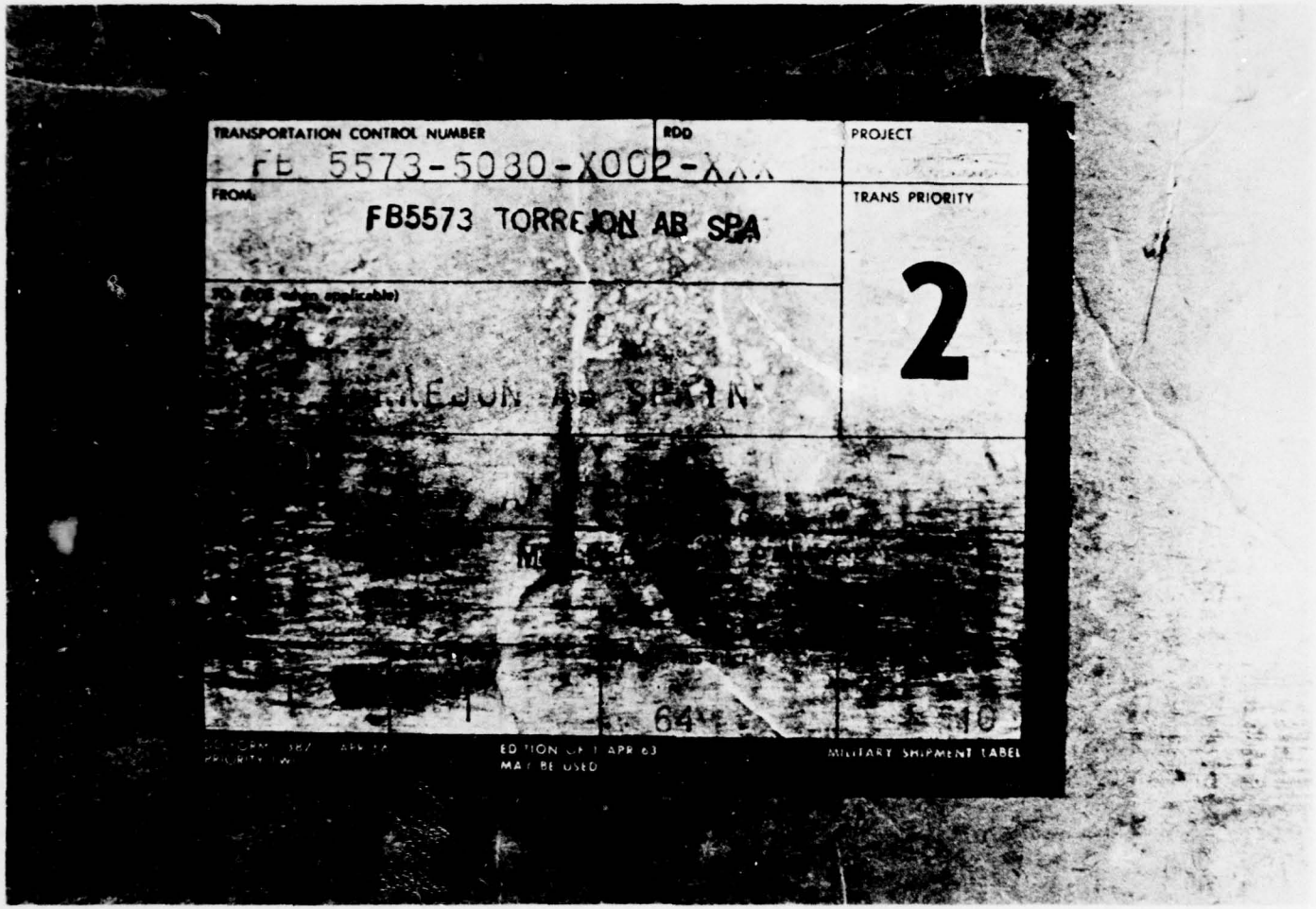


Figure 22. Labels may be obscured by dirt

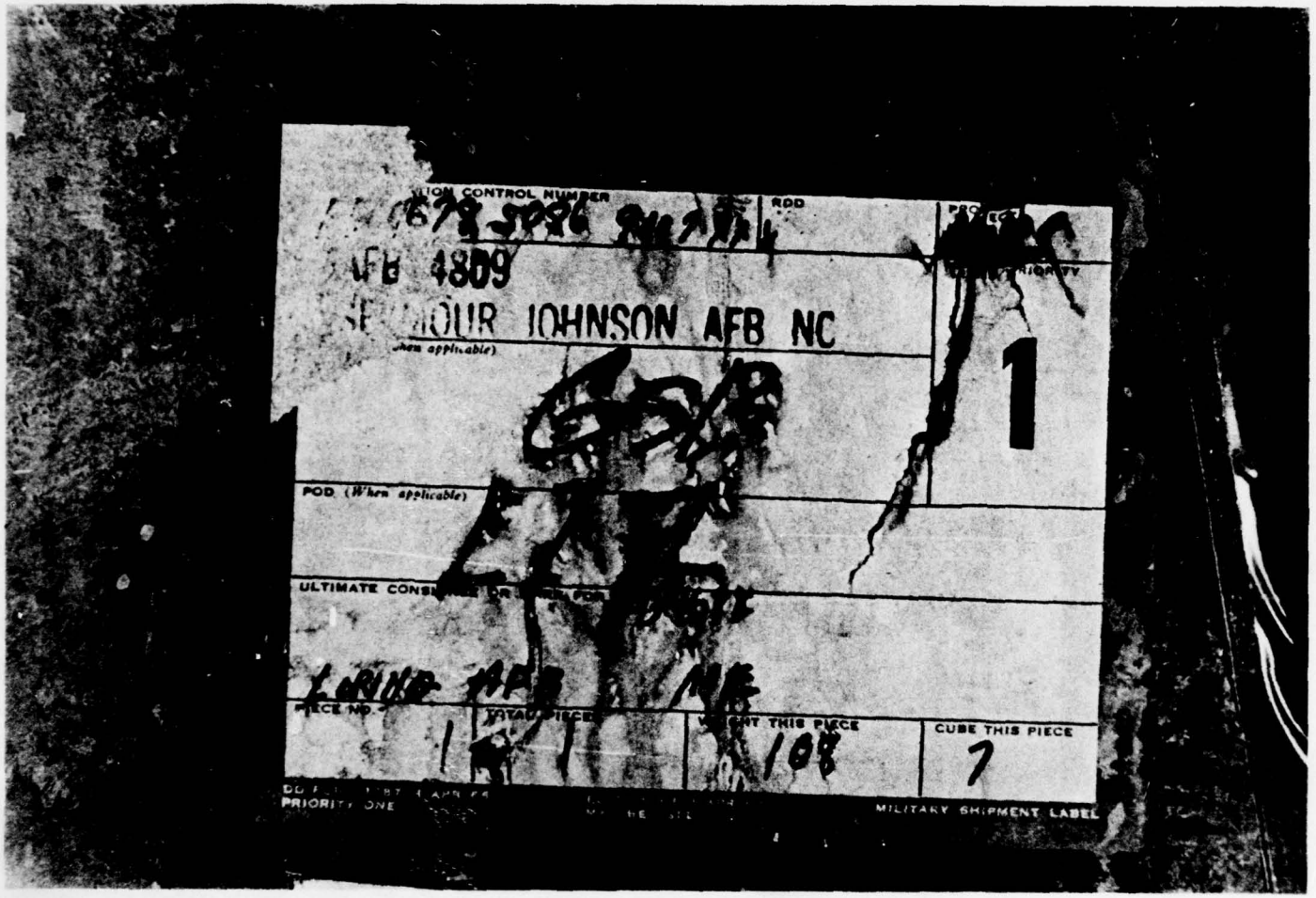


Figure 23. Some data entries may be washed away

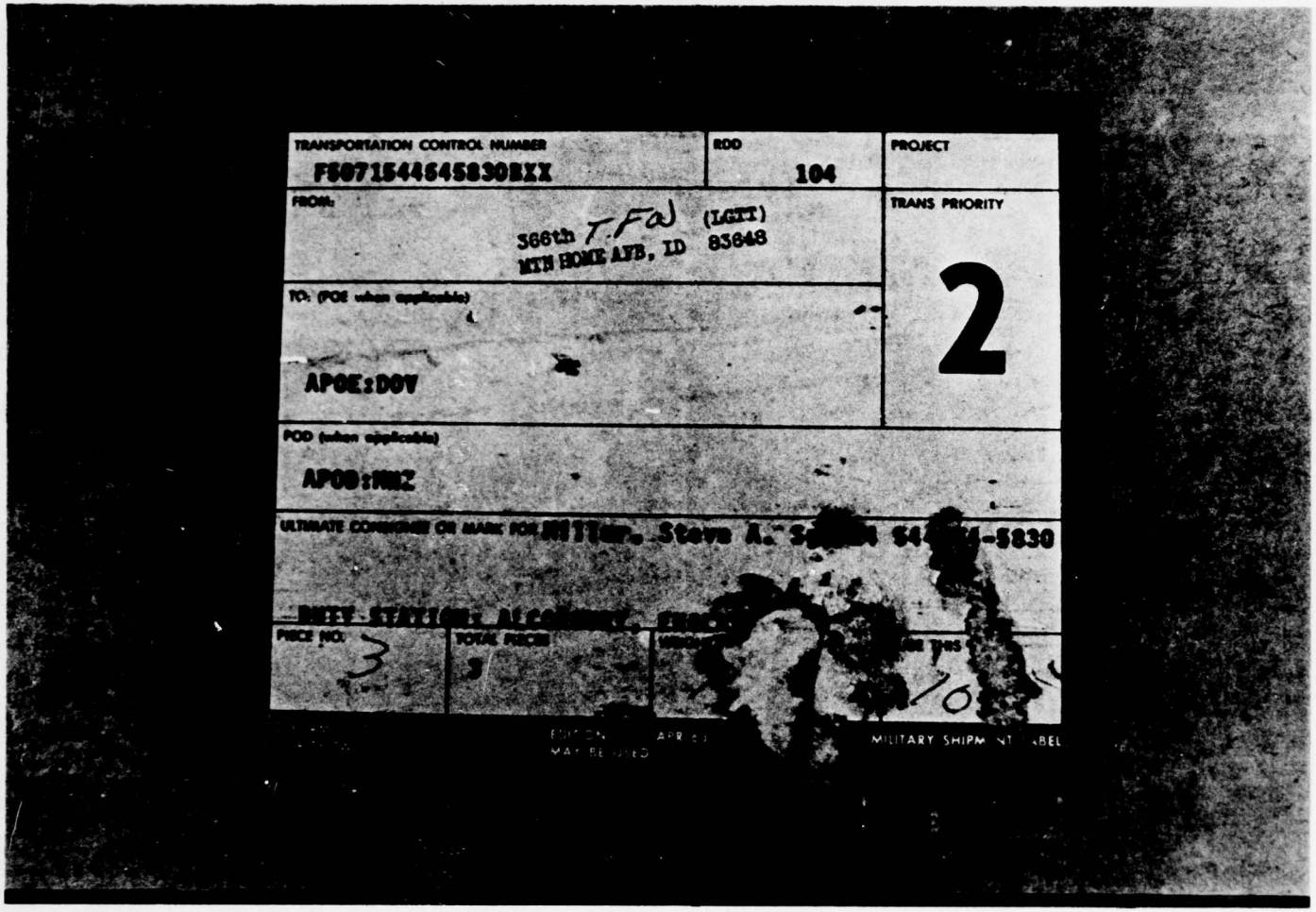


Figure 24. Some data entries may be torn away

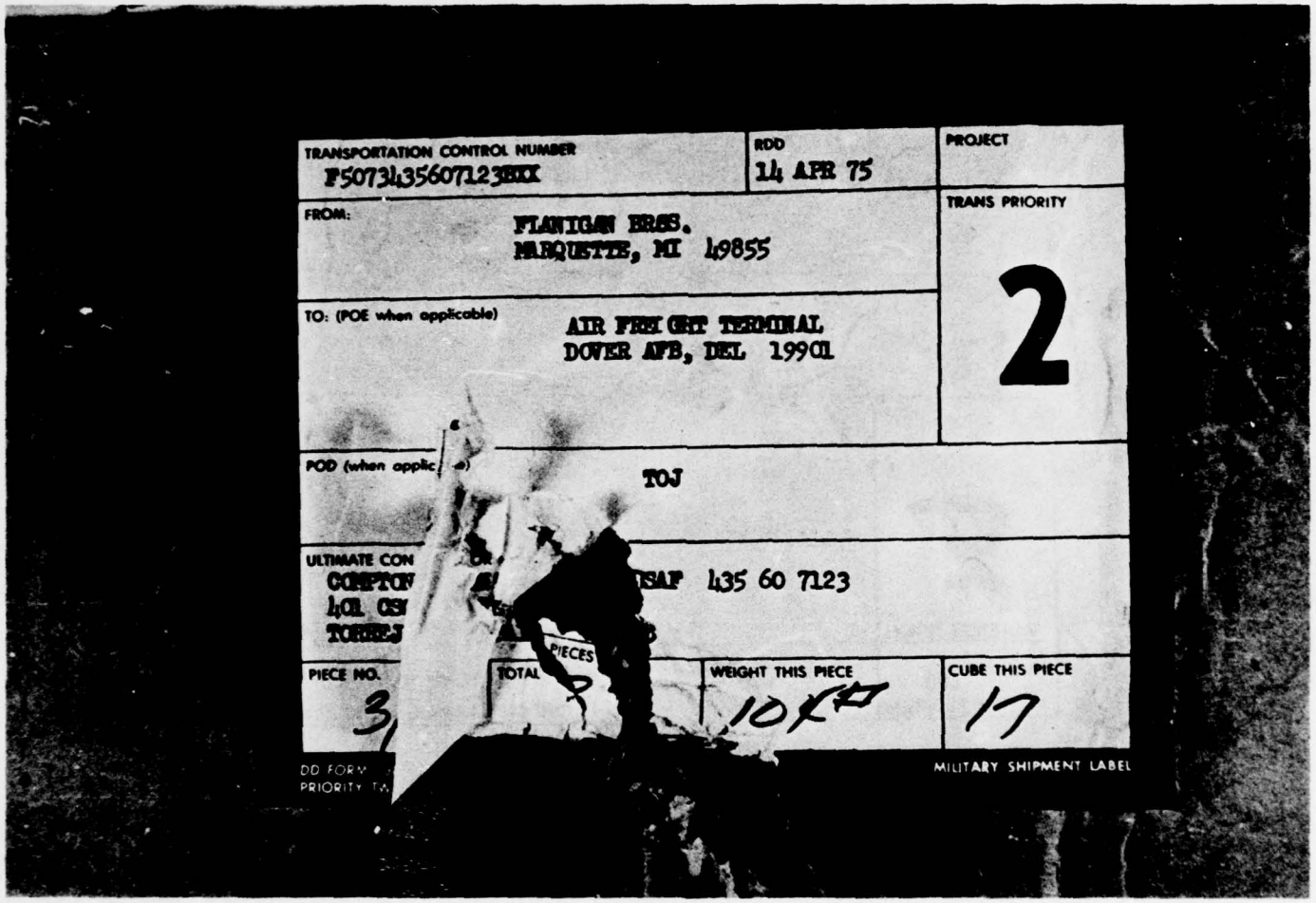


Figure 25. This torn label was later repaired to provide a legible photograph

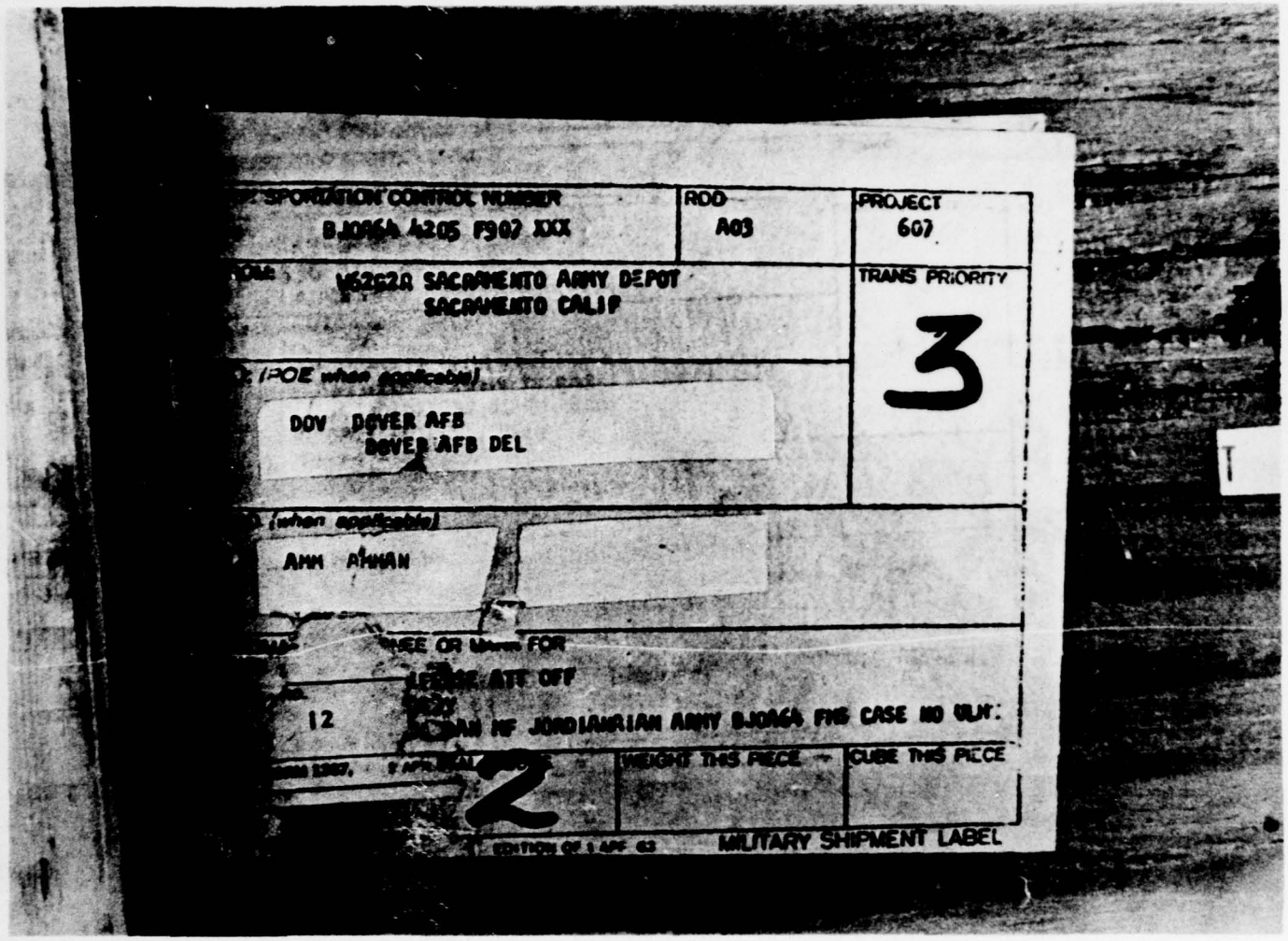


Figure 26. This tear discloses older data underneath

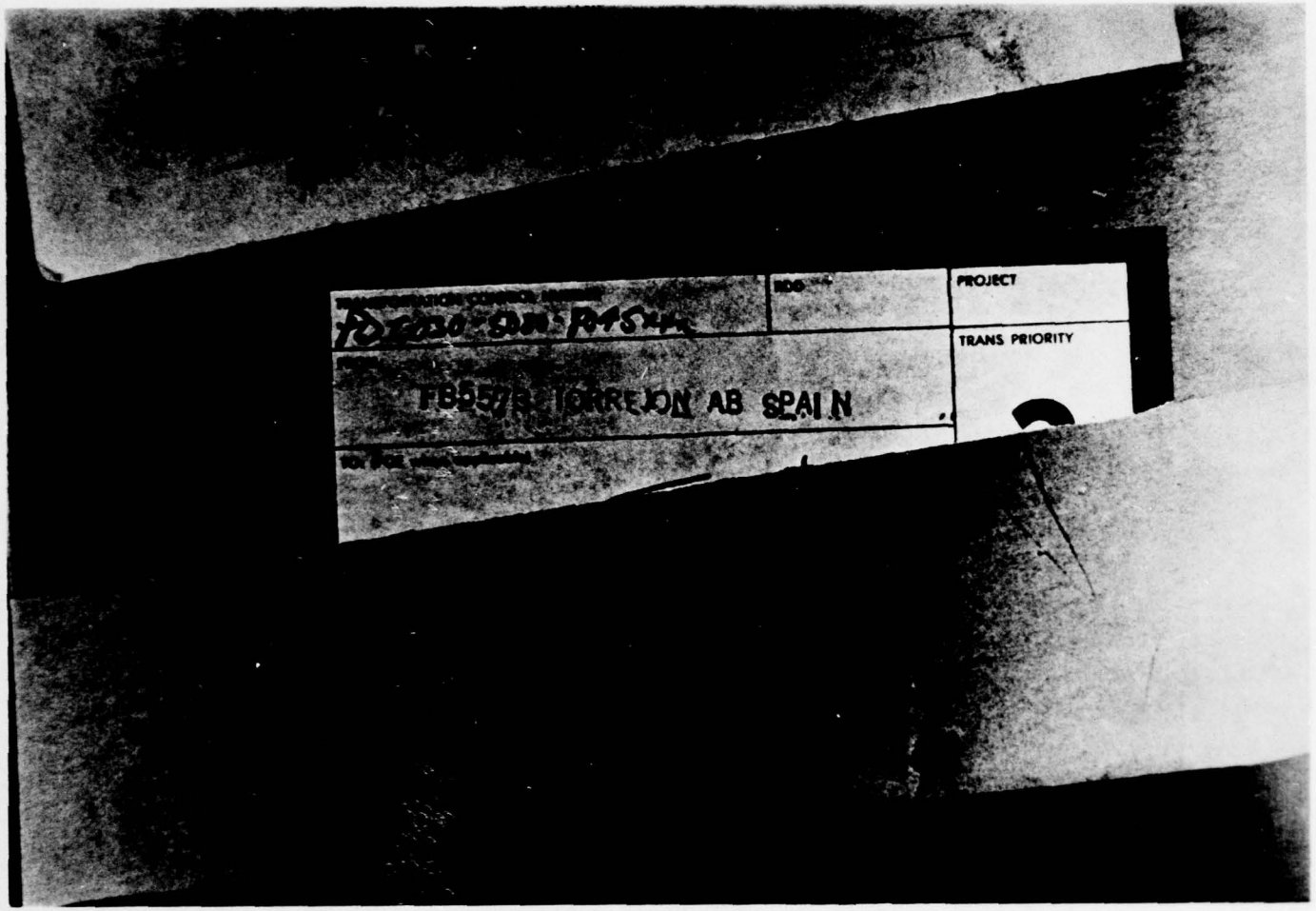


Figure 27. There is not much left of this label

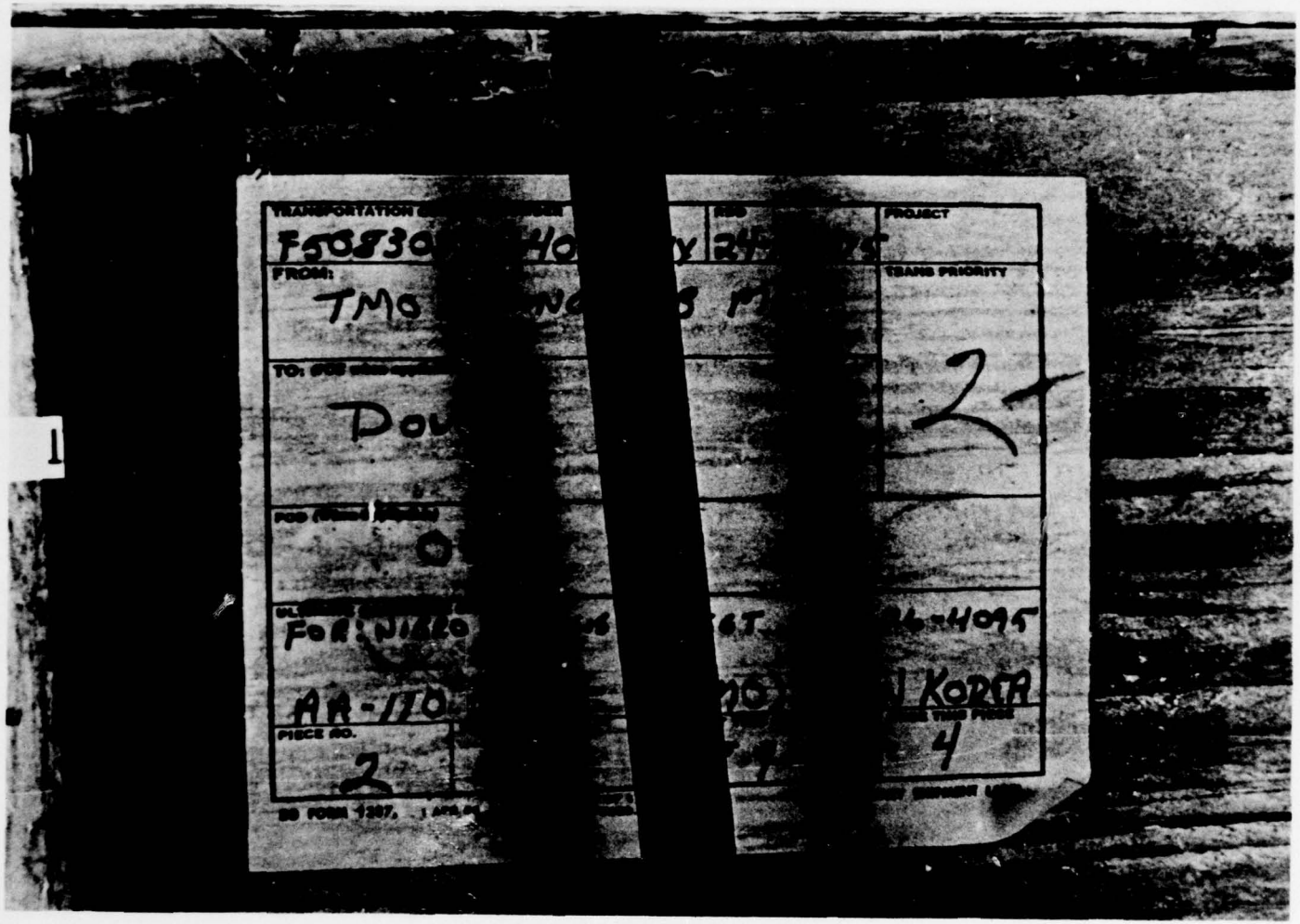


Figure 28. A steel band secures this package but obscures its label

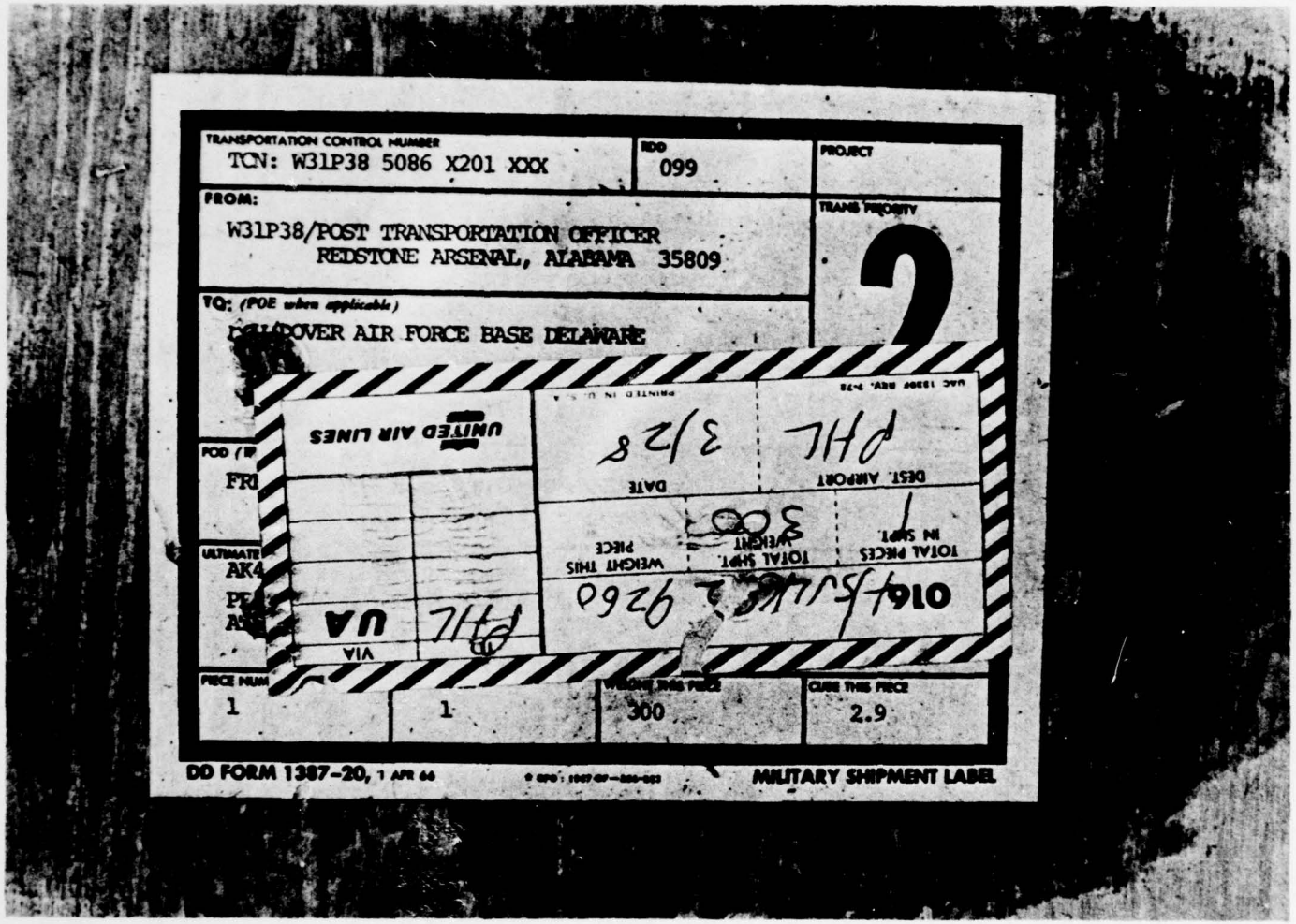


Figure 29. Here an intermediate carrier has contributed to the shipping label

SECTION V

MISSING DATA

When a shipping label is damaged, some of its data entries may be lost. Another label may be perfectly intact, and still have some of its data missing. The photos brought back from Dover were examined to determine how often data entries were omitted from different fields in the standard shipping label format. The results of that count are shown in Table 3. This tabulation ignores the handful of exceptional labels depicted in the preceding section of this report.

Table 3

Count of Data Items Missing from Photographed Shipping Labels

Data Missing	328 Pieces of Truck-Delivered Cargo		64 Pieces of Cargo Arriving by Air	
	No.	%	No.	%
TCN	2	1	2	3
RDD	138	42	56	88
PROJECT	228	69	56	88
PRIORITY	0	0	0	0
CONSIGNOR ("FROM" Code)	69	21	2	3
POE Code	13	4	1	2
POD Code	38	12	0	0
CONSIGNEE Code	83	25	5	8
PIECE NUMBER	12	4	0	0
TOTAL PIECES	2	1	0	0
WEIGHT	28	9	0	0
CUBE	31	9	1	2
Overall	644		123	

Some of the missing data may not be needed. For example, goods or personal effects destined for Dover rather than for export would not necessarily need a transportation control number (TCN). Special PROJECT codes are optional, and are the items omitted most frequently in the listing of Table 3.

Some of the missing data may be available from other sources. As an example, the required delivery date (RDD) is frequently omitted from shipping labels, but it is a required data item in the

Advance Transportation Control and Movement Document (ATCMD) which is processed by MAC to authorize transport for each shipment of cargo. Some data missing from the label may be visible elsewhere on the package. Such a case is illustrated in Figure 31, which shows piece WEIGHT and CUBE stencilled on a container rather than written on its shipping label.

Presumably some data items are missing because of ignorance on the part of the person preparing the shipping label. This would be true especially for those data items requiring some knowledge of codes used in the military transport and accounting systems -- the 3-letter codes for aerial ports of emarkation and debarkation (POE and POD), and the 6-symbol codes used to denote CONSIGNOR ("FROM") and CONSIGNEE. In Table 3 it may be seen that those codes are seldom missing from labelled cargo arriving in Dover by air, i.e., cargo almost exclusively from military shippers. For truck-delivered cargo, however, much of which is shipped by commercial vendors, these codes are omitted more often.

Often it would be possible for a man at the truck dock to add missing data to a shipping label himself. If he saw weight and cube information on the package, as in Figure 30, he could simply write those items on the label before taking its photograph. In adding missing data he might have to rely on his own special knowledge as well as his powers of observation. For a label with a missing POD, he might note that the shipment is bound to a destination in England, and know that the proper code would be MHZ for the Mildenhall RAF Station in Suffolk. If the photographer must scan labels to examine their content, however, his job is no longer a simple matter of pushing a button on a photo-box.

Even more difficult would be the occasional case where labelled data items are complete but wrong. Some errors in label data would, of course, be irretrievable: a clerk may have become confused and omitted a symbol when typing a TCN. Other data errors, however, could conceivably be repaired. A subtle example is illustrated by the label in Figure 31, showing cargo bound for England ostensibly routed by way of the Canal Zone. This label was generated by computer. Presumably some clerk misread the proper destination code, MHZ, and keyed in a slight variation, MH2, which caused the computer program to generate its own surprising POD on the label. Such an error, if recognized, could be corrected at the truck dock, based on the same kind of special knowledge adduced above for the entry of missing data. But to notice wrong items as well as missing items could place an even greater burden on the photographer.

Problems of missing or mistaken data would affect any mode of data entry at the truck dock, not just photography. Using photography or any similar image capture technique, however, would seem to reduce the likelihood that such data lapses would be detected and repaired. That is to say, the process of image capture is fast and easy, and in itself does not require that any attention be given to the data contents of a shipping label. Correction of wrong or missing data, if done at all, would probably be accomplished better during the subsequent transcription of data into digital form, i.e., during key entry from photographed images.

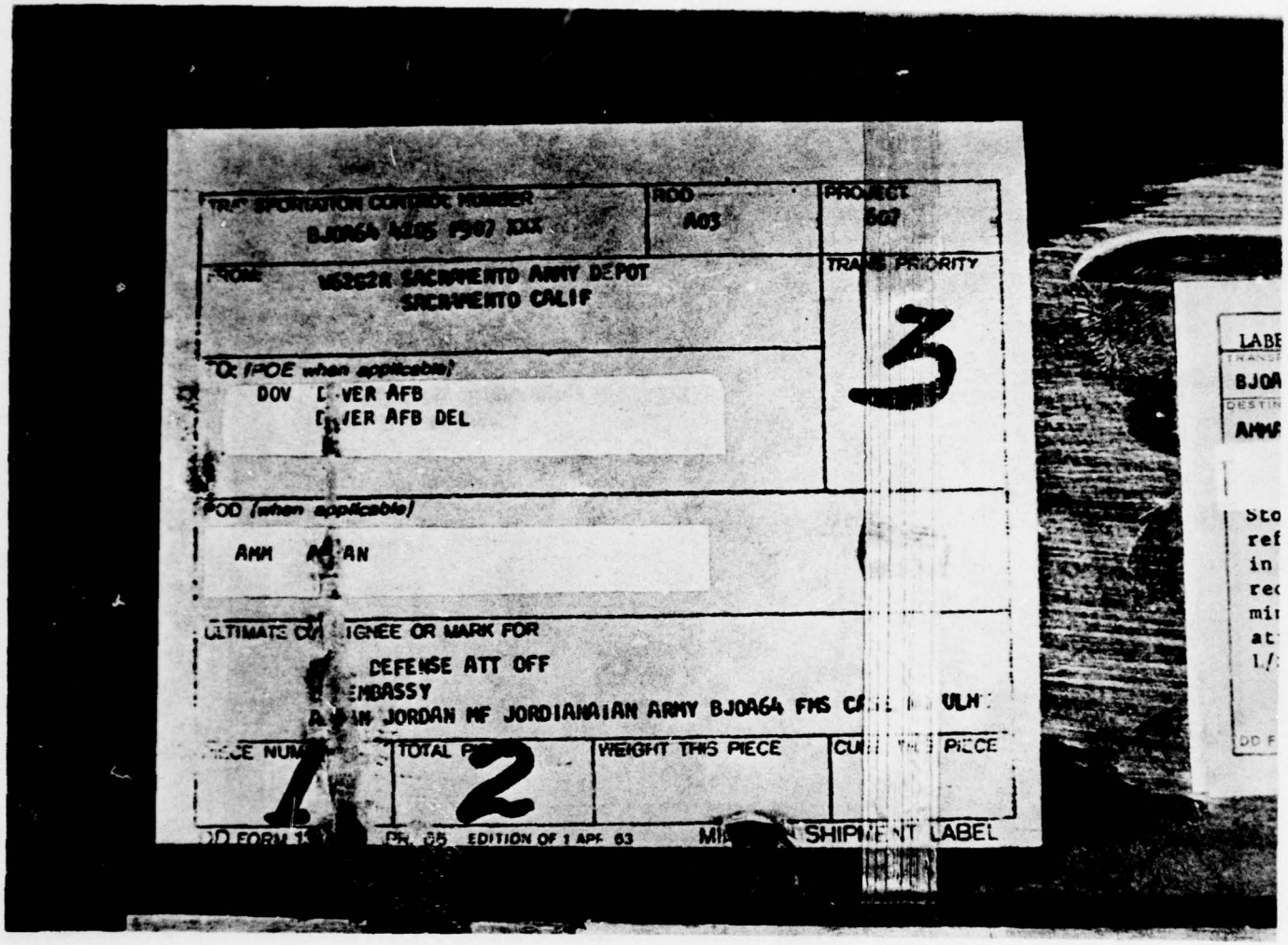


Figure 30. Data missing from the label may be stencilled on the package

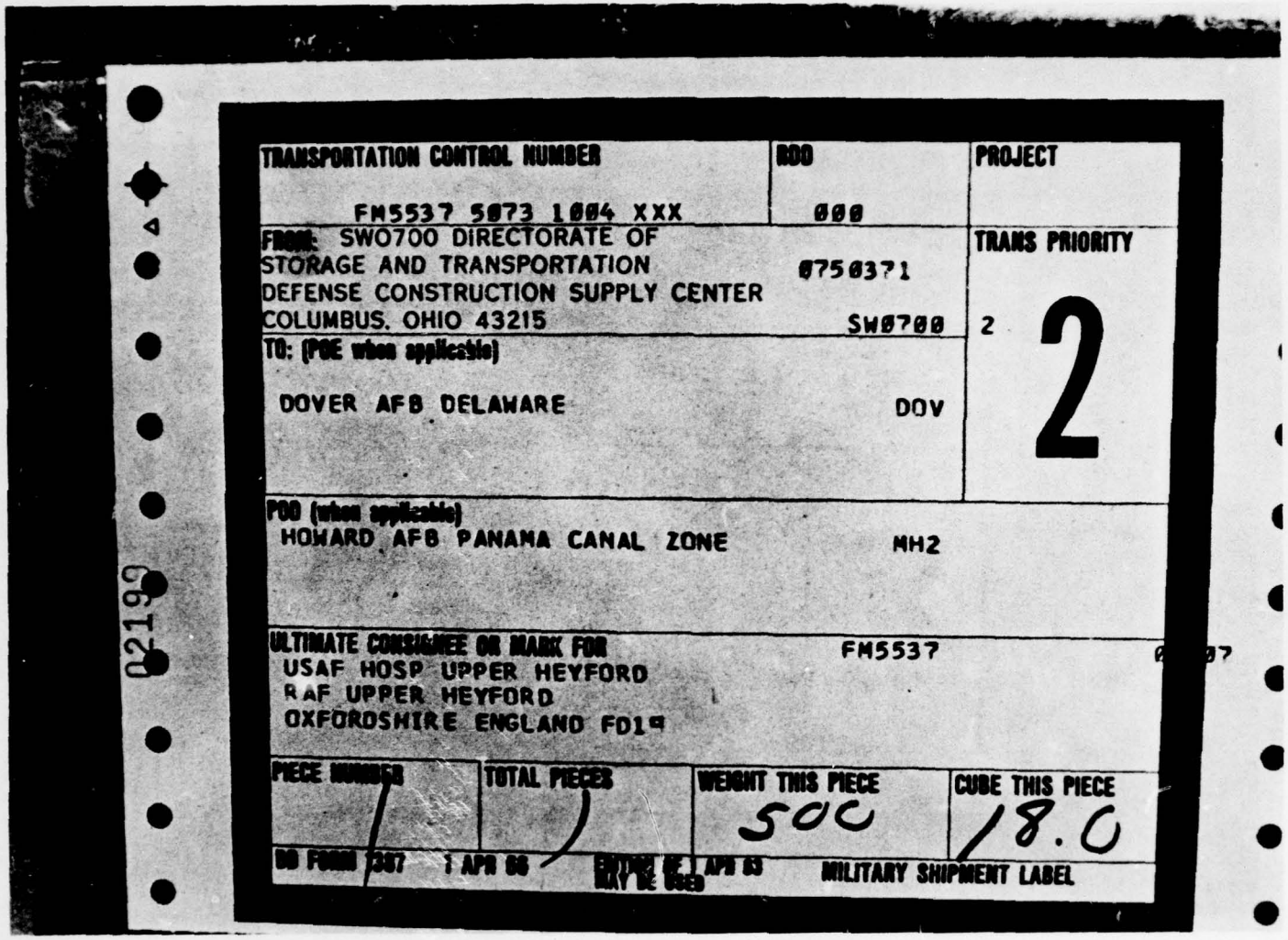


Figure 31. Some label data may prove wrong on careful scrutiny

REFERENCES

Smith, S. L., MAC Air Cargo Data Entry: 1. Preliminary Analysis of Alternative Modes, ESD-TR-76-162, Vol. I, August 1976.

Smith, S. L., MAC Air Cargo Data Entry: 3. Initial Testing of On-Line Terminal, Digital Recorder and Checksheet, ESD-TR-76-162, Vol. III, August 1976.