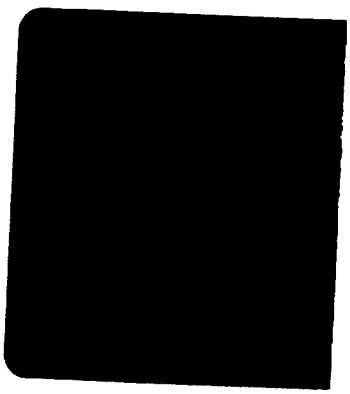
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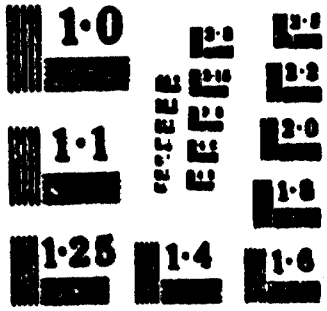
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Evaluation of the SUU-24/A Dispenser and BLU-3/B Bomb (U)

by

Michael J. MacDonald, 1st Lt, USAF

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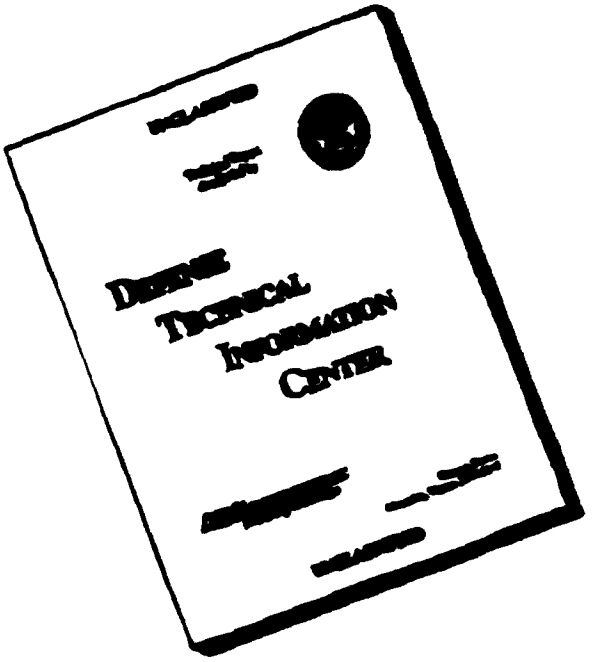
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EVALUATION OF THE SUU-24/A DISPENSER AND BLU-3/B BOMB (U)

by

Michael J. MacDonald, 1st Lt, USAF

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FOREWORD

(U) This is the final report on APGC Project 02662, "Evaluation of the SUU-24/A Dispenser and BLU-3/B Bomb," performed by the Air Proving Ground Center for the Directorate of Armament Development (DAD)*, Research and Technology Division, Eglin Air Force Base, Florida, under the authority of an AFSC SECRET message 15-9-14, dated 15 September 1964. Active physical testing was started on 1 December 1964 and was completed on 10 December 1965.

(U) The participating agencies and their responsibilities were:

1. Air Proving Ground Center - To manage and conduct the test, analyse the data, and prepare the technical report.

2. DAD, Research and Technology Division - To monitor the test and to provide engineering and technical assistance.

3. White Sands Missile Range - To provide an instrumented test range and to reduce data.

4. Air Force Missile Development Center, Holloman AFB, New Mexico - To provide liaison with the White Sands Missile Range, monitor scheduling, and provide photo chase aircraft support.

5. Strategic Air Command - Hq SAC, Offutt AFB, Nebraska, and the 95th Bomb Wing at Biggs AFB, Texas - To provide B-52 and B-47 delivery aircraft, SAC project personnel, and ground munitions maintenance loading crews.

6. OOAMA, Hill AFB, Utah - To provide composite target array and high explosive test range.

(U) The following key personnel were responsible for the testing accomplished under the project and/or the preparation of this report.

Michael J. MacDonald, 1st Lt, USAF	Test Project Engineer
William B. Collins	Development Engineer
Harold Austin, Lt Col, USAF	SAC Project Officer
James Diddle, Maj, USAF	SAC Project Officer
Robert J. Billingsley	Test Design
A. D. Brinson, Jr.	Test Design
James Whatley, Capt. USAF	Operations Research Analyst
Earl Crump	Ballistician
William Ming	Mathematician
Preston Landry	Mathematician/Computer Programmer
Martin Brown	Target Array Design

(U) No classified information in this report has been extracted from other classified documents.

This technical report has been reviewed and is approved.

J. E. ROBERTS, Major General, USAF
Commander

* Now designated Air Force Armament Laboratory.

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CONFIDENTIAL ABSTRACT

(C) This test consisted essentially of an evaluation of the SUU-24/A dispenser with BLU-3/B bombs to operationally qualify the weapon system on B-52 and B-47 aircraft for low altitude use. Special ground handling and loading equipment (AGE) for the weapon system was also evaluated. During the twenty-three flight test missions which were conducted, it was necessary to incorporate modifications to the test items, to qualify the final production version. Missions using live (HE) BLU-3/B bombs conducted against a composite target array of actual and simulated targets showed that the system was highly reliable and effective against most of the targets. The dispenser was found to be compatible with the B-52 aircraft with no modification to the aircraft required. Although the dispenser fitted the B-47 aircraft satisfactorily, its operational use in the B-47 is not recommended unless protection is provided to prevent aircraft damage from carton components released prematurely as a result of collisions among the cartons directly below the aircraft. The AGE was found to be satisfactory in all phases of loading, downloading, and handling of the dispensers and cartons.

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CONTENTS

Section		Page
I.	INTRODUCTION	1
II.	DESCRIPTION	3
	SUU-24/B Dispenser	3
	ADU-253/B Cluster Bomb Adapter	9
	BLU-3/B Antimateriel Bomb	9
	MHU-74/E Adapter Cluster Bomb Lift	17
	MHU-77/M Dispenser Handling Trailer	19
	MHU-76/E Dispenser Loading Rack	19
	MHU-72/E Adapter Handling Carrier	19
	MHU-75/E Adapter Safeing Retainer	24
	Safety Clip Assembly	24
	TTU-244/E Dispenser Test Set	26
	Loading Procedure	26
III.	INSTRUMENTATION	30
	Aircraft and Airborne Instrumentation	30
	Ground Instrumentation	31
IV.	TEST PROCEDURES	33
	Phase I - Missions 1 Through 5	33
	Phase II - Missions 6 Through 18	34
	Phase III - Missions 19 Through 23	34
V.	TEST RESULTS AND DISCUSSION	38
	Phase I	38
	Phase I - Summary	53
	Phase II	53
	Phase II - Summary	71
	Phase III	71
	Phase III - Summary	77
VI.	CONCLUSIONS	78
VII.	RECOMMENDATIONS	80

Appendix

I.	DESCRIPTIONS OF THE MODIFICATIONS INCORPORATED IN CARTON DESIGNS DURING TESTING	113
II.	COMPARISON OF OBSERVED AND COMPUTED DATA	129
III.	MATHEMATICAL DEVELOPMENT OF THE IBM 7094 FORTRAN IV COMPUTER PROGRAM NUMBER 707	143

CONTENTS (Continued)

Appendix		Page
IV.	RESULTS AND DISCUSSION OF MISSIONS 24, 25, 26, and 27	147
V.	IMPACT POSITION DATA	157
VI.	TARGET ARRAY AND DAMAGE ASSESSMENT	255
VII.	DETAILED DRAWINGS OF COMPOSITE TARGET ARRAY	273

ILLUSTRATIONS AND TABLES

Figure		
1.	SUU-24/A Dispenser (Bottom View)	5
2.	Cell Electro-Mechanical Release Mechanism	6
3.	SUU-24/A Dispenser (Bottom View) B-52 Release Sequence	7
4.	SUU-24/A Dispenser (Bottom View) B-47 Release Sequence	8
5.	ADU-253/B Cluster Bomb Adapter (Carton)	10
6.	Timer Mechanism. (A) Closed Position - (1) Safeing Pin, (2) Plunger, (3) Latches in Locked Position, and (B) Open Position - (1) Latches in Open Position, (2) Plunger Arm	11
7.	ADU-253/B Cluster Bomb Adapter with Top and Bridle Extended	12
8.	ADU-253/B Cluster Bomb Adapter Showing Packaging of Bombs. (1) Sides with Ethafoam, (2) Bottom with Ethafoam and Fiberboard, (3) Timer Side, (4) Timer Cover, (5) Top with Ethafoam and Fiberboard, and (6) Fiberboard Spacer Tubes ..	13
9.	BLU-3/B Bomb Showing (A) Internal Construction, (B) Open Fin Configuration - (1) Vane, (2) Vane Spring, (3) Nose Cap, (4) New Wind Tab, (5) Vane-Keeper Strap, and (C) Closed Fin Configuration - (1) Vane-Keeper Strap in Place, (2) Old Wind Tab, (3) Wind Tab and Vane-Keeper Strap in Closed Position	14
10.	MHU-74/E Adapter Cluster Bomb Lift	18
11.	Platen Assembly for MHU-74/E Adapter Cluster Bomb Lift	20
12.	MHU-77/M Dispenser Handling Trailer	21
13.	MHU-76/E Dispenser Loading Rack	22
14.	MHU-72/E Adapter Handling Carrier	23
15.	MHU-75/E Adapter Safeing Retainer	24

ILLUSTRATIONS AND TABLES (Continued)

Figure		Page
16.	Safety Clip Assembly	25
17.	TTU-244/E Dispenser Test Set	27
18.	TTU-244/E Light and Switch Layout Arrangement	28
19.	Dispenser and Handling Trailer on MHU-7/M Loading Trailer	29
20.	Results of an Intact Carton Impact (Arrow)	46
21.	Carton Breakup in B-47 Bomb Bay, Mission 2	47
22.	Damage to B-47 Aft Bomb-Bay Bulkhead, Mission 2	49
23.	Damage to B-47 Bomb-Bay Door, Mission 2	50
24.	Carton Which Functioned Partially. Note impressions of bombs in carton bottom, relative smoothness of sides	52
25.	Damage to B-47 Aft Bomb-Bay Bulkhead, Mission 15	59
26.	Additional Damage to B-47 Aft Bomb Bay Bulkhead, Mission 15	60
27.	Impact Pattern Plot. Mission 15, Pass 2	81
28.	Effective Impact Pattern Area and Overkill Area vs Assumed Bomb Effective Radii, Mission 15, Pass 2	83
29.	Impact Pattern Plot. Mission 15, Pass 3	85
30.	Effective Impact Pattern Area and Overkill Area vs Assumed Bomb Effective Radii, Mission 15, Pass 3	87
31.	Impact Pattern Plot, Mission 16, Pass 1	89
32.	Effective Impact Pattern Area and Overkill Area vs Assumed Bomb Effective Radii, Mission 16, Pass 1	91
33.	Impact Pattern Plot, Mission 16, Pass 2	93
34.	Effective Impact Pattern Area and Overkill Area vs Assumed Bomb Effective Radii, Mission 16, Pass 2	95
35.	Impact Pattern Plot. Mission 16, Pass 3	97
36.	Effective Impact Pattern Area and Overkill Area vs Assumed Bomb Effective Radii, Mission 16, Pass 3	99
37.	Impact Pattern Plot, Mission 18, Pass 2	101
38.	Effective Impact Pattern Area and Overkill Area vs Assumed Bomb Effective Radii, Mission 18, Pass 2	103
39.	Impact Pattern Plot, Mission 19	105
40.	Effective Impact Pattern Area and Overkill Area vs Assumed Bomb Effective Radii, Mission 19	107
41.	Impact Pattern Plot. Mission 20, Pass 3	109
42.	Effective Impact Pattern Area and Overkill Area vs Assumed Bomb Effective Radii, Mission 20, Pass 3	111

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SECTION I

INTRODUCTION

(C) Air Force efforts to provide a controlled response capability in the conduct of limited or general conventional warfare generated a requirement for the Strategic Air Command to be able to deliver large-area coverage munitions, such as the BLU-3/B, BLU-26/B, and M40 bombs.

(C) The SUU-24/A weapon system, consisting of a SUU-24/A dispenser and free-fall ADU-253/B cluster bomb adapters (cartons)* containing munitions, was designed to provide SAC with the capability of utilizing conventional cluster bomb munitions and chemical or biological weapons.

(U) The qualification of the weapon system using a bomb designed to defeat light materiel and personnel was requested by the Air Staff and SAC. The BLU-3/B was selected because it was in full production, and its size and configuration permitted packaging in cartons.

(U) Testing conducted under this project was originally intended to be limited to an evaluation of the SUU-24/A dispenser and the BLU-3/B bomb. However, as the test progressed, it was necessary to include testing of on-the-spot modifications to the dispenser and cartons; prototypes of the dispenser and cartons; production dispensers, cartons, AGE, and modified production dispensers and cartons. Additionally, the test altitudes and airspeeds requested by SAC limited the scope of the test to an evaluation of the weapons system with respect to a previously determined combat delivery tactic.

(U) All of the above changes were a direct result of the requirement to evaluate, qualify, and operationally certify the weapon system in a minimum of time.

(U) The objectives of this test were to:

1. Determine if release and separation of the ADU-253/B cluster bomb adapters from the SUU-24/A dispensers and aircraft were satisfactory.

2. Determine if ADU-253/B cluster bomb adapter opening and BLU-3/B bomb separation characteristics were satisfactory.

---

* For brevity, the ADU-253/B cluster bomb adapter will often be referred to as "carton" throughout this report.

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4. Obtain BLU-1/B bomb dispersion patterns from selected delivery attitudes and airspeeds.

5. Obtain ballistic data for future computation for the Mercer Weapons Delivery Handbook.

6. Determine the adequacy of the loading and handling equipment.

7. Demonstrate the delivery capability of the B-52 and B-47 aircraft with high-explosive munitions against a composite array of actual and simulated targets.

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SECTION II

DESCRIPTION

(U) The SUU-24/A dispenser system (previously designated the MID-1*) is a complete munition dispersion system operating upon command from the aircraft bomb system. When installed in the aircraft, it requires only electrical power for release of the munitions. No electrical or mechanical modification of the aircraft is required. The dispenser system consists of a dispenser, carton release mechanism, munition carton, carton timer, and associated ground handling and safety equipment. The physical dimensions of the dispenser, carton, and BLU-[illegible]/B bomb are shown in Table I.

SUU-24/B DISPENSER

(U) The SUU-24/A dispenser (Fig. 1) is a rectangular aluminum container divided into 24 individual double-wall cells. Each cell can accommodate three ADU-253/B cluster bomb adapters. The cartons are installed from the bottom and are retained in the dispenser by two electro-mechanical release mechanisms (Fig. 2). A signal from the aircraft bomb system actuates the solenoid, which in turn allows the locking cam to rotate, releasing the loading arms (latches) allowing the cartons to fall free from the aircraft.

(U) A cover which is provided for each cell is installed in the cell below the latches (Fig. 1). The cover is a square wooden plate lined with a rubber gasket to protect the latches and cartons from dust and moisture. It is removed prior to flight. Four suspension hooks, two on each side, are installed on the top of the dispenser for attaching the dispenser to the aircraft bomb racks (Fig. 1). A junction box is installed on the rear wall of the dispenser and is used to house the pulse distributor relay and other relays and electrical connections. The electrical connector cables are routed between the extreme outer walls of the dispenser and are housed behind access doors, three in the left side and one in the right side. These cables provide compatibility with the bomb release systems of the B-52 and B-4[illegible] aircraft. The firing sequence of the dispenser when loaded in the B-52 and B-4[illegible] aircraft is illustrated in Figures 3 and 4.

---

* For development test results, see AFGC-TR-[illegible], October 19[illegible].

TABLE I. SUU-24/A, ADU-253/B, AND BLU-3/B DATA.

SUU-24/A DISPENSER

Length ..... 11 ft
Width ..... 4 ft 5 in.
Height ..... 4 ft 1 in.
Weight ..... 925 lb (empty)
Material ..... Aluminum alloy
Junction box .... 1 ft 10 in. by 1 ft 2 in. by 5 1/2 in.

Dispenser Cells

Number 24
Size ..... 1 ft 2 41/64 in. by 1 ft 2 41/64 in. by 3 ft 8 1/4 in.
Capacity .. 3 ADU-253/B cluster bomb adapters

Dispenser Capacity .. 72 ADU-253/B cluster bomb adapters containing 5,328 BLU-3/B bombs

ADU-253/B CLUSTER BOMB ADAPTER (CARTON)

Length ..... 14 3/8 in.
Width ..... 14 3/8 in.
Height ..... 13 5/32 in.
Weight (filled) ..... 138 lb
Capacity ..... 74 BLU-3/B bombs
Adapter Material ..... Aluminum alloy
Retainer Band Material .. Stainless steel

BLU-3/B BOMB

Length .... Unopened — 3.6 in.
Opened —— Approximately 6.5 in.
Diameter .. 2.76 in.
Weight .... 1.74 lb

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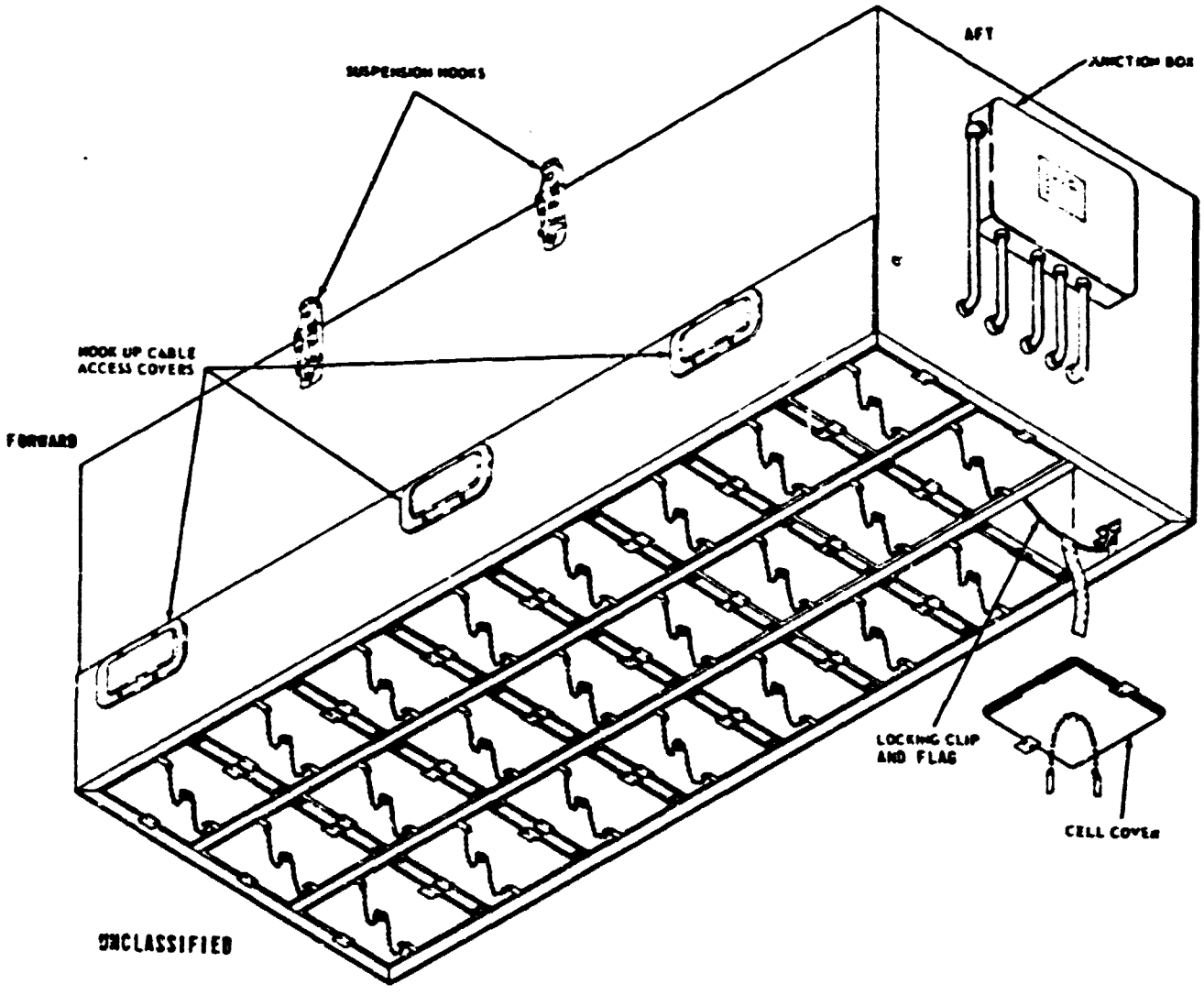


Figure 1. SUU-24/A Dispenser (Bottom View).

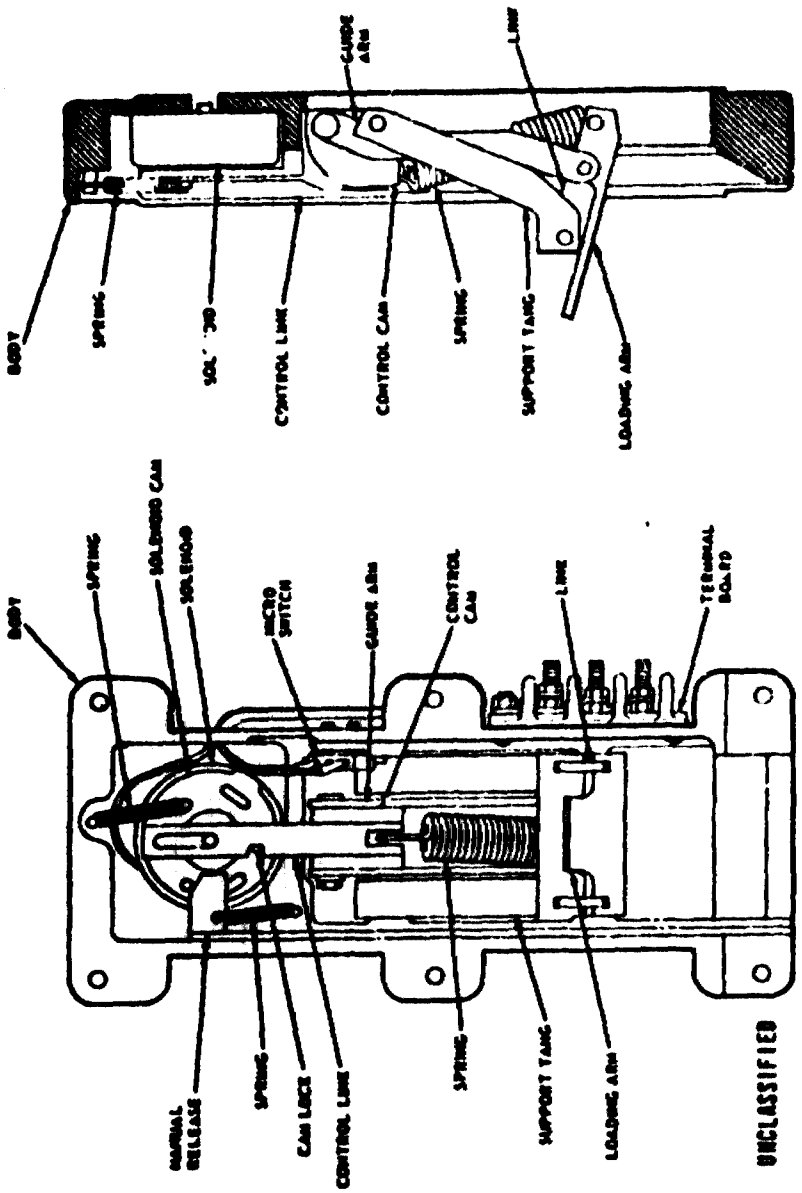


Figure 2. Cell Electro-Mechanical Release Mechanism.

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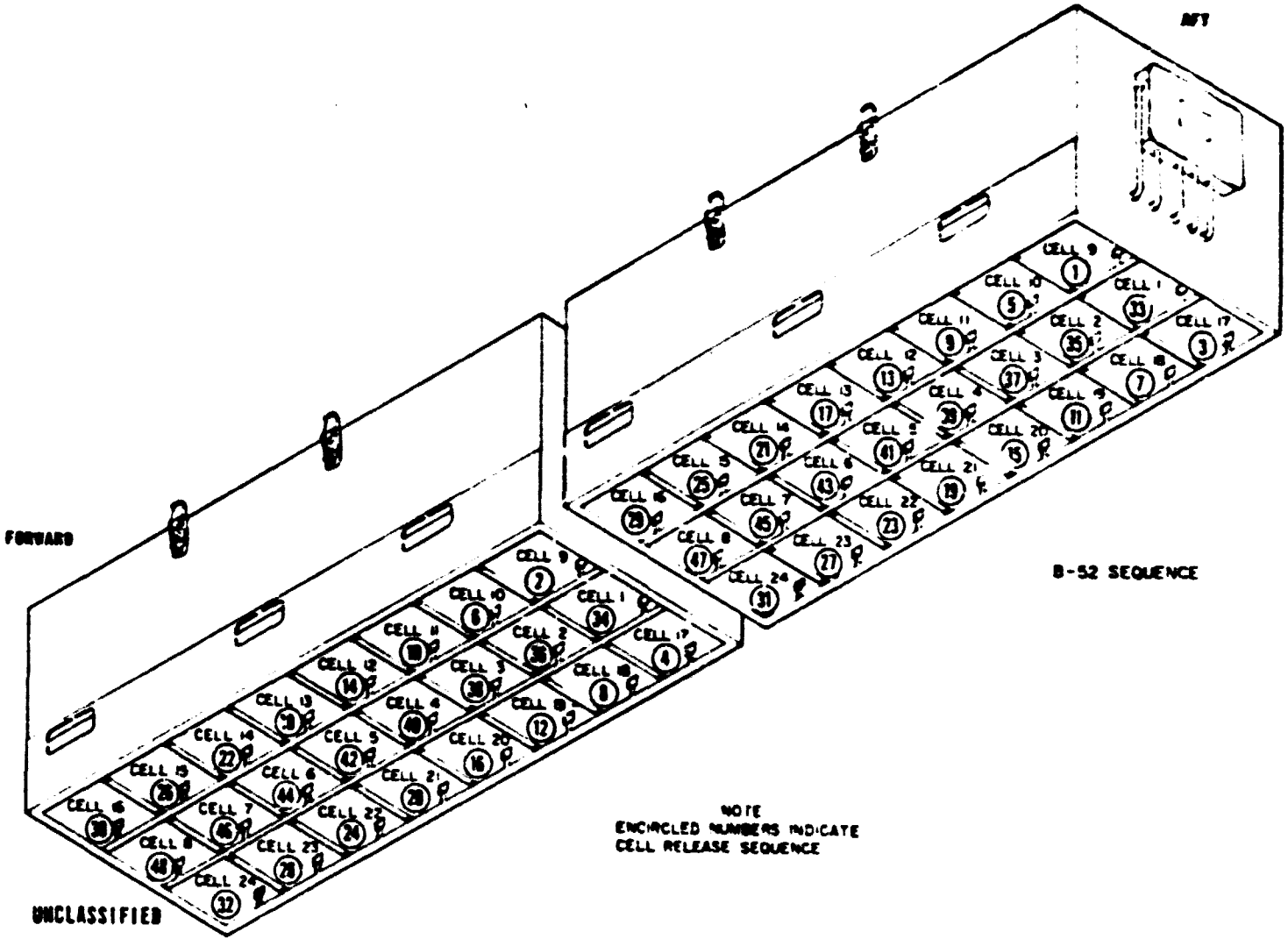


Figure 3. SUU-24/A Dispenser (Bottom View) B-52 Release Sequence.

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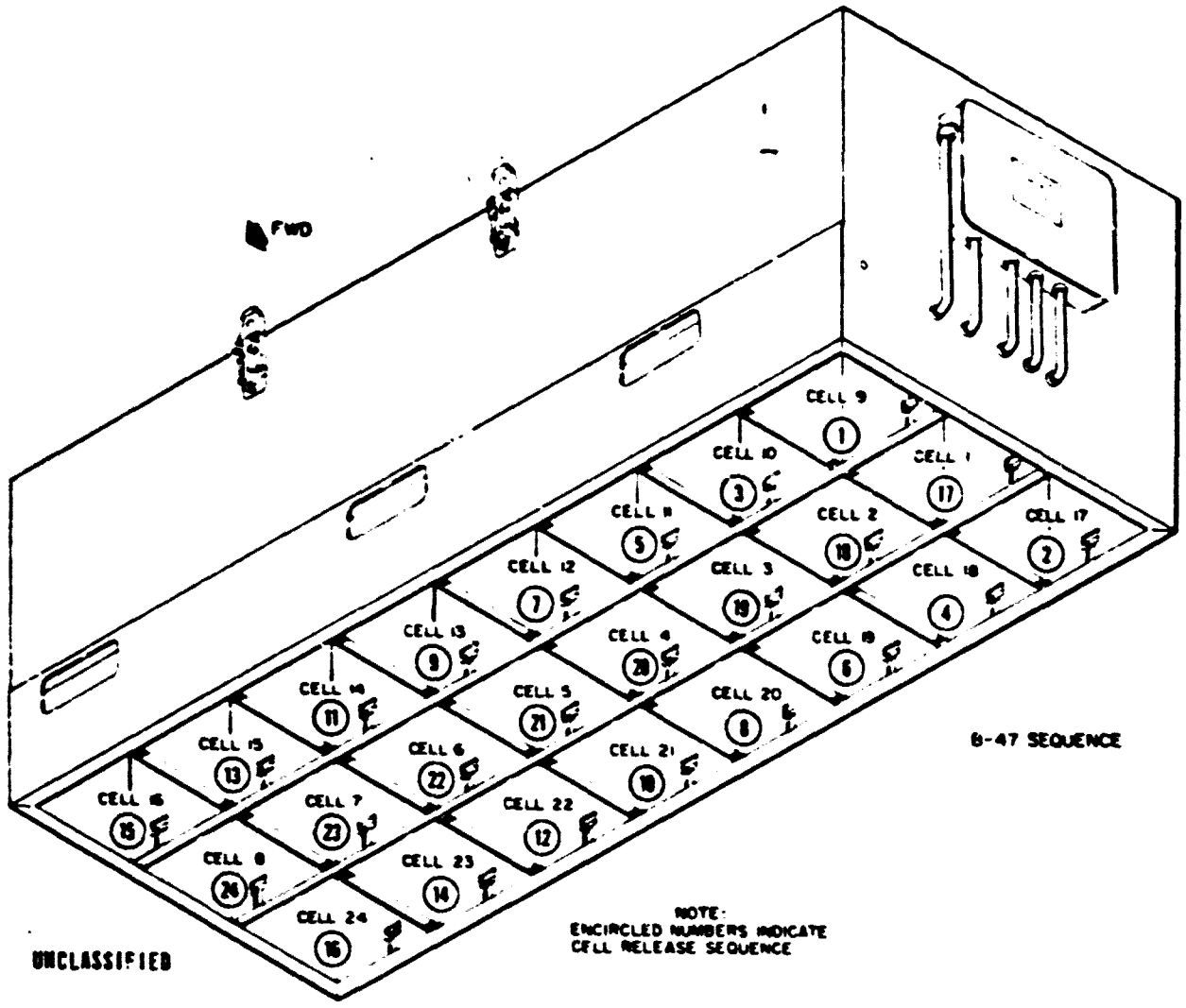


Figure 4. SUU-24/A Dispenser (Bottom View) B-47 Release Sequence.

ADU-253/B CLUSTER BOMB ADAPTER

(U) The ADU-253/B cluster bomb adapter is a square aluminum conteiner, 14 3/8 in. by 14 3/8 in. by 13 5/32 in. high. The four sides are clipped into the carton bottom under spring tension and held together at the top by a steel retaining band and timer (Fig. 5). The timer mechanism (Fig. 6) consists of the standard T-5 timing components, a rotary knob graduated from 0 to 90 sec in 1-sec increments, a spring-loaded actuator plunger (bore rider), two release arms, and a safety pin. The carton top is held in place by overlapping flanges located on the front and rear of the top, and front and rear sides of the carton. The top and bottom of the cartons have square convex and concave areas, respectively, to facilitate safe stacking and ease in loading the cartons.

(U) A bridle made of nylon webbing (3,000-lb test) is provided inside the carton to insure positive opening and dispersion of the BLU-3/B bombs. Pins attach the bridle assembly to the four doublers on the top and the two doublers on the bottom of the carton (Fig. 7). The excess bridle length is packed between a fiberboard filler and the carton top, and is routed between the front side of the carton and the bombs.

(U) Seventy-four BLU-3/B bombs are packed in each carton - three layers each containing five rows of five bombs, with a space provided for the timer mechanism by eliminating one bomb from the top front row.

(U) Tubular fiberboard spacers are placed vertically among the stacks of bombs to insure a tight fit and to prevent the bombs from shifting and damaging the timer or from becoming armed within the carton (Fig. 8).

(U) When the carton is released from the SUU-24/A dispenser, the carton timer is actuated by release of the bore rider. After a predetermined period of time, the timer release arms open, releasing the retaining band and allowing the sides of the carton to separate. The top then acts as a drag device, drawing the bottom of the carton through the sides by means of the bridle assembly, spilling the BLU-3/B bombs into the airstream.

BLU-3/B ANTIMATERIEL BOMB

(U) The BLU-3/B antimateriel bomb (Fig. 9) is approximately 2.76-in. in diameter, 3 in. long, and weighs approximately 1.74 lb. The bomb case is a cast aluminum matrix containing 255, 1/4-in. diameter, 16-grain steel balls. The bomb contains 157 grams of press-loaded cyclotol.

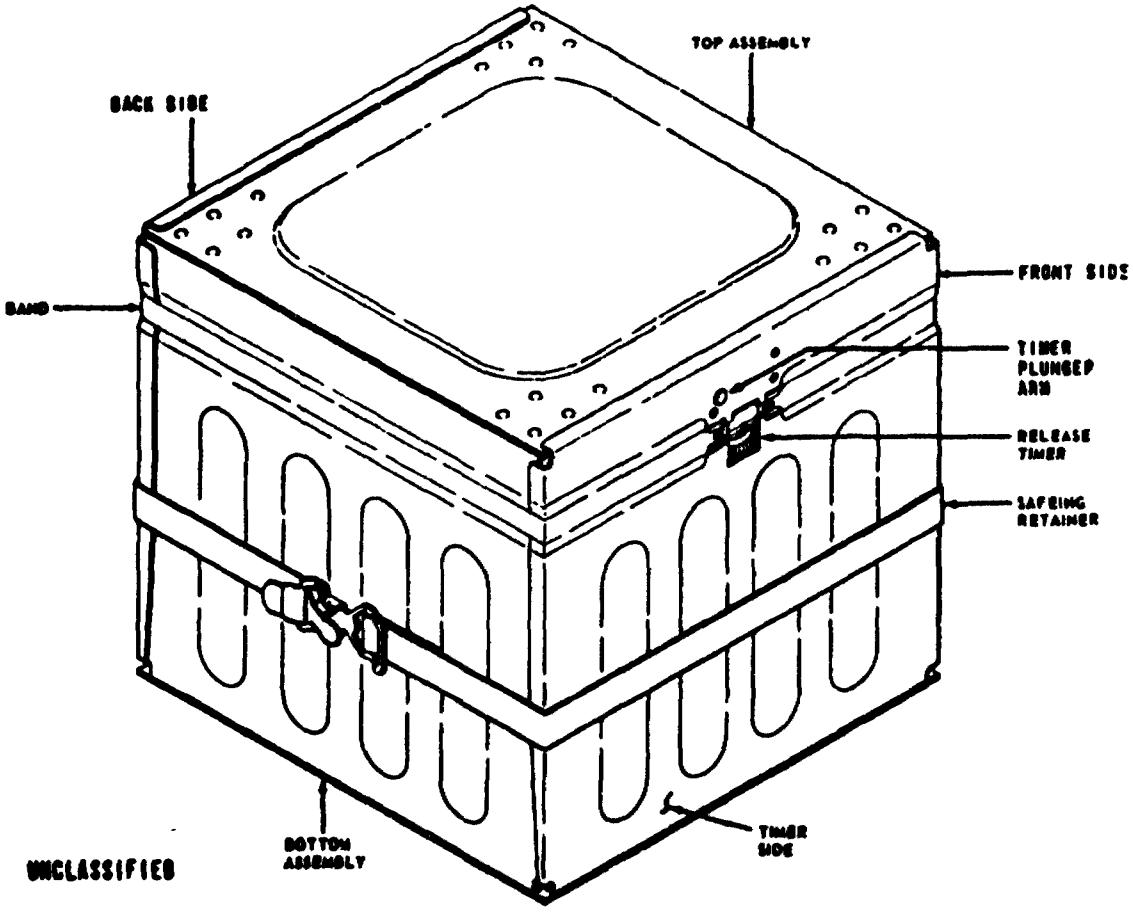


Figure 5. ADU-253/B Cluster Bomb Adapter (Carton).

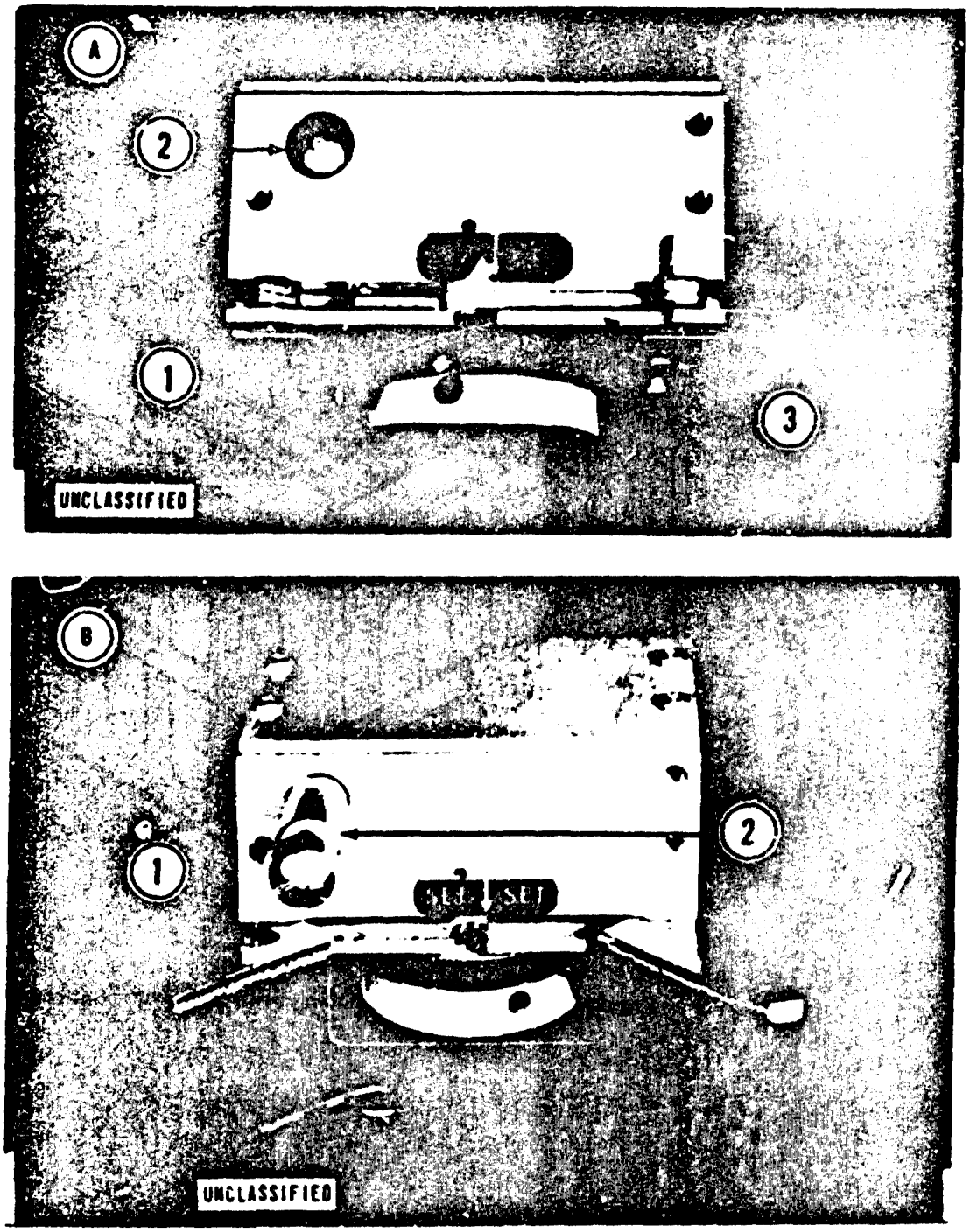


Figure 6. Timer Mechanism. (A) Closed Position - (1) Safeing Pin, (2) Plunger, (3) Latches in Locked Position, and (B) Open Position - (1) Latches in Open Position, (2) Plunger Arm.

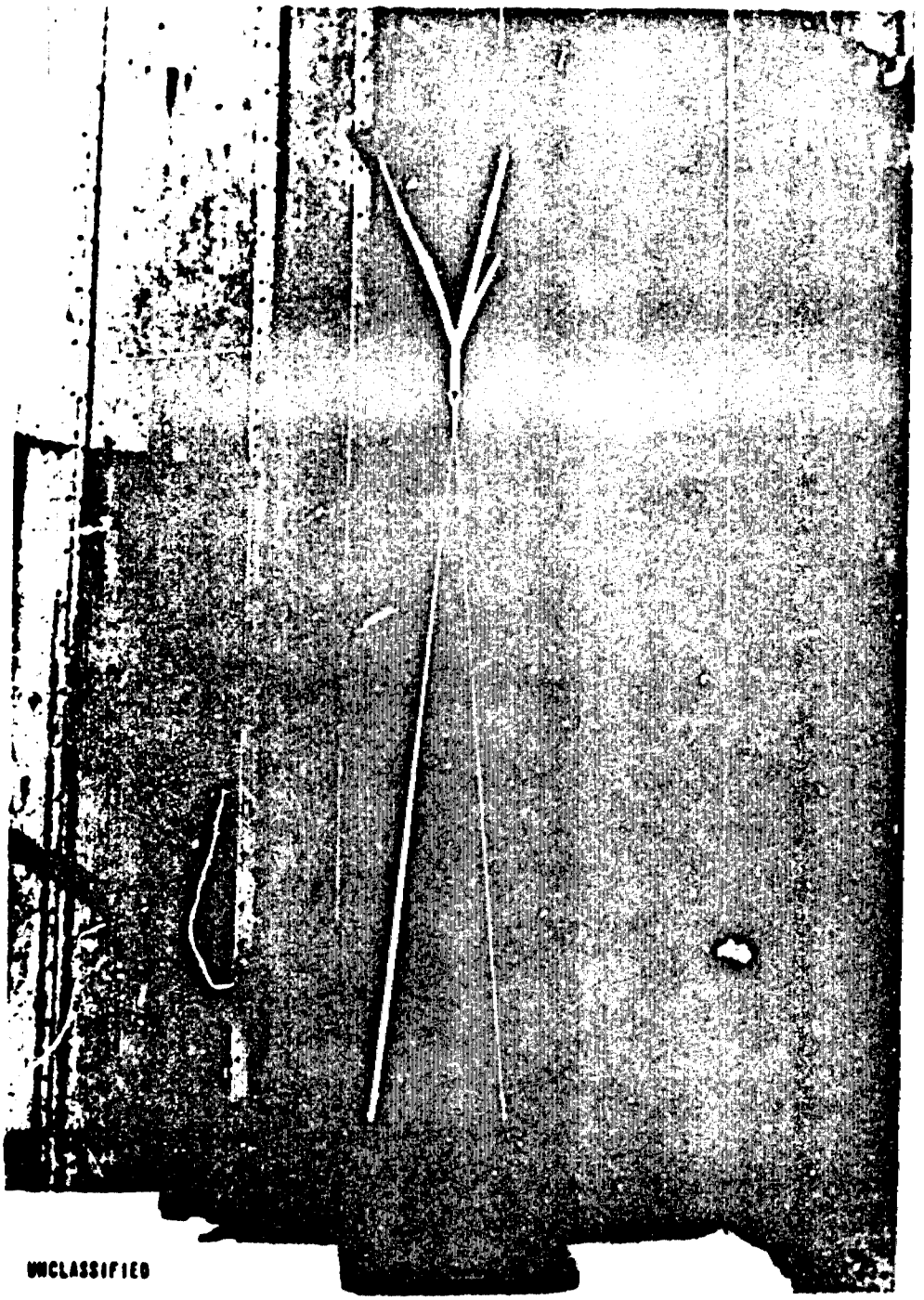


Figure 7. ADU-253/B Cluster Bomb Adapter with Top and Bridle Extended.

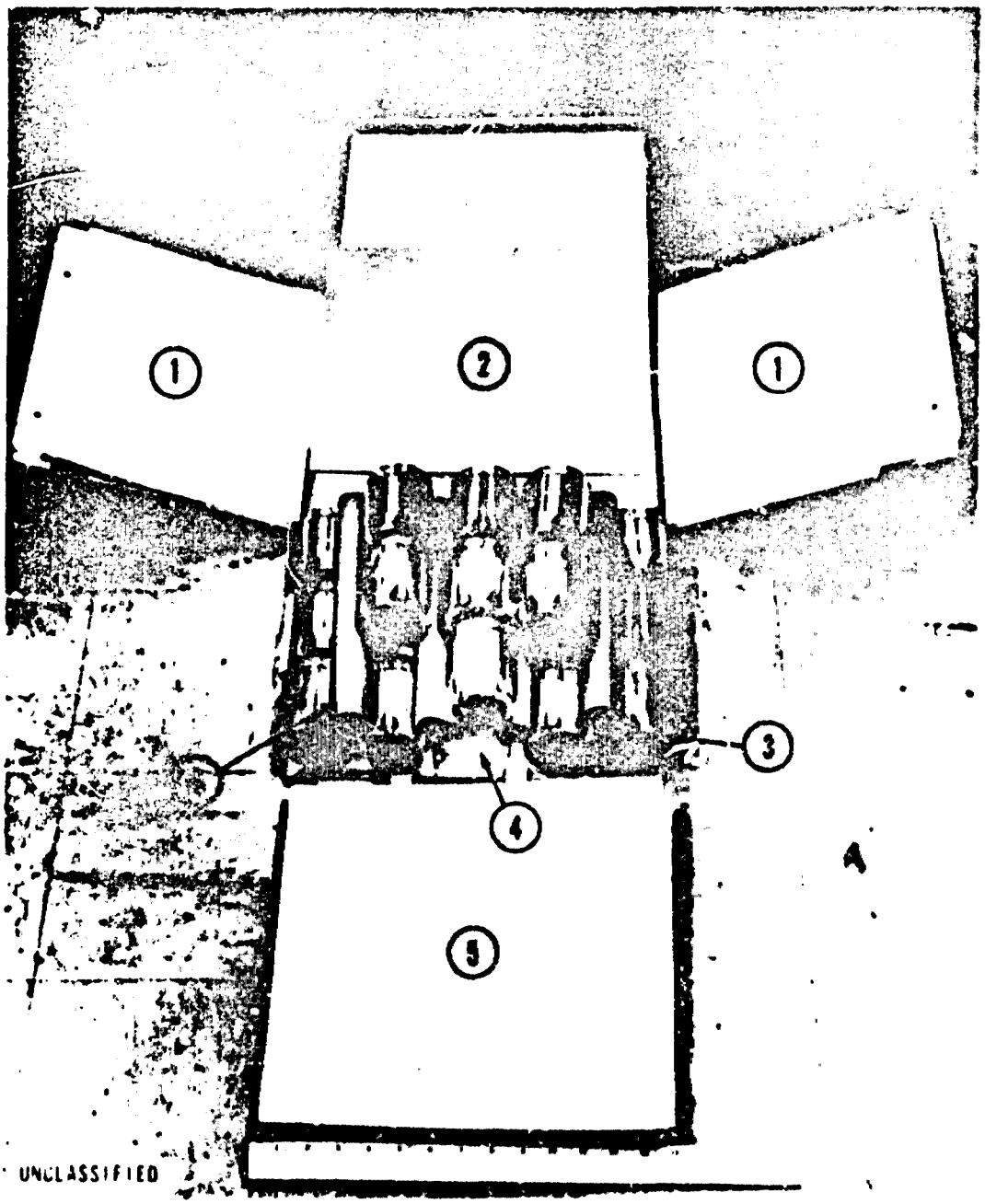


Figure 8. ADU-253/B Cluster Bomb Adapter Showing Packaging of Bombs. (1) Sides with Ethafoam, (2) Bottom with Ethafoam and Fiberboard, (3) Timer Side, (4) Timer Cover, (5) Top with Ethafoam and Fiberboard, and (6) Fiberboard Spacer Tubes.

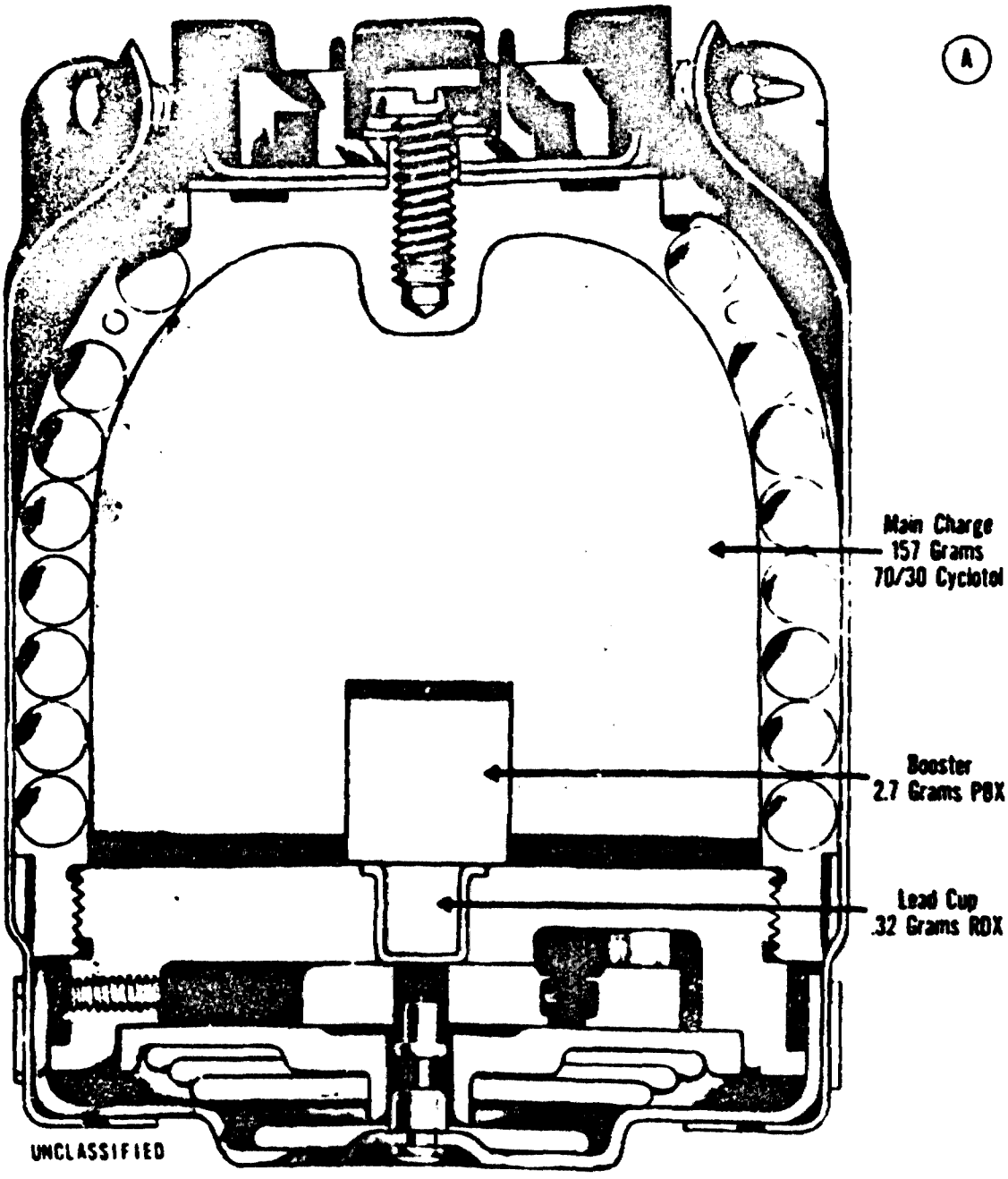


Figure 9. BLU-3/B Bomb Showing (A) Internal Construction, (B) Open Fin Configuration - (1) Vane, (2) Vane Spring, (3) Nose Cap, (4) New Wind Tab, (5) Vane-Keeper Strap, and (C) Closed Fin Configuration - (1) Vane-Keeper Strap in Place, (2) Old Wind Tab, (3) Wind Tab and Vane-Keeper Strap in Closed Position.

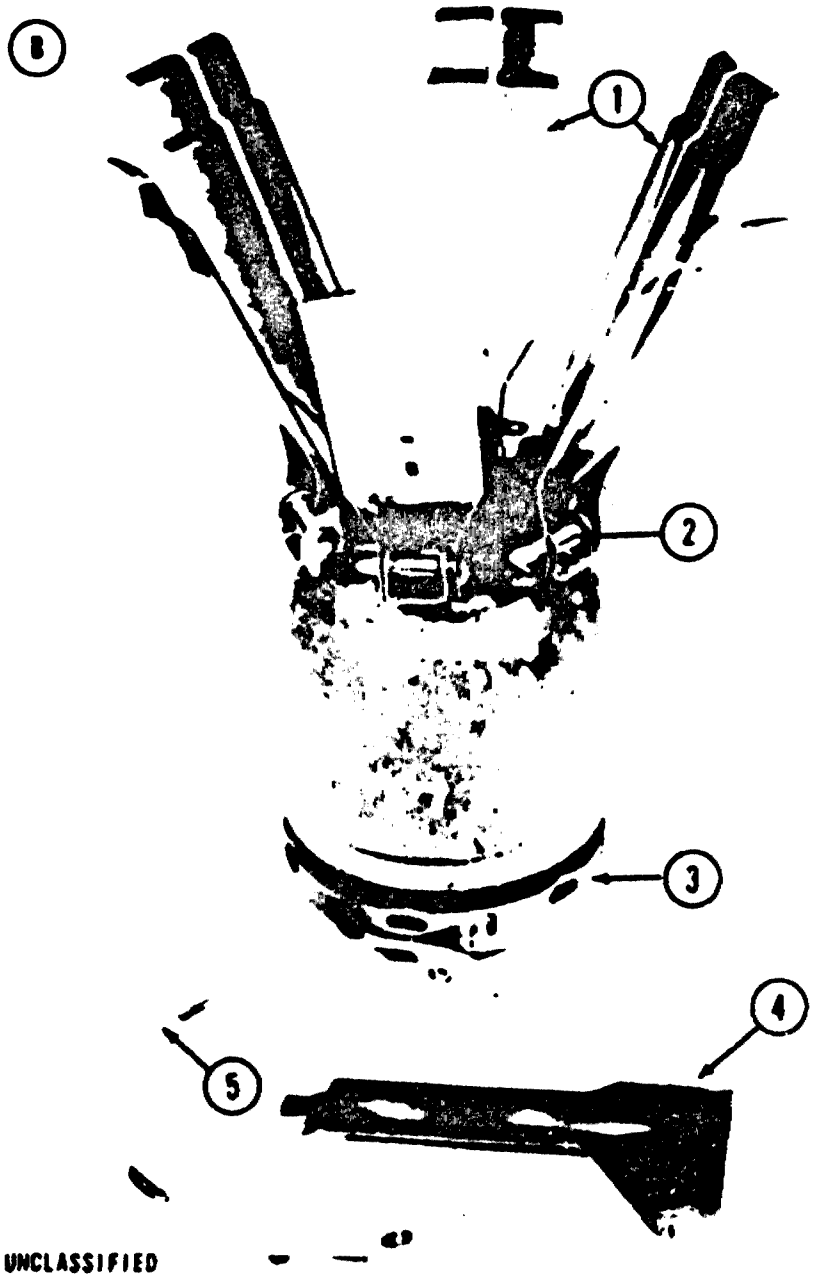


Figure 9 (Continued)

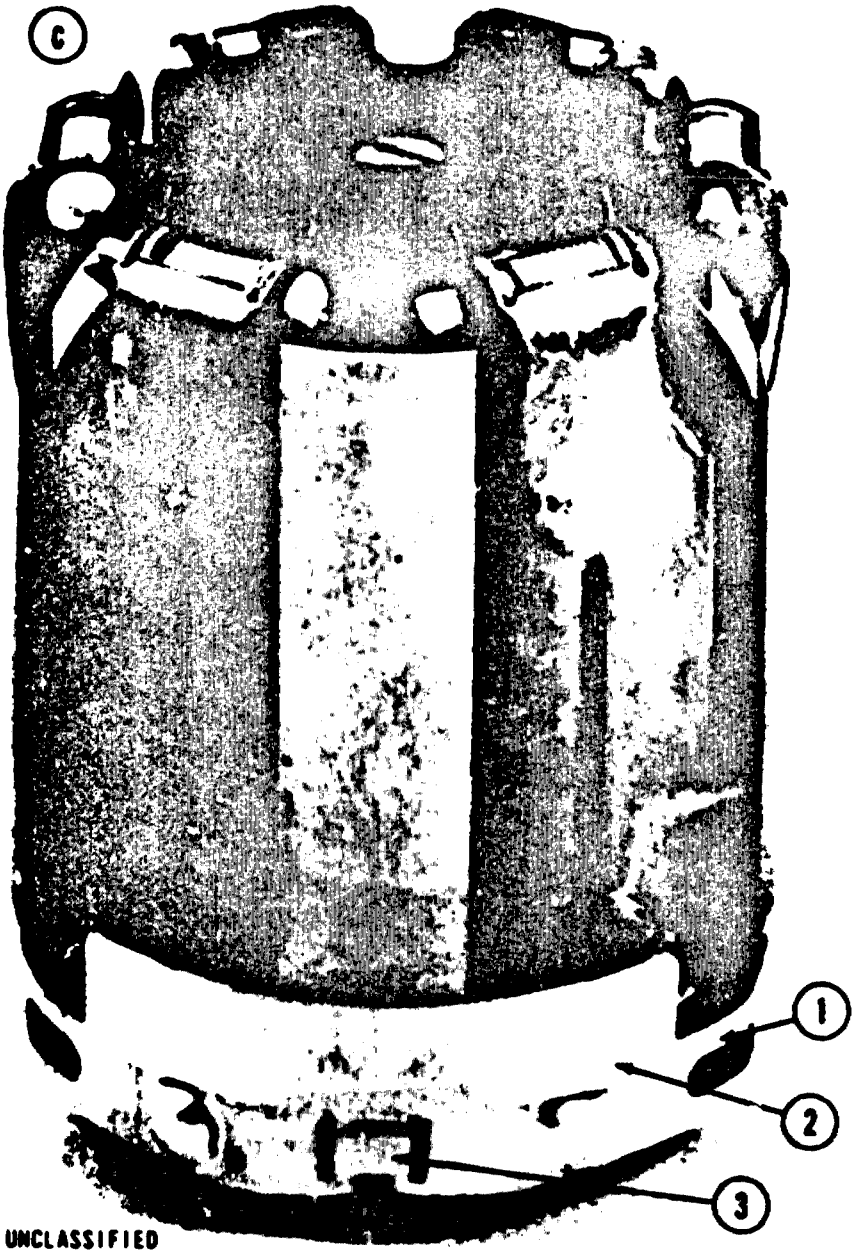


Figure 9 (Concluded)

(U) A vane assembly, located at the tail of the bomb, stabilizes and slows its flight. The fuze assembly is contained in the nose of the bomb. It consists of an escapement mechanism, a slider containing an M55 detonator, a spring to drive the slinder, a firing pin located in the center of the nose cap, and an arming spring under the nose cap. In the unarmed position, the nose cap is held against the body by the vanes which are folded over the body; the vanes in turn are held by a vane-keeper strap and wind tab.

(U) In this configuration the firing pin holds the detonator out of line, preventing the bomb from arming. As soon as the vanes are released, the nose cap and firing pin move down, releasing the slider. The slider spring then forces the detonator into line. The escapement mechanism prevents instantaneous arming by slowing the action of the slider. The time required for arming is between 1.7 and 2.5 sec. After the detonator is in line, any impact sufficient in force (30 lb) to compress the arming spring will drive the firing pin into the detonator causing it to fire.

MHU-74/E ADAPTER CLUSTER BOMB LIFT

(U) The MHU-74/E adapter cluster bomb lift (Fig.10) is a portable, hydraulically operated lifting device specifically designed for loading the ADU-253/B cluster bomb adapters into the SUU-24/A dispenser. The basic components of the lift are: hydraulic power unit (electric motor, hydraulic pump, and reservoir), hydraulic hand pump, speed control unit, platen assembly (lifting platform), handcrank tilt assemblies, hydraulic actuating cylinder, grounding reel, light assembly, and trailer assembly.

(U) The hydraulic power unit consists of an electric motor, hydraulic pump, and a 3-gal reservoir. The reversible electric motor is rated at 3,600 rpm, 1.8 hp, 208 v, 400 cycles. The hydraulic pump is a positive displacement, gear-type, reversible, internal relief valve pump and is mounted on the 3-gal reservoir. The pump has a normal operating pressure of 3,000 psi.

(U) The hydraulic hand pump is lever-operated with a 0.24-cu in. displacement. The hand pump incorporates a one-way check valve and supplies pressure only to the upper side of the hydraulic cylinder.

(U) The speed control unit consists of a lever-actuated, four-way metering valve and two cam-operated switches which control the operation of the hydraulic pump motor. When the speed control valve lever is set at any position other than neutral, the electrical circuit to the hydraulic pump motor is completed.

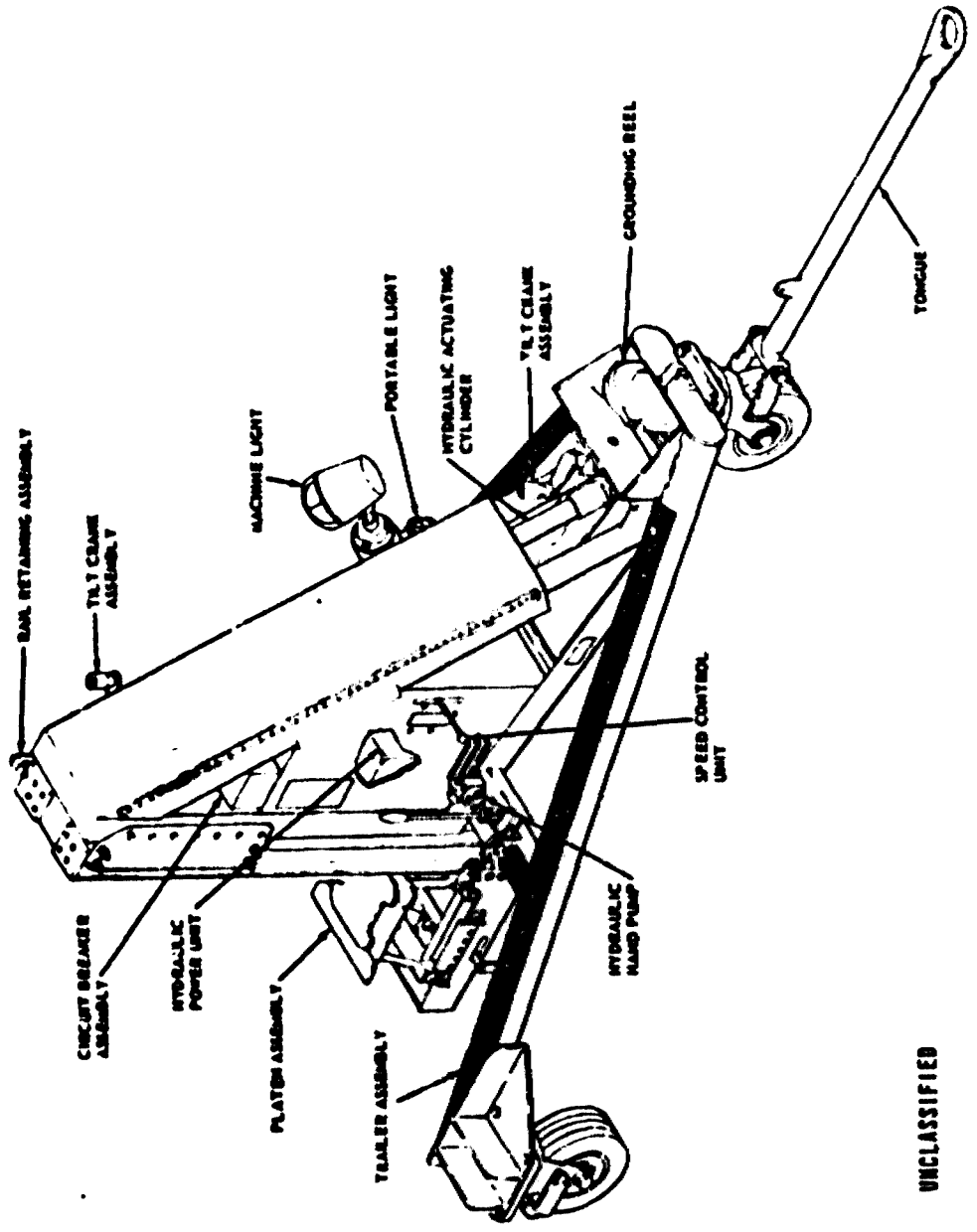


Figure 10. MHU-74/E Adapter Cluster Bomb Lift.

(U) The platen assembly (Fig. 11) has a convex surface on the top side which mates with a concave surface in the bottom of the ADU-253/B cluster bomb adapters. Two handcranks permit adjustment of the platen assembly 5 in. left or right and 2 7/8 in. forward or aft to facilitate alignment with individual cells of the dispenser.

(U) The handcrank tilt assemblies (Fig. 10) permit tilting the hoisting mechanism 7 deg forward or aft and 5 deg left or right. This capability allows correction of misalignment between the MHU-74/E adapter bomb lift and the SUU-24/A dispenser due to variations or ramp or aircraft attitude.

(U) The trailer assembly (Fig. 10) is a welded tubular structure supported by three casters with rubber wheels. The front wheel is steerable, and the two aft wheels are rigid and equipped with shoe brakes. A tongue is bolted to the front wheel for steering and towing purposes.

MHU-77/M DISPENSER HANDLING TRAILER

(U) The MHU-77/M dispenser handling trailer (Fig. 12) is designed for supporting and moving the dispenser in and around the loading and storage area. Tiedown bars are provided for securing the dispenser to the handling trailer for shipping. The handling trailer is mounted on four swivel-type casters and has provisions for a tow bar which can be easily attached or removed from the trailer. The handling trailer is also equipped with bolster adapters which can be extended to mate with securing lugs on the MHU-7/M bomb trailer. The MHU-7/M bomb trailer is used for loading the SUU-24/A dispenser into and out of the aircraft bomb bay and also for transporting purposes.

MHU-76/E DISPENSER LOADING RACK

(U) The MHU-76/E dispenser loading rack (Fig. 13) has two parallel beams supported at each end by an A frame. Each beam is equipped with two hangers which mate with the suspension hooks on the SUU-24/A dispenser. The rack is designed to allow preloading of the munition cartons into the dispenser prior to installation in the aircraft.

MHU-72/E ADAPTER HANDLING CARRIER

(U) The MHU-72/E adapter handling carrier (Fig. 14) is designed for carrying and handling individual cartons. The carrier engages opposite sides of the cartons and incorporates a quick-disconnect pin for locking the carrier in the engaged position.

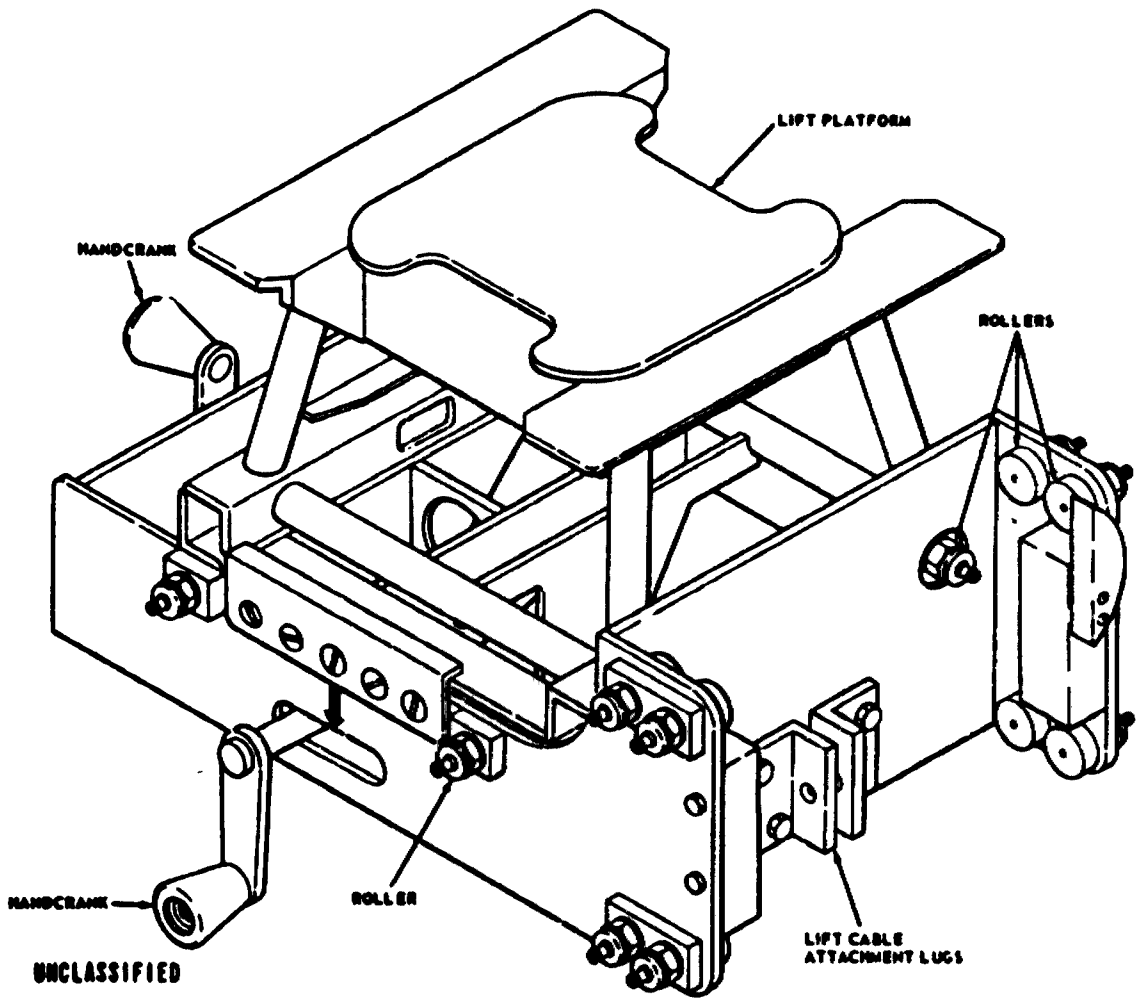


Figure 11. Platen Assembly for MHU-74/E Adapter Cluster Bomb Lift.

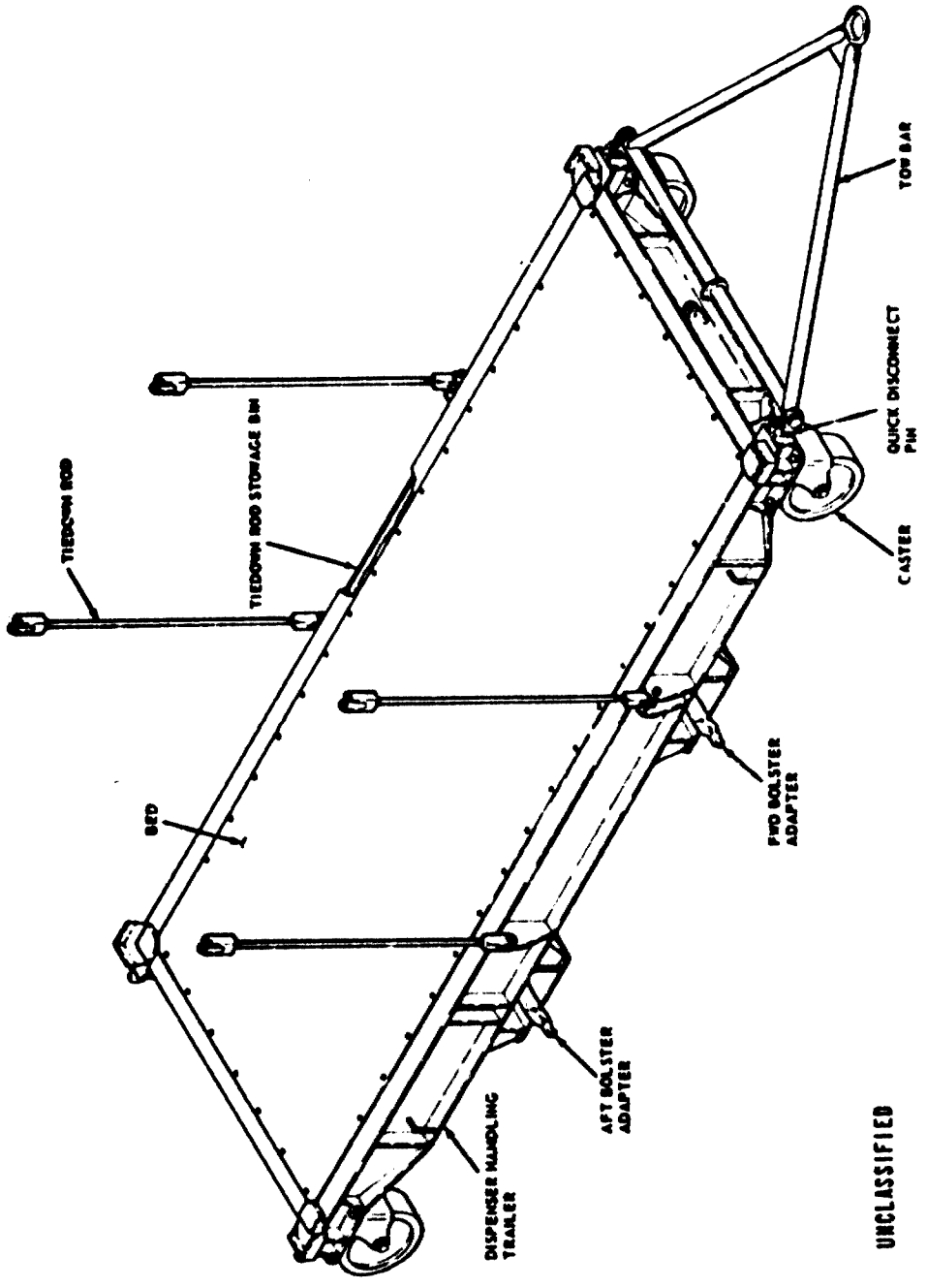


Figure 12. MHL-77/M Dispenser Handling Trailer.

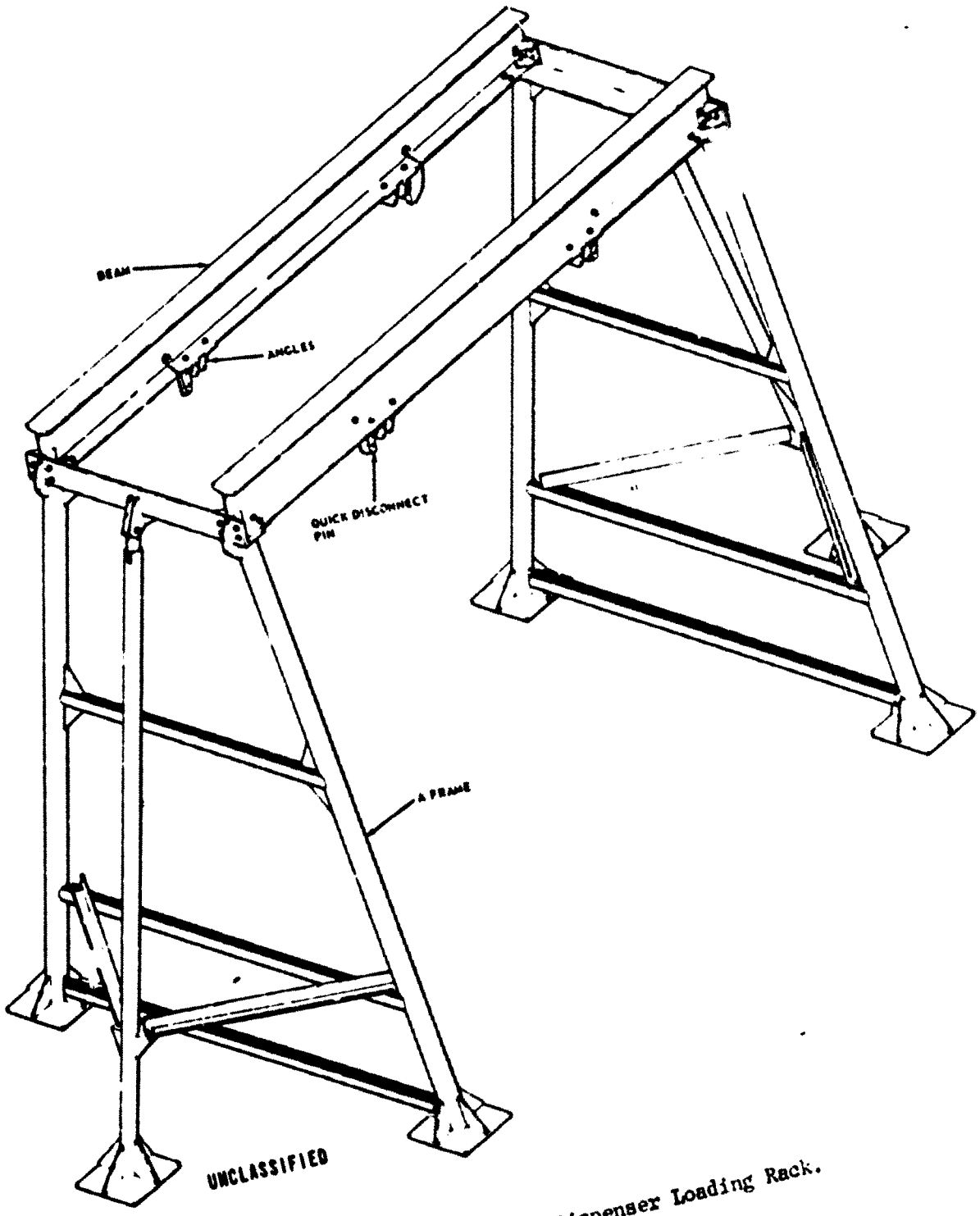


Figure 13. MHU-76/E Dispenser Loading Rack.

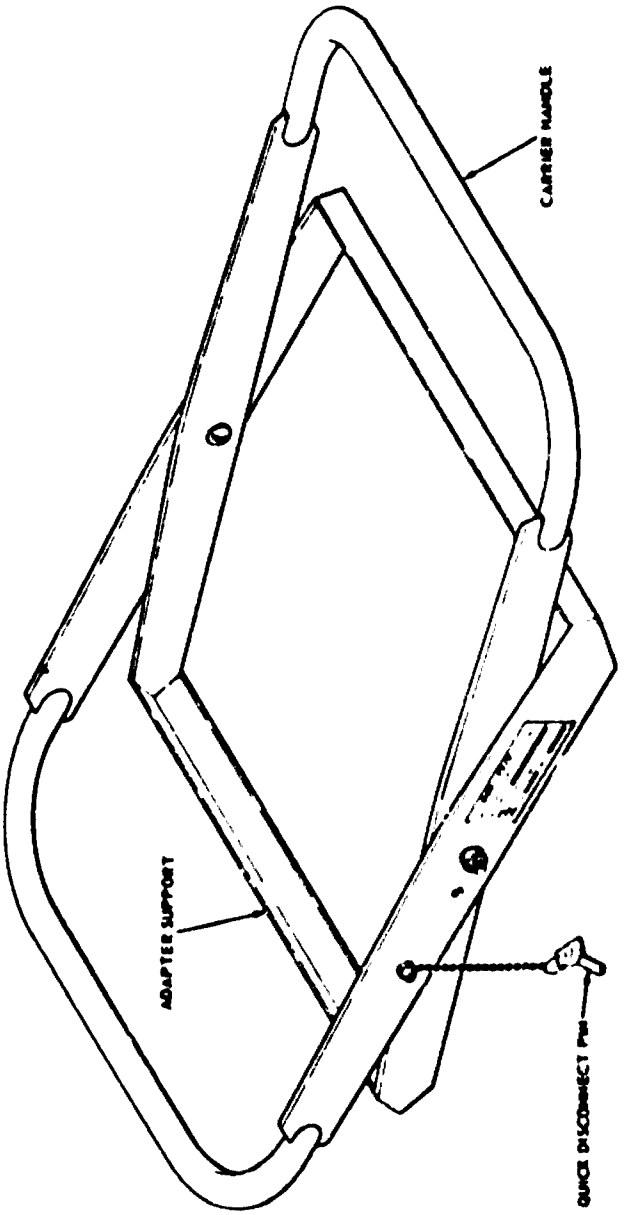


Figure 2-. XM-721 Adapter Handling Carrier.

MMU-75/E ADAPTER SAFEING RETAINER

(U) The MMU-75/E adapter safeing retainer (Fig. 15) is a reusable nylon web belt equipped with a buckle device for ease of installation and removal. The safeing retainer is designed to prevent the accidental opening of the carton during down-loading operations.

SAFETY CLIP ASSEMBLY

(U) The safety clip assembly (Fig. 16) consists of two safety locks connected by a nylon cord to which is attached a red flag. Each safety lock prevents functioning of the release arms of the electro-mechanical release mechanisms after the cartons are loaded into the dispenser. The red flag is to insure that the safety clip assemblies are removed prior to flight.

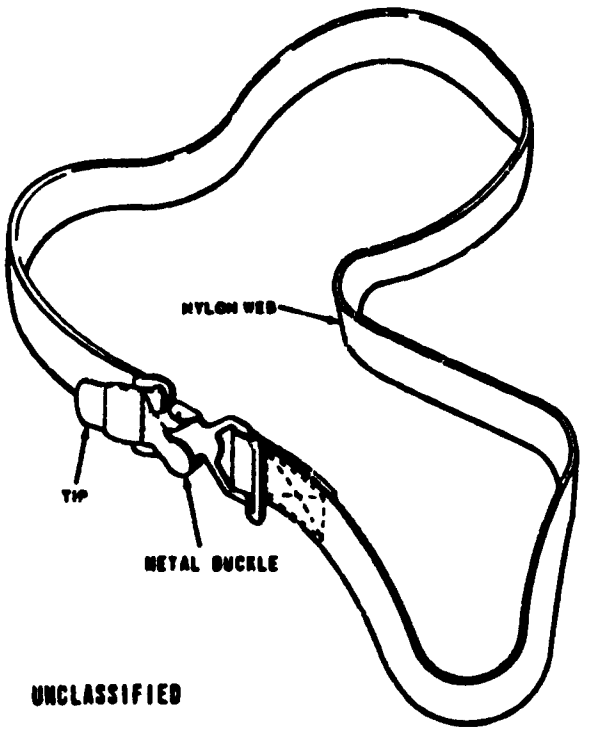


Figure 15. MMU-75/E Adapter Safeing Retainer.

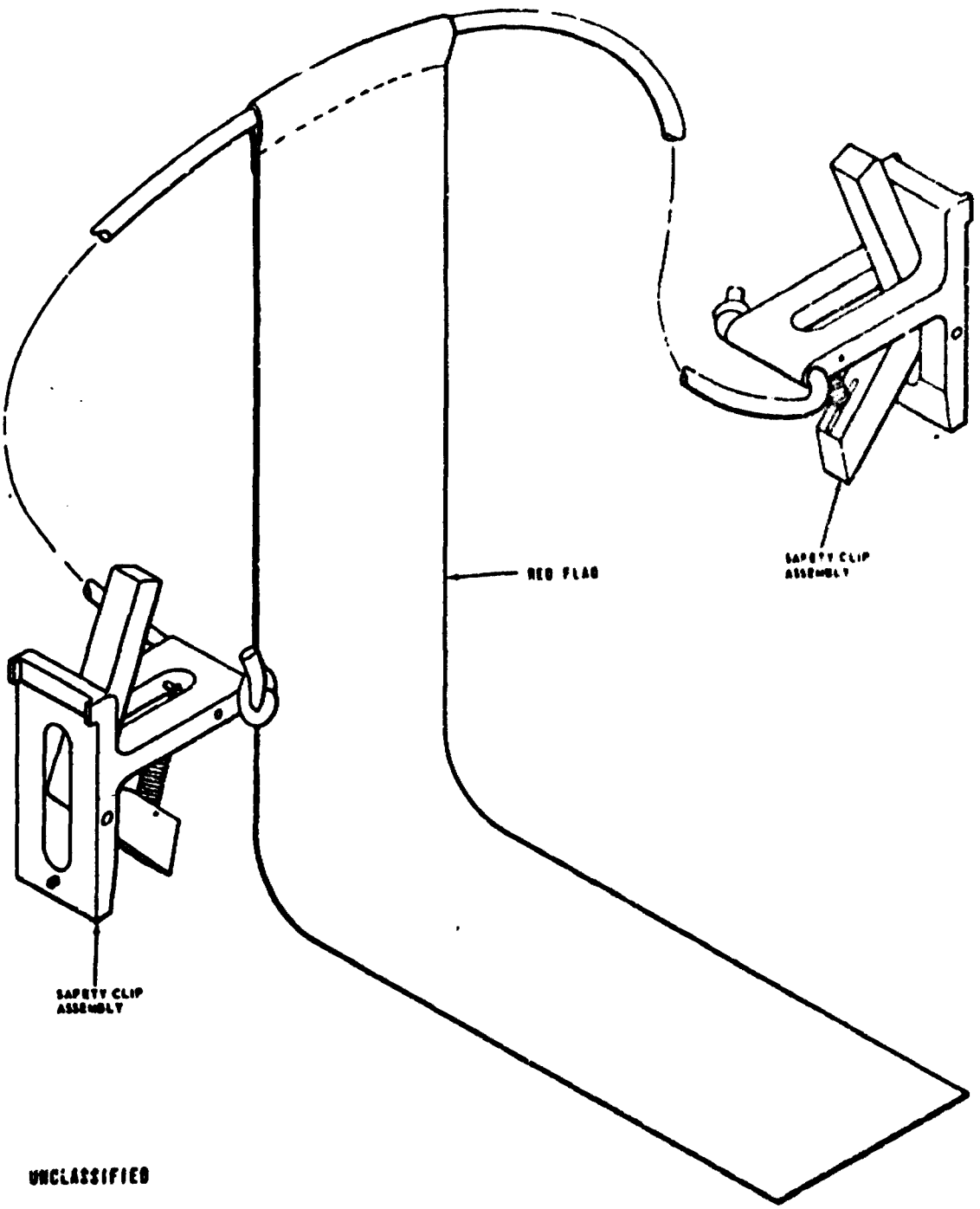


Figure 16. Safety Clip Assembly.

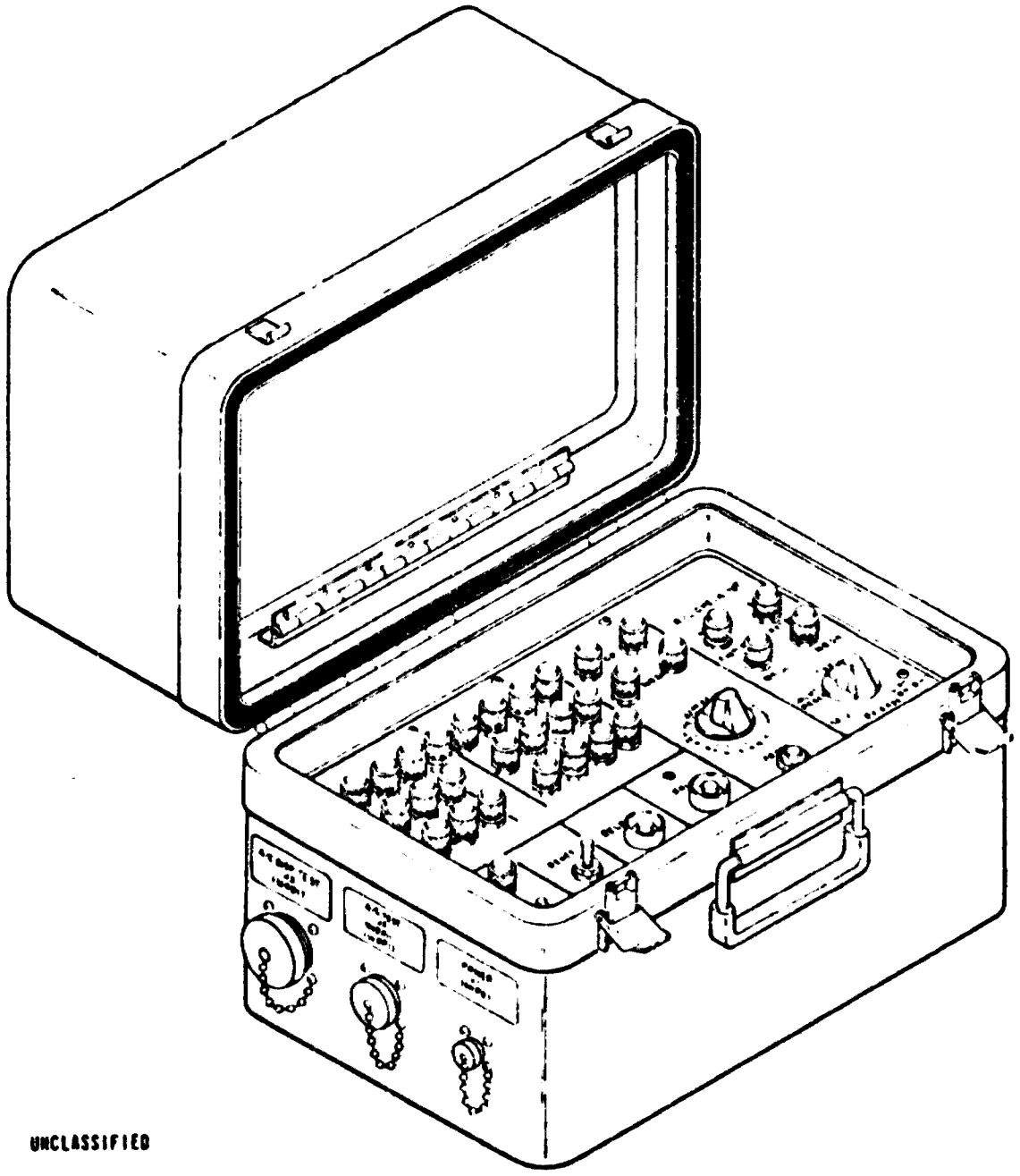
TTU-244/E DISPENSER TEST SET

(U) The TTU-244/E dispenser test set (Fig. 17) consists of a panel assembly and the necessary cable assemblies for interconnecting the dispenser test set with the SUU-24/A dispenser or aircraft and is housed in a suitcase-type container. The lid of the container provides storage space for the cable assemblies. The test set is designed to functionally check the SUU-24/A dispenser in the loaded or unloaded configuration whether installed in the aircraft or not. The AFT DISPENSER and FWD DISPENSER lights (Fig. 18) are used when checking the forward and aft loaded dispensers in the B-52. The FWD DISPENSER lights only are used when checking either a loaded dispenser prior to installation in the aircraft or a loaded dispenser in the B-47 aircraft. The AFT DISPENSER lights are used to check an unloaded dispenser not installed in an aircraft. The lights operate on a bright/dim principle, each light operating for two cells. Each light changes from bright to dim to show the release of the first cell and from dim to off for release of the second cell to which it is related.

LOADING PROCEDURE

(U) The SUU-24/A dispenser with the MHU-77/M dispenser handling trailer is loaded on the MHU-7/M bomb trailer and transported to the aircraft for loading (Fig. 19). The MHU-7/M trailer is positioned under the aircraft bomb bay and the SUU-24/A dispenser elevated into position. Once the dispenser suspension hooks and the aircraft clip-in racks are mated and secured, both the MHU-77/M and MHU-7/M trailers are removed. One dispenser at a time is loaded in the B-52. The dispenser(s) are then mated with the aircraft bomb systems by installing the connecting cable.

(U) Prior to loading any munition, the dispenser/aircraft combination is given an electrical check employing the TTU-244/E dispenser test set. If a "no-go" light is obtained, loading of the cartons can proceed. The MHU-74/E adapter cluster bomb lift is prepositioned under the cell to be loaded, and three cartons are placed on the platen with the timer sides facing aft. The platen is raised until the top of the first carton to enter the cell is approximately one-half to one inch below the cell walls. At this point the tilt mechanisms are adjusted to correct for deviations from the horizontal of the aircraft and/or the MHU-74/E adapter cluster bomb left. Minor positioning adjustments are also made at this time utilizing the platen handcranks.



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Figure 17. TTU-244/E Dispenser Test Set.

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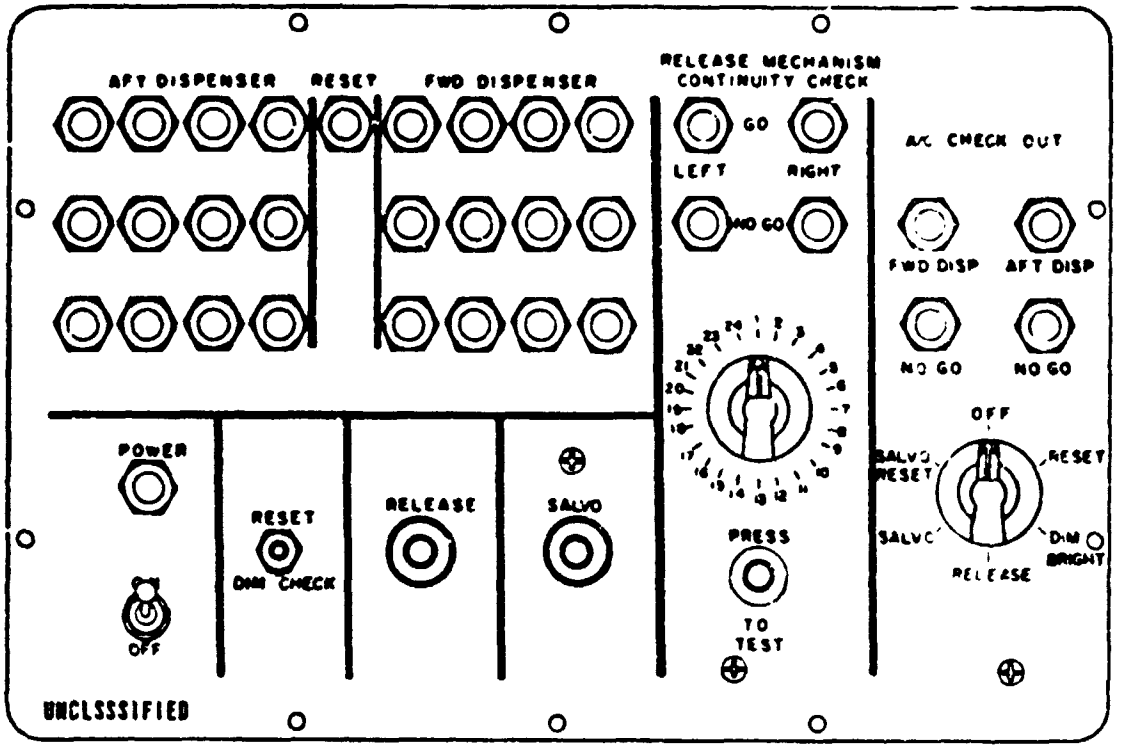


Figure 18. TTU-244/E Light and Switch Layout Arrangement.

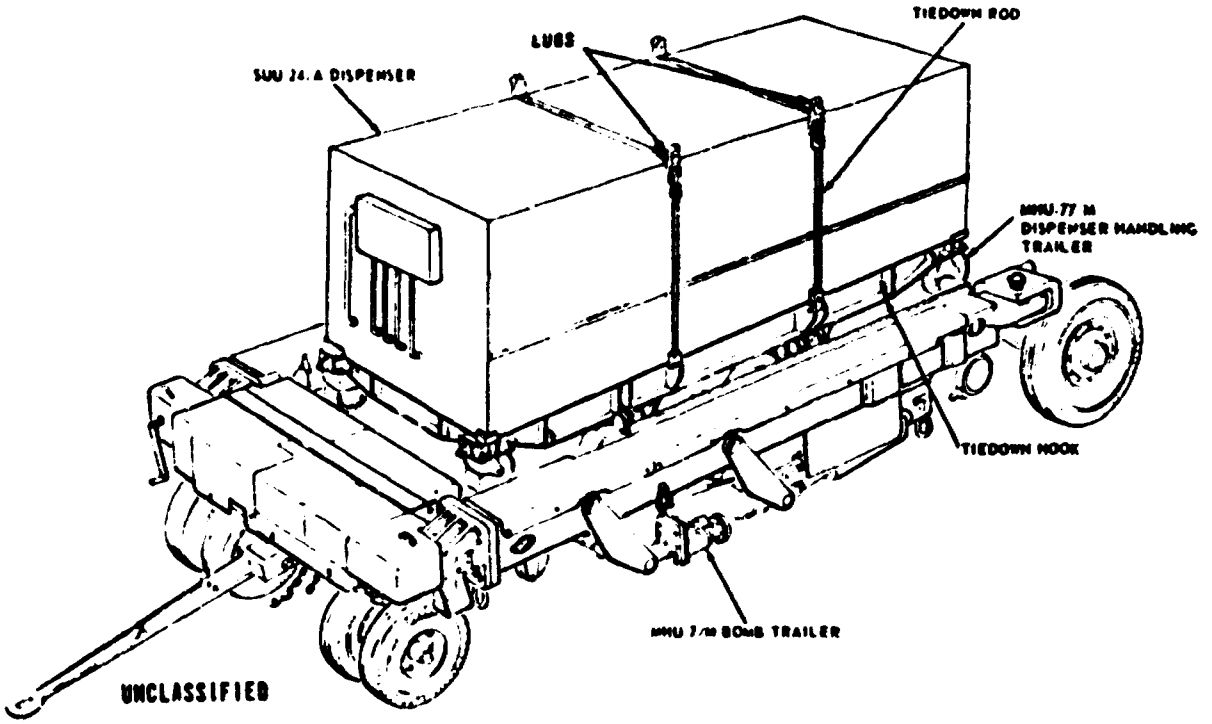


Figure 19. Dispenser and Handling Trailer on MHU-7/M Loading Trailer.

(U) The carton is raised into the cell until the actuator plunger arm of the timer has just entered the cell. (The timer can be set at this point of the loading procedure, or it may be pre-set.) The safety pin is removed allowing the plunger arm to contact the cell wall and the carton raised until the timer mechanism is completely enclosed in the cell. The safety band is removed and the carton is raised completely into the cell.

(U) After the above procedures for all three cartons have been followed, the electro-mechanical release mechanisms are hand-set and locked with the safety clips. The individual dust cover may then be installed. The same procedures are followed to complete the loading for all cells.

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SECTION III

INSTRUMENTATION

(U) The instrumentation of this test consisted of the equipment necessary to determine:

1. If unsafe conditions existed during release and fallaway of the cartons.

2. Opening characteristics of the cartons.

3. Ballistics of the cartons and bombs.

4. Ground impact patterns of the bombs.

AIRCRAFT AND AIRBORNE INSTRUMENTATION

(U) Hand-held motion picture DBM-5/A Milliken (200-400 frames per second) and M-35 Mitchell (0-128 frames per second) cameras were employed in F-100F, T-33, UH-1 helicopter, and B-57 photo-chase aircraft to record release and fallaway of the cartons. Flight research Mod III synchronous 16mm motion picture cameras were installed on brackets attached to the forward end of the SUU-24/A dispenser in the B-52 and B-47 aircraft to record release characteristics in the immediate bomb-bay area. The radar bombing system, including the RBS tone system, were employed by both aircraft to obtain delivery accuracy and the exact time of release of the cartons.

(U) The B-47 RBS tone system was modified to eliminate the necessity for the navigator to actuate it manually when employing the manual bombing system. The RBS tone system is an oscillator interconnected between the bombing system and UHF transceiver. When activated, a continuous tone is generated and transmitted through the transceiver. When the bombs are released, the tone is instantly cut off, thus providing time of the bomb release.

GROUND INSTRUMENTATION

(U) The ground instrumentation used to track the aircraft and cartons as follows.

(U) Contraves cinetheodolites were used to record time-space-position data of the aircraft and cartons from T-10 sec through release and the cartons from release through function in the X, Y, and Z coordinates. The Contraves cinetheodolites have the following capabilities and characteristics:

Film size	35mm
Magazine capacity	400 ft
Focal length	60 in.
Aperture	F/8 to F/44
Frame rate	10 fps or 30 fps
Focus	1 km to infinity
Exposure time	1/40 and 1/120 sec.

(U) The Contraves cinetheodolites cover 360 deg in azimuth and -10 deg to 1[illegible] deg (manual mode) or -10 deg (servodrive mode) in elevation.

(U) When the Contraves cinetheodolites were used, the RBS tone of the aircraft was recorded on a multichannel Brush recorder and magnetic tape which also recorded the theodolite shutter pulse. The theodolite film and tone recorder were imprinted with IRIG format B time signals.

(U) Askania cinetheodolites were also used to record the time-space-position data of the aircraft and cartons.

(U) The Askanias have the following capabilities and characteristics:

Film size	35mm
Magazine capacity	164 ft (1200 frames)
Focal length	40 in.
Aperture	F/4.5 to R/22
Frame rate	5 fps
Exposure time	-1/150 sec.

(U) The Askania cinetheodolite manual tracking instruments cover 360 deg in azimuth and from 10 deg to 190 deg in elevation. Control of the camera is maintained by two operators each manipulating a handwheel, one for azimuth and one for elevation.

(U) When the Askania cinetheodolites were used, the RBS tone, theodolite shutter pulses, and IRIG format B time signals were recorded on a Brush recorder and oscillograph.

(U) High-speed 35mm Mitchell and Faxtax cameras on portable tracking mounts were employed on the ranges to record release, fallaway, and functioning characteristics of the cartons and bombs. These cameras operate at a variable frame rate from 0 to 98 fps and utilized lens sizes from 6 in. to 80 in. The 24-in., 40-in. and 80-in. lens were the primary sizes utilized during the project. Color and black-and-white film were used throughout the test and were time-annotated to provide the exact time of events in relation to carton release time.

(U) Fixed position DBM-5/A Milliken cameras using black-and-white film and operating at a frame rate of 200 fps were used to record the impact characteristics of the bombs.

SECTION IV

TEST PROCEDURES

(U) Twenty-three missions were required to complete this project. The test was divided into three phases. Phase I consisted of missions 1 through 5, Phase II consisted of missions 6 through 18, and Phase III consisted of missions 19 through 23.

(U) Four additional missions were accomplished as special tasks to determine the feasibility of (1) spinning cartons, (2) napalm cartons, (3) the effect of a baffle in the rear of the bomb bay of the B-47, and (4) using a modified retaining band for the ADU-253/B. The parameters and results for these missions are contained in Appendix IV.

(U) The majority of the decisions affecting the progress of the test were made on the basis of the immediately available information after each mission, such as approximate values of the timer functions, impact pattern size, and dud rates of bombs. Evaluations of the carton functioning characteristics were made in committee on the basis of visual impressions coupled with available film coverage.

(C) The test parameters, particularly bombing altitudes and airspeeds, were governed primarily by the expressed requirements of SAC, the using command. The maximum test altitude was 3,000 ft AGL, and the airspeeds were 350 KIAS for the B-52 and 425 KIAS for the B-47.

(U) From the start of the test, various organizations such as OOAMA, OOCAMA, 35MMS Squadron, SAAMA, and Picatinny Arsenal were requested to observe and evaluate the test items and their operation from the standpoint of their specific areas of responsibilities in order to provide inputs for design, production, or operation of the system. This was an additional aid in reducing the lead time to operationally qualify the weapon system.

PHASE I - MISSIONS 1 THROUGH 5

(U) The objectives of these missions were to obtain (1) initial ballistic data on the cartons and bombs, (2) carton functioning characteristics, and (3) bomb impact patterns for a variety of delivery altitudes and airspeeds.

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(C) B-52 and B-47 aircraft were employed for the missions conducted at WSMR. The bombing altitudes were varied from 400 ft to 3,000 ft AGL. The delivery airspeeds were 350 KIAS for the B-52 and 425 for the B-47.

(U) Single- and multiple-carton releases were made. Carton configurations 1 and 2 (see Appendix I) and the prototype dispensers tested under AFGC Project 2502W2 were used. The missions and test conditions are listed in Table II.

PHASE II - MISSIONS 6 THROUGH 18

(U) The objectives of this series of tests were to (1) determine the most reliable means of achieving uniform and consistent carton functioning characteristics, (2) acquire bomb impact patterns for single and multiple carton releases, and (3) acquire carton and bomb ballistic data. Carton configurations 2 through 10 were used (see Appendix I). Both the prototype and initial production dispensers were used.

(U) The B-52 and B-47 aircraft BRIC systems were employed for the multiple cell drops to acquire data on pattern overlap density build-up. Three primary BRIC settings were used: 76 ft, 194 ft, and 437 ft between release pulses. The missions and test conditions are listed in Table III.

PHASE III - MISSIONS 19 THROUGH 23

(U) Phase III was conducted using essentially production cartons. The specific objectives for this phase of testing were to (1) verify the functioning characteristics of the production cartons, (2) verify and demonstrate impact pattern and dud rate data, (3) qualify the system with high-explosive BLU-3/B bombs, and (4) obtain lethality data.

(U) Missions 19 and 22 were the most important missions in this series. Mission 19 consisted of release of a full B-47 load of 5,328 inert bombs with live fuzes at WSMR. This was the only mission which provided accurate bomb impact data for the complete weapon system in the B-47. Mission 22 consisted of release of a full B-52 load of 10,656 high-explosive BLU-3/B's on a simulated target. Mission 23 consisted of two passes over the target area, in which a one-half dispenser load (2,664 bombs) was released on each pass.

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TABLE II. TEST MISSIONS AND CONDITIONS, PHASE I.

Mission Number	Date (1964)	Aircraft	Pass	Altitude (ft AGL)	Airspeed (KIAS)	Cartons Per Pass	Timer Setting	Carton Configuration
1	1 Dec	B-52	1	5000	350	5	4	1
2	1 Dec	B-47	1	400	425	5	4	1
		B-47	2	000	425	5	4	1
		B-47	3	2000	425	5	4	1
		B-47	4	1400	425	5	4	1
		B-47	5	1400	425	5	4	1
		B-47	6	2000	425	5	4	1
		B-47	7	2000	425	5	4	1
		B-47	8	3000	425	5	4	1
3	1 Dec	B-52	1	2400	350	5	4	2
		B-52	2	2000	350	5	4	2
		B-52	3	1800	350	5	4	2
		B-52	4	1400	350	5	4	2
		B-52	5	1000	350	5	4	2
		B-52	6	600	350	5	4	2
		B-52	7	400	350	5	4	2
4	16 Dec	B-47	1	3000	425	5	5	2
		B-47	2	2000	425	5	5	2
		B-47	3	1400	425	5	5	2
		B-47	4	600	425	5	5	2
		B-47	5	1400	350	1	5	2
		B-47	6	1400	350	1	5	2
5	17 Dec	B-47	1 - 5	1000	425	1	5	2

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TABLE III. TEST MISSIONS AND CONDITIONS, PHASE II.

Mission Number	Date (1965)	Aircraft	Passes	Altitude (ft AGL)	Airspeed (KIAS)	Cartons Per Pass	Timer Setting (sec)	Carton Configuration	BRIC Setting (ft)
6	21 Jan	B-52	1 - 11	1400	350	1	3	5 and 4	---
7	22 Jan	B-52	1 - 7	1400	350	1	3	3, 4 and Installed Upside Down	---
8	2 Feb	B-52	1 - 16	1400	350	1	3	5 and 6 (8 each)	---
9	2 Feb	B-47	1 - 15	1400	425	1	3	5 (7 ea) 6 (8 ea)	---
10	3 Feb	B-52	1 - 7	1400	350	1	3	7	---
11	3 Feb	B-47	1 - 7	1400	425	1	3	7	---
12	17 Feb	B-47	1	2000	350	9	3	8	76
		B-47	2	2000	350	9	3	8	194
		B-47	3	2000	350	9	3	8	437
13	18 Feb	B-47	1	1400	350	9	3	8	76
		B-47	2	1400	350	9	3	8	194
		B-47	3	1400	350	9	3	8	437
14	19 Feb	B-47	1	800	350	9	3	8	76
		B-47	2	800	350	9	3	8	194
		B-47	3	800	350	9	3	8	437
15	2 Mar	B-47	1	1400	425	3	3	9	76
		B-47	2	1400	425	9	3	9	194
		B-47	3	1400	425	9	3	9	437
		B-47	4	1400	425	3	3	8	76
		B-47	5	1400	425	3	3	9	86
		B-47	6	1400	425	6	3	8	100
16	3 Mar	B-47	1	1400	350	9	3	8	100
		B-47	2	1400	350	9	3	8	194
		B-47	3	1400	350	9	3	8	437
17	30 Mar	B-47	1 - 14	1400	425	3	3	10	---
		B-47	15	1400	425	9	3	10	---
18	1 Apr	B-47	1	1400	425	3	3	10	---
		B-47	2	1400	425	18	3	10	194

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(U) The simulated target, designed by APGC, was constructed on the Hill AFB test range. It contained actual and simulated targets such as POL, ammunition, barracks and personnel areas, revetted and unrevetted aircraft, a simulated SAM site and missile launcher, plywood witness panels, and various types of vehicles. Because of the complexity of the target array and the results of the missions against it, the damage results will be treated separately in Appendix VI. The missions and test conditions are listed in Table IV.

TABLE IV. TEST MISSIONS AND CONDITIONS, PHASE III.

Mission Number	Date (1965)	Aircraft	Passes	Altitude (ft AGL)	Airspeed (KIAS)	Cartons Per Pass	Timer Setting (sec)	Carton Configuration	BRIC Setting (ft)
19	14 Apr	B-47	1	800	425	72	3	10	100
20	27 Apr	B-47	1	1000	425	1	5	11	---
		B-47	2	1000	425	2	5	11	100
		B-47	3	1000	425	21	5	11	100
21	28 Apr	B-52	1	1000	350	2	5	11	76
		B-52	2	1000	350	4	5	11	76
		B-52	3	1000	350	41	5	11	76
22	6 May	B-52	1	800	350	144	4	12	76
23A	20 May	B-47	1	1000	425	36	4	12	100
23B		B-47	2	1000	425	36	4	12	200

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SECTION V

TEST RESULTS AND DISCUSSION

(U) This section is treated in three phases. Each mission is presented with a discussion which relates it to the previous test results and the activities which followed. This presentation was considered the best means by which continuity of the report could be maintained.

(U) Table V presents the results of the reduced observed data, and Table VI presents for each mission the number and kind of bombs dropped, recovered and duds, where applicable.

(U) Appendix I presents the carton modifications and configuration utilized for the test. Appendix II presents comparison of the observed and computed ballistic data for those missions in which sufficient data was acquired to permit valid ballistic computations.

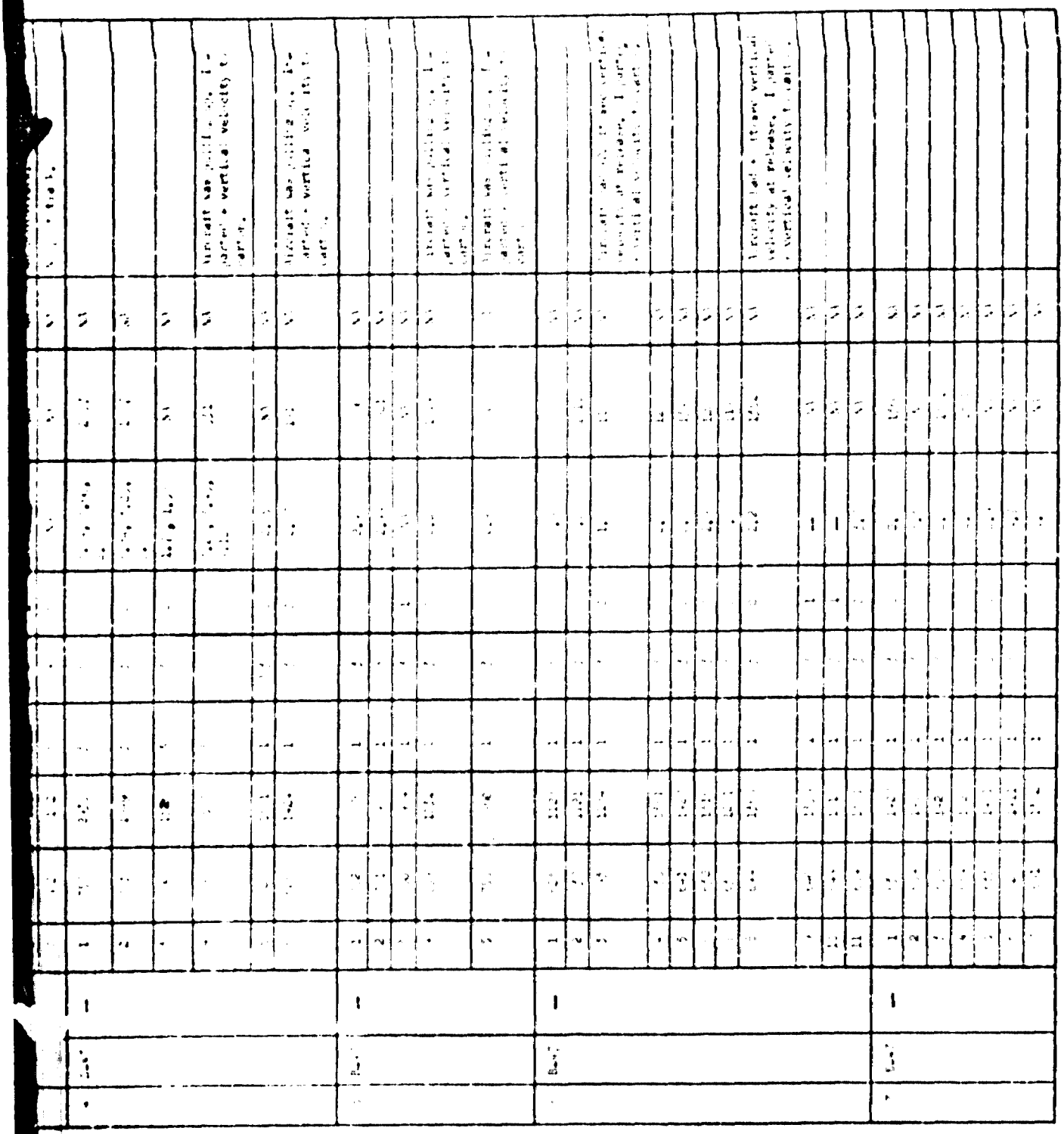
(U) Appendices III, IV and V present an explanation of the lethal area coverage computer program; a synopsis of the four additional test missions conducted under this project number, including mission objectives and results; and the bomb impact position data for those impact plots presented and discussed in Phases II and III of this Section.

PHASE I

(C) Mission 1 was conducted at 5,000 ft AGL and 590 KIAS employing a B-52 aircraft and utilized the carton and timer tested under AFGC Project [illegible] W (Appendix I, Table I-1, configuration 1). The mission aborted after one pass because of a range instrumentation power failure. Of the three cartons released, one failed to function and impacted intact (Fig. [illegible]). No cause for the timer malfunction was determined since both the timer and the carton were almost completely destroyed.

(C) Mission 2 was conducted using a B-47 aircraft flying at 525 KIAS and also utilized carton configuration 1. Eight passes were made: one each at 400 feet, 600 ft, 1,000 ft, 1,400 ft, 1,800 ft, and 5,000 ft AGL. During the course of the mission, eight cartons opened in the bomb bay immediately after release from the dispenser (Fig. 21) and resulted in extensive damage to the aircraft,

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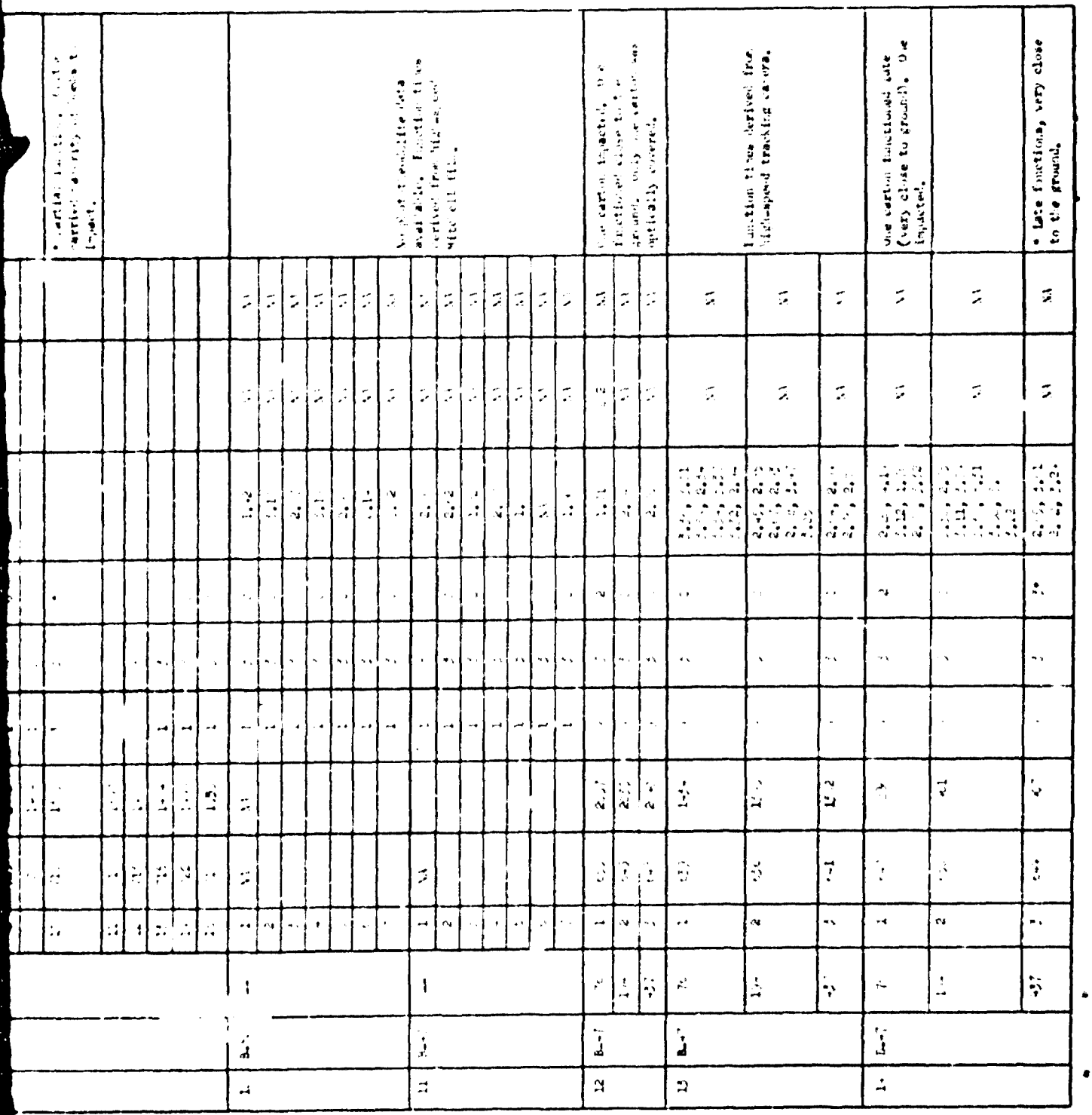
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TABLE V. RESULTS OF REDUCED OBSERVED DATA, MISSIONS 1-25.

Mission No.	Aircraft Type	BRIC Setting (ft)	Pass No.	Release Airspeed (fps)	Release Altitude AGL (ft)	Cartons per Pass	Timer setting (sec)	Cartons Impacting			Remarks
								No. of Impacts	Time of Function (sec)	Altitude AGL (ft)	Velocity (KIAS)	
1	B-52	-	1	NA	NA	4	-	1	[illegible]	NA	NA	Four film strips obtained from MIT Bell film. No photothedolite tracking obtained.
2	B-47	-	1	[illegible]	[illegible]	4	-	1	[illegible]	NA	NA	Lower release.
			2	[illegible]	[illegible]	4	-	[illegible]	[illegible]	NA	NA	One carton burst at release.
			3	[illegible]	[illegible]	[illegible]	-	[illegible]	NA	NA	NA	Two cartons burst at release, one carton burst at photothedolite track.
			4	[illegible]	[illegible]	4	-	1	[illegible]	NA	NA	Two cartons burst at release.
			5	[illegible]	[illegible]	3	-	[illegible]	[illegible]	NA	NA	Close release. One carton burst at release, two cartons fell at exit, one carton at photothedolite track.
			6	[illegible]	[illegible]	4	-	4	[illegible]	[illegible]	NA	
			[illegible]	[illegible]	[illegible]	4	-	[illegible]	[illegible]	NA	NA	Two cartons burst at release.
			[illegible]	[illegible]	[illegible]	3	-	2	NA	NA	NA	One carton burst at release.
3	B-52	-	1	[illegible]	[illegible]	4	-	1	[illegible]	NA	NA	
			2	[illegible]	[illegible]	2	-	[illegible]	NA	NA	NA	Three cartons functioned very close to the ground. No photothedolite.
			[illegible]	[illegible]	[illegible]	[illegible]	-	2	[illegible]	[illegible]	NA	
			[illegible]	[illegible]	[illegible]	[illegible]	-	[illegible]	[illegible]	[illegible]	NA	
			[illegible]	[illegible]	[illegible]	[illegible]	-	[illegible]	[illegible]	[illegible]	NA	
			[illegible]	[illegible]	[illegible]	[illegible]	-	1	[illegible]	NA	NA	No photothedolite.
			[illegible]	[illegible]	[illegible]	4	-	[illegible]	[illegible]	NA	NA	No photothedolite track.
4	B-47	-	1	[illegible]	[illegible]	[illegible]	-	[illegible]	[illegible]	[illegible]	NA	
			2	[illegible]	[illegible]	[illegible]	-	[illegible]	[illegible]	[illegible]	NA	
			[illegible]	[illegible]	[illegible]	[illegible]	-	[illegible]	[illegible]	[illegible]	NA	Aircraft was pulling up. Impact + vertical velocity to carton.
			[illegible]	[illegible]	[illegible]	[illegible]	-	[illegible]	[illegible]	[illegible]	NA	
			[illegible]	[illegible]	[illegible]	1	-	[illegible]	[illegible]	NA	NA	Aircraft was pulling up. Impact + vertical velocity to carton.

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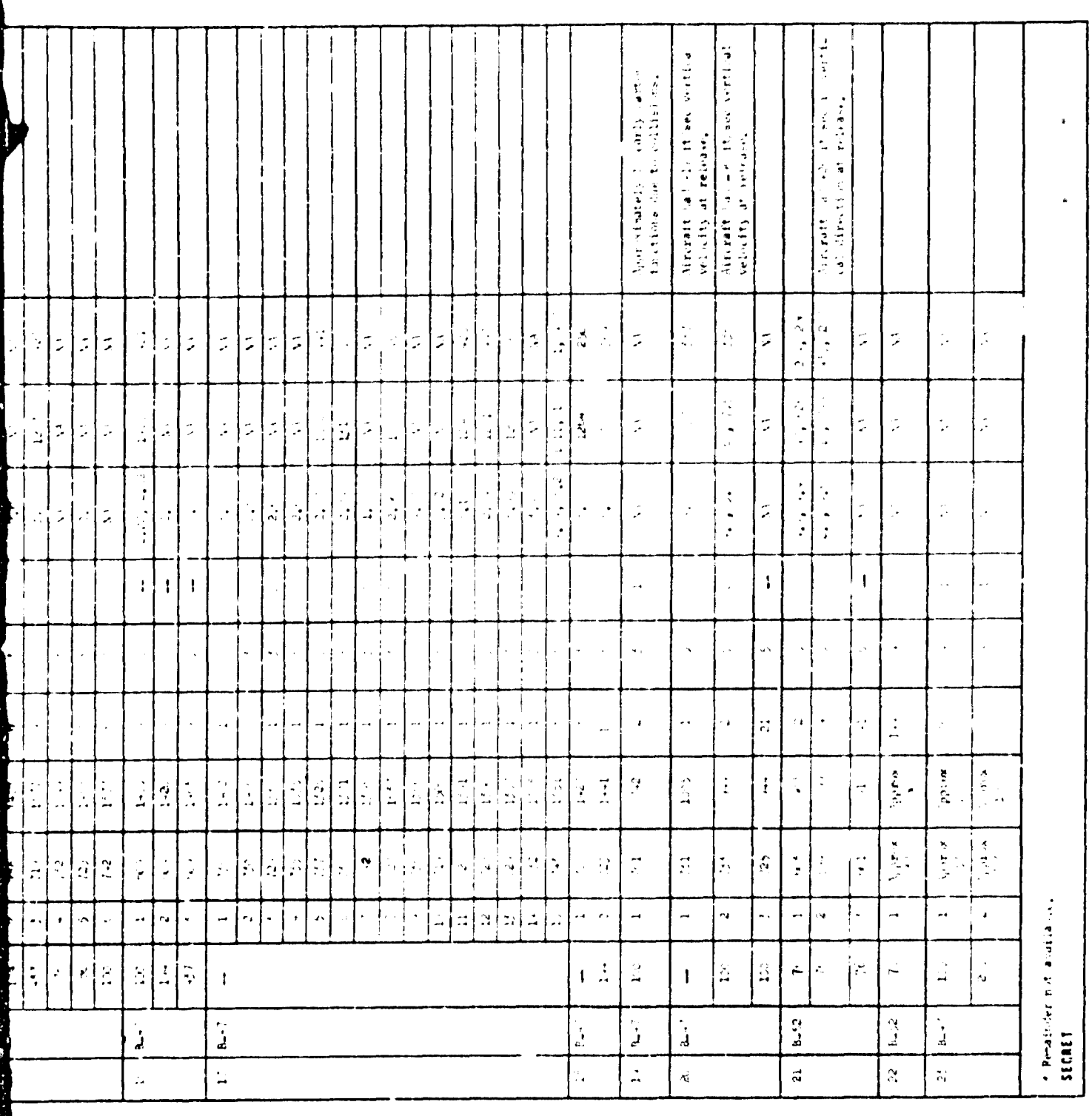
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TABLE V. (Continued)

Msn No.	Aircraft Type	BRIC Setting (ft)	Pass No.	Release Airspeed (kts)	Release Altitude AGL (ft)	Cartridge ...	Timer Setting (sec)	[illegible]: No. of Impacts	Time of Function (sec)	Altitude AGL (ft)	Velocity (kts)	Remarks
[illegible]	B-52	—	1	[illegible]	[illegible]	1	[illegible]	[illegible]				
			2	[illegible]	[illegible]	1	[illegible]	[illegible]				
			[illegible]	[illegible]	[illegible]	1	[illegible]	[illegible]				
			[illegible]	[illegible]	[illegible]	1	[illegible]	[illegible]				
			[illegible]	[illegible]	[illegible]	1	[illegible]	[illegible]				
			[illegible]	[illegible]	[illegible]	1	[illegible]	[illegible]				
			[illegible]	[illegible]	[illegible]	1		1				
				[illegible]	[illegible]	1	[illegible]	[illegible]				
			[illegible]	[illegible]	[illegible]	1	[illegible]	1				
			[illegible]	[illegible]	[illegible]	1	[illegible]					
			11	[illegible]	[illegible]	[illegible]	[illegible]					
			12	[illegible]	[illegible]	1	[illegible]	1				
			[illegible]	[illegible]	[illegible]	1		[illegible]				
			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]					
			[illegible]	[illegible]	[illegible]	1						
			[illegible]	12	[illegible]	1	[illegible]					
[illegible]	[illegible]	—	1	[illegible]	[illegible]	1	[illegible]					Missions ... [illegible] data for cartridges were [illegible].
			2	[illegible]	[illegible]	1						
			[illegible]	[illegible]	[illegible]	1						
			[illegible]	[illegible]	[illegible]	1	[illegible]					
				[illegible]	[illegible]	1		1				
				[illegible]	[illegible]	1						
			[illegible]	[illegible]	[illegible]	1	[illegible]	1				
				[illegible]	[illegible]	1		[illegible]				
				[illegible]	[illegible]	1						
			[illegible]	[illegible]	[illegible]	1		*				* Partial function, [illegible] carried [illegible] to impact.
			[illegible]	[illegible]	[illegible]	1						
			[illegible]	[illegible]	[illegible]	1						
			[illegible]	[illegible]	[illegible]	1						
			[illegible]	[illegible]	[illegible]	[illegible]						
			[illegible]	[illegible]	[illegible]							
[illegible]	[illegible]	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]		[illegible]	
			[illegible]			[illegible]			[illegible]	[illegible]	[illegible]	
			[illegible]			[illegible]			[illegible]	[illegible]	[illegible]	
			[illegible]			[illegible]			[illegible]	[illegible]	[illegible]	

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TABLE V. (Concluded)

Mon No.	Aircraft Type	BREC Setting (ft)	Pass No.	Release Airspeed (kts)	Release Attitude AGL (ft)	Latitude for Pass	Time Setting (sec)	No. of Launches	[illegible]	[illegible]	Remarks
15	B-57	As	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		1-0	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		457	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		7-0	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		9-0	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		150	6	7-2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
16	B-57	150	1	[illegible]	1-0	[illegible]	[illegible]	--	[illegible]	[illegible]	[illegible]
		1-0	2	[illegible]	1-2	[illegible]	[illegible]	--	[illegible]	[illegible]	[illegible]
		457	3	[illegible]	1-2	[illegible]	[illegible]	--	[illegible]	[illegible]	[illegible]
17	B-57	--	1	[illegible]	1-2	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			2	[illegible]	1-0	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			3	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			4	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			5	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			6	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			7	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			8	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			9	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			10	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			11	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			12	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			13	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			14	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			15	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			16	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			17	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			18	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			19	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			20	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			21	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			22	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			23	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			24	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			25	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	B-57	--	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		1-0	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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TABLE VI. TYPES AND NUMBERS OF BOMBS DROPPED AND RECOVERED.
(Dud rates are shown where applicable.)

Mission	Number of Bombs Dropped	Number of LD or HL	Number of Bombs Recovered	Number of LD Recovered	Number of Duds	Dud Rate (%)	Remarks
1	222	75 LD	145	---	0	---	Accuracy questionable
2	[illegible]	[illegible] LD	[illegible]	[illegible]	[illegible]	[illegible]	Accuracy questionable
3	[illegible]	525 LD	[illegible]	[illegible]	[illegible]	[illegible]	Accuracy questionable
4	1,056	56 LD	[illegible]	[illegible]	[illegible]	[illegible]	
5	570	[illegible] LD	[illegible]	[illegible]	[illegible]	[illegible]	
6	214	0	[illegible]	[illegible]	0	0	
7	[illegible]	50 LD	[illegible]	[illegible]	[illegible]	[illegible]	Accuracy questionable
8	1,[illegible]	0	[illegible]	[illegible]	0	0	
9	1,[illegible]	0	[illegible]	[illegible]	0	0	
10	[illegible]	0	4[illegible]	[illegible]	0	0	
11	[illegible]	0	[illegible]	[illegible]	0	0	
12	1,9[illegible]	1,9[illegible] LD	1,[illegible]	1,[illegible]	[illegible]	[illegible]	
13	1,[illegible]	1,99[illegible] LD	1,[illegible]	1,[illegible]	[illegible]	[illegible]	
14	1,99[illegible]	1,9[illegible] LD	1,[illegible]	1,[illegible]	[illegible]	[illegible]	
15	2,[illegible]	2,442 LD	1,[illegible]	1,[illegible]	[illegible]	[illegible]	
16	1,[illegible]	1,9[illegible] LD	1,[illegible]	1,[illegible]	[illegible]	[illegible]	
17	1,25[illegible]	1,25[illegible] LD	1,149	1,149	[illegible]	[illegible]	
18	1,554	1,554 LD	1,[illegible]	1,[illegible]	[illegible]	[illegible]	
19	5,[illegible]	5,[illegible] LD	5,[illegible]	5,[illegible]	[illegible]	[illegible]	
20	1,[illegible]	1,[illegible] HL	NA	NA	[illegible]	[illegible]	
21	2,[illegible]	2,[illegible] HL	NA	NA	[illegible]	[illegible]	
22	[illegible]	[illegible] HL	NA	NA	[illegible]	[illegible]	Eight cartons impacted intact
23A	1,[illegible]	1,[illegible] HL	NA	NA	[illegible]	[illegible]	One carton impacted intact
23B	1,[illegible]	1,[illegible] HL	NA	NA	[illegible]	[illegible]	One carton impacted intact

NA: Not applicable.

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Figure 20. Results of an Intact Carton Impact (Arrow).

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Figure 21. Carton Breakup in Bomb Bay, Mission 2.

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consisting of gouges, scrapes, and punctures of various sizes from the carton parts and from bombs impacting in and out of the bomb bay (Figs. 22 and 25). Four other cartons failed to open and impacted intact. Ballistic data were obtained for one carton on pass 6 and 8. This is presented in Appendix II, Table II-1, Part 1.

(U) Inspection of the impact area and a review of the phototheodolite and photo-chase film did not indicate the cause for the premature carton openings or why the four timers did not function.

(U) Inspection of the remaining cartons revealed that the tension of the retaining band was not uniform on all cartons. Some bands were extremely tight while others were extremely loose.

(U) To correct these problems, the old timers were replaced with a redesigned timer (Timer No. 2, Appendix I, Fig. I- , and the cartons were rebanded with uniform tension.

(C) Mission 3 was conducted employing a B-52 and utilized carton configuration 2 (Appendix I, Table I-1). Seven passes at 350 KIAS were made: one each at 2,600 ft, 2,000 ft, 1,800 ft, 1,400 ft, 1,000 ft, 600 ft and 400 ft AGL.

(U) One cell (three cartons) was released on each pass. One carton released from each altitude impacted intact and all six cartons released on the last two passes impacted intact for a total of 15 nonfunctioning cartons. No premature carton openings were observed in the bomb bay and no cause was determined for the timer malfunctions. Ballistic data were obtained for two cartons on pass 2, one carton on pass 3 and one carton on pass 4 (Appendix II, Table II-1, Part 1).

(U) A critical inspection of the remaining cartons and timers by both project and contractor personnel resulted in the following conclusions and corrective actions:

(U) Conclusions: The timers of the cartons which impacted intact may have operated; however, the vertical edges of the carton sides of the remaining cartons were slightly bowed out and when constrained by the retaining band caused an excessive binding force along the contact surfaces between the front and back of the carton. It was considered possible for this force to have prevented the sides, front, and back of the cartons which impacted from springing apart when subjected to aerodynamic forces.

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Figure 22. Damage to B-47 Aft Bomb-Bay Bulkhead, Mission 2.

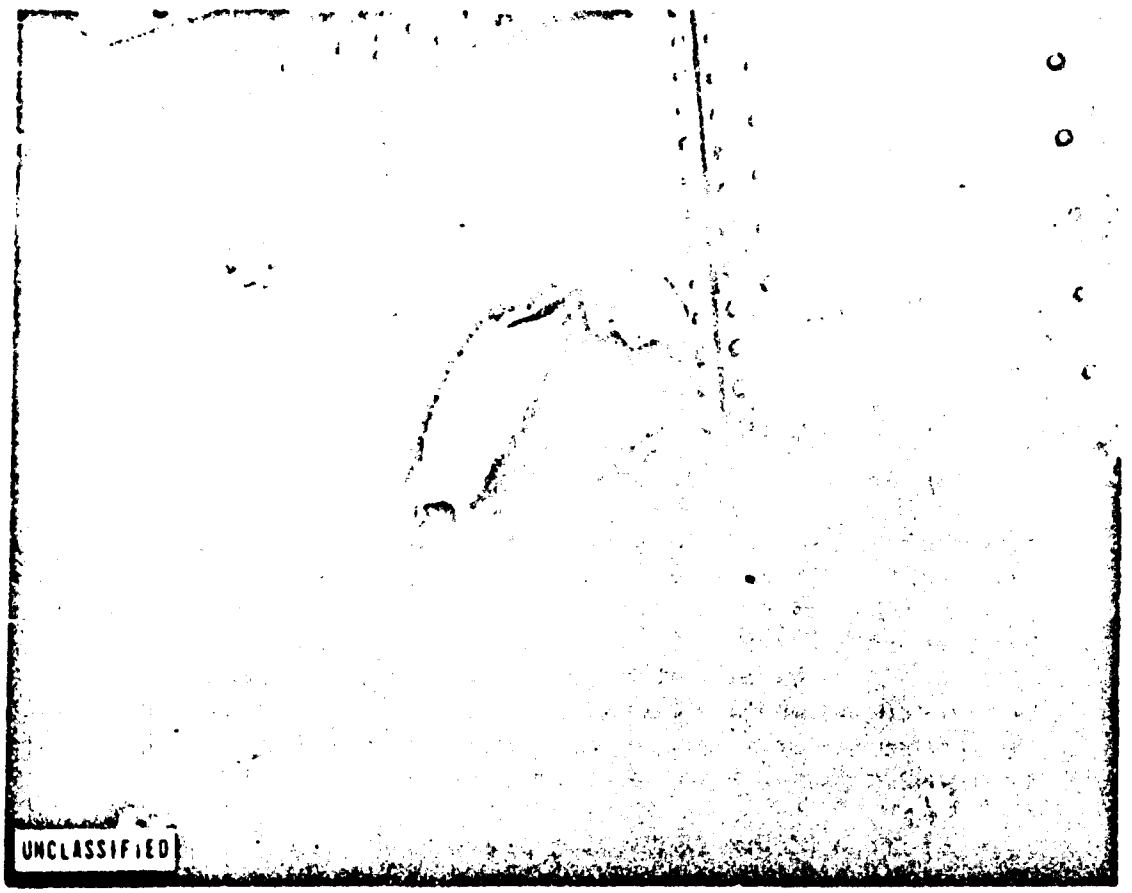


Figure 25. Damage to B-47 Bomb-Bay Door, Mission 2.

(U) Corrective Action: The two sides of each remaining carton were replaced with new components. The vertical edges were coated with a silicone grease[1] to minimize binding.

[1] Dow Corning 4 Compound (Silicone Dielectric and Lubricant) Lot No. A625.

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(U) Conclusion: The newer timer was critically inspected and its interface with the cell wall of the dispenser checked. Two deficiencies were revealed: (1) the timer actuator arm would not always start the timer mechanism if released slowly, a positive "snap-action" was required to start the mechanism, and (2) the difference in the dimensions of the carton and cell left sufficient room for the timer actuator arm to rest gently against the rear cell wall. Thus, when released, the actuator arm was not snapping out but was often falling to the action position and failing to start the timer mechanism.

(U) Corrective Action: This condition was corrected by rivetting a 40 x 6 x 1/8-in. piece of sheet aluminum to the rear wall of the cell walls. This produced a much tighter fit of the carton and resulted in a positive release of the actuator arm of the timer.

(C) Mission 4 was conducted with a B-47 aircraft. Four release altitudes were employed: 5,000 ft, 2,000 ft, 1,400 ft, and 600 ft AGL. All the cartons were dropped at 425 KIAS except for the last two passes which were flown at 350 KIAS. The Mod III 16mm bomb-bay cameras were installed to record the release and fallaway of the cartons from the dispenser. Carton configuration 2 was used. Of the 12 cartons released at 425 KIAS, four failed to open completely and carried some of the bombs to impact. The timer operations which had been set to function 3 sec after release varied from 1.58 to 4.12 sec. Apparently, the cartons which failed to open completely spilled some bombs as the cartons descended. Inspection of the range after the test revealed that the cartons had been damaged only on the side which hit the ground first. The damage consisted of impressions from the bombs (Fig. 24).

(U) None of the available film revealed a cause for the partial functions. Moreover, the photographic support group at WSMR indicated that the multiple carton drops were resulting in confusion as to which carton to track. Since accurate carton and bomb ballistics were vitally necessary, it was decided to accomplish the next mission with single-carton releases to insure that adequate phototheodolite data for carton and bomb ballistic computations would be obtained.

(C) Mission 5 was conducted with a B-47 aircraft flying at 1,000 ft AGL and 425 KIAS. One carton was released on each of five passes. The carton released on the third pass failed to function. On the sixth pass the dispenser failed to release the carton. A postflight check of the dispenser and aircraft revealed no apparent cause for the release failure. Ballistic data were obtained on the carton released on pass 5. This is presented in Appendix II, Table II-1, Part 1.

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ure 24. Carton Which Functioned Partially. Note impressions of bombs in carton bottom, relative smoothness of sides.

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PHASE I - SUMMARY

(U) Test results from missions 1 through 5 indicated that:

1. A definite deficiency existed in the carton opening characteristics.

2. The timer was not reliable, although it was the second configuration to be used.

3. Telephoto film coverage failed to provide resolution sufficient for the project personnel to determine the exact manner in which the cartons were functioning.

4. The impact patterns available could not be treated as accurate data because:

(a) The unreliable carton functionings were not repeatable, resulting in uneven, nonrepeatable impact patterns.

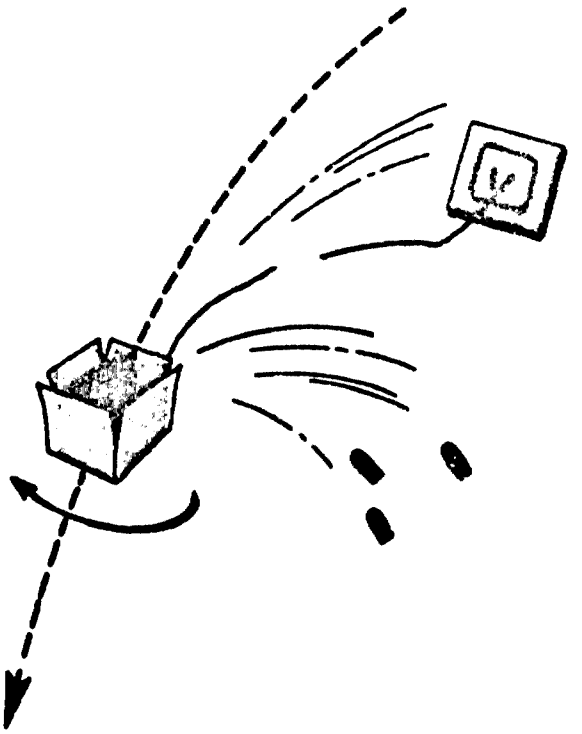
(b) Lack of data for the time-space-positions of the functioning cartons made it impossible to determine with any validity a correlation between delivery altitude/airspeed and ground impact patterns.

PHASE II

(C) Missions 6 and 7 were single-carton drops from 1,400 ft AGL and at 350 KIAS. The altitude and airspeed were kept constant to eliminate the number of variables. Modified cartons designed to provide a positive and consistent carton opening were used. Ten cartons were modified with a steel cable arrangement, attached to the top and bottom (Appendix I, carton configuration 5), which was designed to cause the top to act as a drag device and pull the carton apart. Five additional cartons were modified with a dowel and spring arrangement (Appendix I, carton configuration 4) which was designed to push the top off and the sides outward thus insuring separation. Also included were three cartons which were unmodified. These three were loaded into the dispenser in an inverted position. Available film coverage had indicated that the cartons were stable. If this were true and the cartons did not tumble, it was thought by positioning the carton in the inverted attitude, the bombs would fall down and out of the carton by the force of gravity when the retaining band was released.

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(U) Nine steel-cable modified cartons and two dowel-spring modified cartons were released on mission 6. Ballistic data were obtained for the carton released on pass 9 which impacted intact. This data is presented in Appendix II, Table II-I, Part 1. Three of the steel-cable modified cartons failed to open completely because the tops ripped off, allowing one carton to carry most of the bombs to the ground (Fig. 24). Inspection of the impact area indicated this occurred because the carton tops with broken cable segments were found hundreds of feet back along the flightline. Photo-chase film and telephoto film confirmed the results of the range inspection. Furthermore, the film revealed the conditions which caused the complete openings. Upon functioning, the three cartons that impacted partially intact were oriented in a manner which presented the carton bottom down and at an angle which seemed to be perpendicular to the trajectory. The carton sides flared out slightly and stopped. The carton top broke away and left the carton falling as depicted below:



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(U) It was theorized that this manner of falling resulted in a low-pressure area forming inside the carton and a high-pressure area caused by the airstream on the outside of the carton; thus, the slight spring tension of the sides was unable to overcome the resisting force of the airstream, and the carton became oriented in the above manner and fell to impact.

(U) Three dowel- and spring-modified cartons, three inverted cartons, and one steel-cable carton were released on mission 7. All functioned properly when the retaining band was released. No ballistic data were obtained.

(U) Analysis of the film from both missions revealed that, contrary to what was believed, the cartons rotated and tumbled in the airstream. This data invalidated the theory of carton stability.

(U) Although the results of missions 6 and 7 were promising, it was decided to conduct further tests to refine and improve the carton designs. After redesign, one would be chosen with which to continue the project.

(C) Missions 8, 9, 10, and 11 were conducted with a B-52 and B-47 aircraft using carton configurations 5, 6, and 7 (Appendix I). The four missions were flown at 1,500 ft AGL. The B-52 flew at 350 KIAS, and the B-47 flew at 425 KIAS.

(U) Sixteen steel-cable cartons and fifteen dowel- and spring-modified cartons were dropped on missions 8 and 9. No carton functioning times were recorded. The available film coverage was used to evaluate the functioning characteristics.

(U) Analysis of the carton functions as recorded on telephoto camera film resulted in the decision by project personnel to continue testing with the steel-cable modification. A less important factor contributing to this decision was the ease of loading the cartons when modified with the steel-cable as compared to the difficulties encountered with the dowel and spring modification.

(U) Inspection of the carton components after missions 8 and 9 showed that, although the steel-cable modified cartons were functioning properly, the cable was snapping in various places. The majority were breaking at the connection of the bridle apex and the single connecting cable to the carton bottom. Prior to missions 10 and 11, this connection was changed, resulting in carton configuration 7. (See Appendix I.)

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(U) Missions 10 and 11 tested carton configuration 7. All cartons functioned. Cable breakage was less than that experienced during missions 8 and 9. Further analysis of the telephoto film and the cable breakage indicated that a dual cable connection to the carton bottom would provide more reliable functioning.

(U) Missions 12, 13, and 14 releasing three cells each pass were conducted with a B-47 aircraft flying at 350 KIAS and were the first multiple-cell releases using carton configuration 8 which incorporated a dual connection to the carton bottom and was fabricated by the contractor (Appendix I, Fig. I-6). The missions were designed to provide quanitative data on the impact pattern density and overlap using three BRIC settings and any variations resulting from the three different delivery altitudes.

(C) The missions were flown at 2,000 ft, 1,400 ft, and 800 ft AGL, in that order. BRIC settings of 76 ft, 194 ft, and 437 ft were used for each mission, one on each pass.

(U) Prior to flying the missions, however, the cartons required slight remodification. This remodification was made by clipping the steel cable at the four corners of the carton top where they were routed through and over the top to prevent their slipping through if they broke.

(C) Inspection of the impact areas after each mission indicated that there was little difference between the impact patterns resulting from the 2,000-ft and 1,400-ft AGL release altitudes. The difference between the impact patterns from the 2,000-ft and 800-ft release altitudes was appreciable. The lower altitude produced a shorter, slightly narrower, and more dense pattern. Little difference could be noted for these three-cell releases between the 76-ft and 194-ft BRIC pattern results. The 437-ft BRIC patterns appeared to be about 400 ft longer and 90 ft wider than the 74-ft BRIC pattern.

(U) When the reduced impact plots and flight data were received from WSMR, two things were apparent:

1. Error had been introduced into the impact plots either in the original survey or in the data reduction process. Groups of bombs were out of place to the north and south of the main pattern. It was impossible for the bombs to have impacted where they were depicted. Such positioning would have required the carton or cartons to decend at a considerable angle away from the normal trajectory. Visual observation and the telephoto film eliminated this possibility. The most probable error source was the method used to score the

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impacts - transits and stadia boards. Although it was too late to correct the error, it was assumed that either some of the angles and/or backsights had been misread or erroneously recorded.

2. Photographic coverage was limited because of the number of cartons released at one time; it was impossible to record the functioning times of all cartons. Although these times were not available, the unevenness in some of the patterns clearly indicated that cartons functioned early or late. An early carton opening would have caused the BLU-3/B bombs to have an overall shorter down-range travel than those from a carton having a later time of functioning since the BLU-3/Bs become high-drag almost immediately after they enter the airstream. A late carton functioning would have caused the BLU-3/Bs to travel further down range. Both conditions would cause gaps in the patterns.

(U) The contractor was asked to consider possible means of improving the timer reliability, such as employing a plunger arm to actuate the mechanism rather than the flip-out arm.

(U) The differences among the impact patterns were not quantitatively conclusive because of the uneven patterns and the error in the data. The expected variations in the pattern resulting from the different ERIC settings could not be determined conclusively. However, the project personnel generally agreed that the 76-ft ERIC setting produced the best impact patterns.

(C) Furthermore, although SAC emphasized the lowest possible delivery altitude (i.e., 800 ft AGL) in order to provide maximum aircraft survivability, it was decided to continue testing at a higher altitude (1,400 ft AGL) until a more reliable timer could be produced, and to provide better photographic coverage of the release and functioning of the cartons on future missions.

(U) The operation of the steel-cable bridle configuration was also evaluated. Of 43 cartons recovered, 10 had no failures. Of the remaining 33 which had one or more broken cables to the carton bottom, 13 also had one or more broken cables to the carton top. Further examination of the cartons indicated two things:

1. The swage remodification had prevented many carton tops from separating completely from the cables, thus reducing carton malfunctions.

2. It was necessary to redesign the bridle arrangement, using a more flexible material which would stretch when subjected to the opening shock and thus reduce the possibility of a broken bridle assembly, which would result in a partial functioning of the carton. Moreover, while incorporating flexibility and a greater stretch factor, the redesigned bridle would have to

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open the carton in a manner that would produce impact patterns very similar to those achieved with the steel-cable bridle.

(C) Mission 15 was conducted at APGC at 1,400 ft AGL and 425 KIAS with a B-47 to functionally test a prototype nylon bridle modification fabricated from 1,500-lb test nylon straps. (See Appendix I, Fig. I-8, configuration 9). Twenty-seven of the nylon and six of the steel-cable type were dropped. The steel-cable type were dropped for comparative purposes. Six passes were made. The cartons equipped with nylon bridles were to have been dropped in three passes of nine cartons each. The BRIC settings were 76 ft, 194 ft, and 437 ft. However, the BRIC unit malfunctioned, resulting in only the 194-ft and 437-ft releases being useful. The cartons equipped with steel-cable were inadvertently released off-range, and no data were recorded for time of functioning or impact patterns. Ballistic data were obtained for one carton on passes 4 and 5. This is presented in Appendix II, Table II-1, Parts 2 and 3.

(U) During the course of the mission, damage was inflicted on the aft bulkhead of the bomb bay and on the bottom side of the fuselage just aft of the bomb bay. (See Figs. 25 and 26.) Bomb-bay film coverage showed that one carton had opened in the bomb bay and that the top had caused the damage. The bombs fell clear of the aircraft. A possible explanation is that, during the loading process, the cartons had to be forced into the cells because the aircraft was at an angle to the ramp, and this may have caused the retaining band to break or pull off the latches of the timer.[1] Another carton fell from the bomb bay with the retaining band still in place but without the top, and turned over spilling the bombs. The timer released the retaining band in about 3 sec, and the carton components broke apart normally. This was the only time this occurrence was observed.

(U) A review of the telephoto film by project personnel indicated that the 1,500-lb test nylon bridle appeared to require a longer time to spill the bombs from the cartons as compared to the steel cable. The use of a stronger nylon strap was suggested, and the contractor agreed to incorporate 3,000-lb test nylon in the design in order to reduce the stretch factor while retaining flexibility.

(S) The impact patterns for the two three-cell releases were similar. (See Figs. 27 and 29* The overall lengths of the patterns, 2,289 ft for the 194-ft BRIC setting and 2,427 ft for the 437-ft BRIC setting, included all the recovered bombs; the overall widths of 377 ft and 376 ft, respectively, also account for all the bombs. However, these overall values are inflated when considering an effective pattern since they include the usual "buildup," "tail-off" bombs and

[1] The original MHU-74/E adapter cluster bomb lift was employed, and it had no adjustments for angle. Reference: APGC TR-64-69.

* Figs. 27 - 42 begin on page 81.

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Figure 25. Damage to B-47 Aft Bomb-Bay Bulkhead, Mission 15.



Figure 2[illegible]. Additional Damage to B-47 Aft Bomb Bay Bulkhead, Mission 15.

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"maverick" bombs which were strung out by themselves. The impact position data (i. e., the X and Z cordinates of the plotted bombs) are contained in Appendix V.

(S) In an effort to provide a useful and more accurate analysis of the impact patterns for this mission and subsequent missions, APGC personnel developed a computer program for determining a measure of lethal area coverage using various assumed lethal radii for the bombs. (See Appendix III for program explanation.) This program computed an overall rectangle for the pattern which would include either 95.5 percent (2.0 σ) or 86.6 percent (1.5 σ) of the bombs in the width and 95.5 percent (2.0 σ) or 86.6 percent (1.5 σ) in the length. Within the computed rectangle, the computer was able to compute the area covered or "killed" and "overkilled" by all the bombs for the assumed kill radii. The radii selected for the computations were 5, 8, 10, 12, 15, and 20 ft. Furthermore, an impact pattern could be subdivided and each subsection could be evaluated by the same method. The parameters of length and width considered in this type of analysis were not limited to 1.5 σ or 2.0 σ. The values could be varied in order to provide a more accurate presentation of the density buildup throughout the impact pattern. Thus, the impact pattern could be evaluated by other than averaged values.

(S) Tables VII and VIII contain the values for the lethal area build-up studies for the two impact patterns of mission 15. Figures 28 and 30 are graphs showing the relationship of the lethal area coverage by one bomb, two or more bombs, etc., for the different assumed values for the kill radii of the bombs. The overall impact pattern is not considered in the graphs. Only the effective pattern as defined by 2 σ in the Y (width) and 1.5 σ in X (length) is evaluated. It would seem that the 437-ft BRIC impact pattern provided a higher and more consistent kill area than the 194-ft BRIC impact pattern; however, the computer extended the width of the lethal area rectangle considered to 180 ft, whereas, the main portion of the impact pattern was not more than 120 ft wide.

(C) Mission 16 was accomplished with a B-47 aircraft and cartons having steel-cable modifications identical to those dropped on mission 15. (Appendix I, configuration 8.) The steel-cable type were used because they were the only ones available. Moreover, since this was the type which the future nylon type had to duplicate, the data obtained for impact patterns and dud rates would be valid. Nine cartons (three cells) were released on each of three passes, all of which were flown at 1,400 ft AGL and 350 KIAS. The BRIC settings used were: 100 ft for the first pass, 194 ft for the second pass, and 437 ft for the third pass. The original B-47 BRIC setting of 76 ft was increased to 100 ft because a functional check with an oscilliscope of the BRIC unit after mission 15 revealed that, at settings lower than 100-ft intervals, the desired separate pulses were being generated as one continuous signal. (This condition was not found in the B-52 BRIC units.)

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TABLE VII. LETHAL AREA BUILDUP DATA, MISSION 15, PASS 2.

Parameters Involved	Subrectangle Number	Assumed Kill Radii for Each Bomb											
		R=[illegible] ft[1]		R=[illegible] ft		R=1[illegible] ft		R=12 ft		R=15 ft		R=2[illegible] ft	
		Kill Area[2] (ft^2)	Kill (%)[3]	Kill Area (ft^2)	Kill (%)	Kill Area (ft^2)	Kill (%)	Kill Area (ft^2)	Kill (%)	Kill Area (ft^2)	Kill (%)	Kill Area (ft^2)	Kill (%)
Overall Pattern Length = 2239 ft	1	1,12[illegible]	[illegible]	2,[illegible]2	[illegible]	[illegible],3[illegible]	15.1	[illegible],2[illegible]	1[illegible]	[illegible],5[illegible]	2[illegible]	1[illegible],[illegible]3[illegible]	[illegible]
Overall Pattern Width = 577 ft	2	5,5[illegible]	10.7	7,[illegible]2	2[illegible]	11,[illegible]2	[illegible].1	1[illegible],12	[illegible].2	1[illegible],[illegible]	[illegible].1	2[illegible],[illegible]	[illegible]
Subrectangle Length = 1[illegible].0 ft	3	5,5[illegible]	10.6	7,[illegible]	2[illegible].7	11,[illegible]2	[illegible].1	1[illegible],[illegible]	[illegible].3	1[illegible],[illegible]	[illegible]	[illegible],1[illegible]	[illegible].2
Subrectangle Width = 132.0 ft	4	7,[illegible]4[illegible]	22.2	1[illegible],12	[illegible].3	1[illegible],[illegible]	[illegible]	1[illegible],[illegible]	[illegible]	22,1[illegible]	[illegible].1	2[illegible],[illegible]	[illegible]
Subrectangle Area = 3[illegible],[illegible].0 ft^2	5	[illegible],[illegible]	2[illegible].2	1[illegible],[illegible]	[illegible]	21,[illegible]	[illegible].3	2[illegible],[illegible]	[illegible]	3[illegible],[illegible]	[illegible].3	[illegible],[illegible]2	[illegible].5
XX = 2.0 ZK = 2.0	6	[illegible],[illegible]2[illegible]	21.[illegible]	1[illegible],112	[illegible].2	1[illegible],32[illegible]	[illegible].7	21,[illegible]2	[illegible]	2[illegible],[illegible]2[illegible]	[illegible].5	2[illegible],[illegible]2[illegible]	[illegible]
Grid Delta = 2.0 ft^2	7	5,71[illegible]	11.1	[illegible],[illegible]0	2[illegible].[illegible]	11,[illegible]2	[illegible].3	1[illegible],2[illegible]	[illegible].[illegible]	1[illegible],[illegible]2[illegible]	55.[illegible]	2[illegible],[illegible]0[illegible]	[illegible].7
Length of Pattern Considered = 1[illegible]3[illegible] ft	8	2,[illegible]2	7.1	[illegible],[illegible]2	1[illegible].[illegible]	[illegible],1[illegible]	2[illegible].[illegible]	1[illegible],[illegible]	[illegible].[illegible]2	1[illegible],[illegible]2	[illegible].1	1[illegible],1[illegible]	[illegible].[illegible]3

[1] Assumed kill radius for each bomb.
[2] Area covered by all bombs considered for subrectangle.
[3] Percent of subrectangle of area covered by bombs.

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TABLE VIII. LETHAL AREA BUILDUP DATA, MISSION 15, PASS 3.

Parameters Involved	Subrectangle Number	Assumed Kill Radii for Each Bomb											
		R = [illegible] ft		R = [illegible] ft		R = [illegible] ft		R = [illegible] ft		R = 15 ft		R = [illegible] ft	
		Kill Area (ft²)	Kill (%)	Kill Area (ft²)	Kill (%)	Kill Area (ft²)	Kill (%)	Kill Area (ft²)	Kill (%)	Kill Area (ft²)	Kill (%)	Kill Area (ft²)	Kill (%
Overall Pattern Length = [illegible] ft	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Overall Pattern Width = [illegible] ft	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Subrectangle Length = [illegible] ft	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Subrectangle Width = [illegible] ft	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Subrectangle Area = [illegible] ft²	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
NX = 2.0, NY = [illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Grid Delta = [illegible] ft²	7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Length of Pattern Considered = [illegible] ft	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	12	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[1] Assumed kill radius for each bomb.
[2] Area covered by all bombs considered for subrectangle.
[3] Percent of subrectangle of area covered by bombs.

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(C) One timer failed to function, and a definite variation in the other times of functioning were observed during the mission. A number of bombs were found which had impacted before the wind tab had stripped off, thereby not allowing the arming cycle to start. Two causes were probable; (1) late opening carton which failed to allow the bombs enough time to function, and (2) mid-air collisions among the bombs which deformed the wind tabs, or otherwise caused damage to the bomb which would prevent them from functioning. Bombs with the wind tabs intact were located throughout the pattern and as far as 2,000 ft down range from the end of the pattern. Thus it would seem that both (1) and (2) above were contributing causes. The net effect of these malfunctions, however, with respect to the density of the resultant impact patterns and dud rates, was negligible.

(C) The dud rate for pass 1 was 5.78 percent - 34 duds out of 588 bombs surveyed; pass 2 included 30 duds out of 546 bombs surveyed for a dud rate of 5.49 percent; and pass 3 resulted in a slight increase to a 6.76 percent dud rate for 33 duds out of 488 bombs surveyed.

(U) A study of the impact plots for the three passes (Figs. 31, 33, and 35) shows that the impact pattern for passes 1 and 2 were fairly uniform and that pass 3 resulted in a pattern with large void areas. The rectangles superimposed on the patterns were used in the lethal area study represented graphically in Figures 32, 34, and 36. The pattern length considered in the lethal area build-up studies (Tables IX, X, and XI) are longer than those represented in Figures 32, 34, and 36 are are not graphically depicted. The impact position data for the bombs plotted are presented in Appendix V.

(C) Although the impact pattern for pass 2 should have been longer than pass 1 because of the BRIC setting used, it is 180 ft shorter. It is also more uniform and compact; however, the effective pattern length of pass 2 is longer than that of pass 1 which was anticipated. Examination of the two patterns shows that the excessive pattern length of the first pass was a direct result of an erratic initial build up and ending, presumably caused by both early and late carton functionings. Phototheodolite tracking data of the cartons were limited, and therefore no listing of all the carton functioning times was available. No data suitable for ballistic computations were obtained.

(U) The most significant variable affecting the impact pattern was the carton functioning times. The size of the pattern is inversely proportional to the length of time required for the carton to open. The dispersion of the bombs is greater at higher airspeeds since it is totally dependent upon the initial velocity imparted to the bombs at the time of carton functioning. Once the bombs are in the airstream and the vanes are deployed, the bombs become high-drag and stabilized, losing velocity in both the X and Y directions until the terminal velocity of approximately 100 ft/sec is reached.

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TABLE IX. LETHAL AREA BUILDUP DATA, MISSION 16, PASS 1.

Parameters Involved	Subrectangle Number	Assumed Kill Radii for Each Bomb											
		R=5[1] ft		R=[illegible] ft		R=[illegible] ft		R=[illegible] ft		R=15 ft		R=20 ft	
		Kill Area[2] (ft^2)	Kill (%)[3]	Kill Area (ft^2)	Kill (%)	Kill Area (ft^2)	Kill (%)	Kill Area (ft^2)	Kill (%)	Kill Area (ft^2)	Kill (%)	Kill Area (ft^2)	Kill (%)
Overall pattern length = 1[illegible]72 ft	1	1,[illegible]40	[illegible].2	[illegible]	17.[illegible]	[illegible]	25.3	[illegible],012	23.2	[illegible]	[illegible].3	12,52[illegible]	[illegible].3
Overall pattern width = 275 ft	2	[illegible],[illegible]3[illegible]	1[illegible].[illegible]	[illegible],2[illegible]2	[illegible].3	[illegible]	[illegible]	11,2[illegible]4	[illegible].2	13,272	[illegible].7	15,32[illegible]	7[illegible].3
Subrectangle length = [illegible]40 ft	[illegible]	[illegible],[illegible]7[illegible]	2[illegible].[illegible]	[illegible],[illegible]4[illegible]	[illegible].[illegible]	11,52[illegible]	[illegible].[illegible]	12,[illegible]12	[illegible].3	1[illegible],[illegible]8[illegible]	[illegible].[illegible]	1[illegible],2[illegible]4[illegible]	[illegible].2
Subrectangle width = 1[illegible]5 ft	[illegible]	[illegible],[illegible]7[illegible]	2[illegible].2	[illegible],[illegible]4[illegible]	[illegible].[illegible]	[illegible]2,[illegible]	[illegible].[illegible]	1[illegible],[illegible]4[illegible]	[illegible].[illegible]	1[illegible],[illegible]4[illegible]	[illegible].3	1[illegible],2[illegible]4[illegible]	[illegible].2
Subrectangle area = 1[illegible],52[illegible] ft^2	[illegible]	[illegible],[illegible]4[illegible]	[illegible].[illegible]	1[illegible],[illegible]42	[illegible].[illegible]	12,[illegible]4[illegible]	[illegible].[illegible]	1[illegible],[illegible]4[illegible]	[illegible].3	1[illegible],[illegible]72	[illegible].4	17,[illegible]4[illegible]	[illegible].0
M = [illegible].0, N = 2.0	[illegible]	[illegible],32[illegible]	[illegible].[illegible]	12,[illegible]1[illegible]	[illegible].[illegible]	[illegible],[illegible]2[illegible]	[illegible].[illegible]	12,[illegible]2[illegible]	[illegible].[illegible]	[illegible],[illegible]4[illegible]	[illegible].[illegible]	1[illegible],[illegible]42	[illegible].7
Grid Delta = 2.[illegible] ft^2	[illegible]	[illegible],[illegible]2	2[illegible].[illegible]	[illegible],12[illegible]	[illegible].2	11,22[illegible]	[illegible].1	12,[illegible]42	[illegible].2	1[illegible],1[illegible]4	7[illegible].2	15,[illegible]4[illegible]	92.7
Length of pattern considered = 1,2[illegible]0 ft	[illegible]	[illegible],12	1[illegible].2	[illegible],12[illegible]	[illegible].[illegible]	[illegible],22[illegible]	-2.5	1[illegible],2[illegible]4	[illegible].[illegible]	13,[illegible]4[illegible]	[illegible].2	1[illegible],13[illegible]	[illegible].6
	[illegible]	[illegible]4[illegible]	[illegible].[illegible]	2,[illegible]72	[illegible].[illegible]	3,12[illegible]	[illegible].2	[illegible],2[illegible]3	22.[illegible]	[illegible],[illegible]1[illegible]	31.1	[illegible],[illegible]0[illegible]	[illegible].[illegible]

[1] Assumed kill radius for each bomb.
[2] Area covered by all bombs considered for subrectangle.
[3] Percent of subrectangle of area covered by bombs.

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TABLE X. LETHAL AREA BUILDUP DATA, MISSION 16, PASS 2.

Parameter Involved	Subrectangle Number	Assumed Kill Radii For Each Bomb											
		R [illegible] ft		R [illegible] ft		R [illegible] ft		R [illegible] ft		R 25 ft		R [illegible] ft	
		Kill Area[2] (ft^2)	Kill (%)[3]	Kill Area (ft^2)	Kill (%)	Kill Area (ft^2)	Kill (%)	Kill Area (ft^2)	Kill (%)	Kill Area (ft^2)	Kill (%)	Kill Area (ft^2)	Kill (%)
Overall Pattern Length = 2,5[illegible] ft	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4,[illegible]0	[illegible]	6,[illegible]	[illegible]
Overall Pattern Width = [illegible] ft	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Subrectangle Length = [illegible] ft	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Subrectangle Width = [illegible] ft	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Subrectangle Area = 19,5[illegible] ft^2	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
NX = 2.0, NY = 1.5	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Grid Delta = 2.0 ft^2	7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Length of Pattern Considered = 2,[illegible] ft	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	59.5	[illegible]	[illegible]

[1] Assumed kill radius for each bomb.
[2] Area covered by all bombs considered for subrectangle.
[3] Percent of subrectangle of area covered by bombs.

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TABLE XI. LETHAL AREA BUILDUP DATA, MISSION 16, PASS 3.

Parameters Involved	Subrectangle Number	Assumed Kill Radii For Each Bomb											
		R=5[1] ft		R=[illegible] ft		R=10 ft		R=12 ft		R=15 ft		R=20 ft	
		Kill Area[2] (ft^2)	Kill (%)[3]	Kill Area (ft^2)	Kill (%)	Kill Area (ft^2)	Kill (%)	Kill Area (ft^2)	Kill (%)	Kill Area (ft^2)	Kill (%)	Kill Area (ft^2)	Kill (%)
Overall Pattern Length = 2,062.6 ft	1	1,634	[illegible]	[illegible]	22.9	4,305	33.0	6,348	48.7	8,530	57.5	11,254	75.8
Overall Pattern Width = 333 ft	2	2,572	25.9	4,973	33.4	6,564	44.2	8,000	53.9	9,970	67.0	12,660	85.1
Subrectangle Length = 124.0 ft	3	1,126	7.6	2,460	16.5	3,546	23.8	4,264	28.7	5,564	37.4	7,240	48.7
Subrectangle Width = 120.0 ft	4	2,170	14.6	4,754	32.2	6,600	44.4	8,332	56.4	10,652	71.5	12,760	85.8
Subrectangle Area = 14,880 ft^2	5	3,244	22.0	6,664	44.8	8,564	59.0	10,532	72.7	12,428	86.9	14,620	98.2
NX = 2.0, NY = 1.5	6	2,264	15.2	4,620	31.0	6,044	40.6	7,240	48.0	8,404	56.5	9,804	65.9
Grid Delta = 2.0 ft^2	7	564	3.8	1,426	9.5	2,252	14.3	3,038	20.4	4,568	30.7	6,952	46.6
Length of Pattern Considered = 1860 ft	8	2,160	7.9	2,640	17.7	3,706	25.3	4,960	33.5	6,852	46.0	9,560	66.5
	9	2,230	14.8	5,000	33.6	7,052	47.4	8,956	60.2	11,152	74.9	13,536	90.0
	10	3,666	24.8	6,964	46.8	8,554	57.5	9,708	65.2	11,172	75.1	13,000	88.0
	11	3,872	27.0	7,556	50.8	9,556	64.2	11,624	74.1	12,332	82.9	13,856	93.1
	12	3,664	24.8	7,368	49.5	9,568	63.0	10,916	73.4	12,372	83.1	13,696	[illegible] 0
	13	3,256	21.1	6,600	[illegible]	8,022	53.0	10,136	68.1	11,886	79.9	13,616	91.5
	14	2,648	16.5	5,128	34.5	6,748	45.3	8,336	56.0	10,432	70.0	13,124	88.2
	15	520	3.5	1,232	8.7	1,952	13.0	2,568	17.3	3,464	23.3	4,730	31.7

[1] Assumed kill radius for each bomb.
[2] Area covered by all bombs considered for subrectangle.
[3] Percent of subrectangle of area covered by bombs.

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(U) The attitudes of the bombs at impact were checked during these missions by means of high-speed Milliken cameras. No analysis of the impact angles was made. The attitude of the majority of the bombs was considered to vary between 60 and 90 deg. This is borne out by the very low dud rate.

(C) Mission 17 was conducted with a B-47 aircraft flying at 1,400 ft AGL and 452 KIAS and was the first test with the 3,000-lb test nylon bridle. (See Appendix I, configuration 10, and Fig. I-12.) A new timer, incorporating a spring-loaded plunger, was introduced. Also introduced were the redesigned wind tab (see Appendix I, Fig. I-13) and the internal packaging materials, fiberboard and ethafoam, which had been selected by Picatinny Arsenal as the best materials to withstand shock, vibration, heat, cold, and moisture.

(C) Fourteen single-carton drops and one single-cell (3 cartons) releases were made in order to insure that complete photographic coverage was obtained on each carton function. Ballistic data were obtained for each of the fourteen single-carton drops and are presented in Appendix II, Table II-1, Parts 2 and 3. The average functioning time of the 16 cartons observed and photographed was 3.1 sec, and the average deviation was ±0.48 sec. The dud rate of 7.4 percent was higher than experienced in missions 15 and 16 but considered to be acceptable. This represented 86 duds of 1149 bombs recovered.

(U) No impact plots were made of these drops since the single-carton releases were conducted primarily to test carton functioning.

(U) Visual observation and photographic coverage showed that this carton configuration functioned quickly and smoothly, that it was consistent, and that it was almost identical in functioning characteristics to the steel-cable carton functionings observed during missions 15 and 16.

(U) Mission 18 was conducted with a B-47 and was primarily a six-cell (18 carton) drop to obtain additional data on bomb impact pattern density and carton overlap using the new carton configuration. A preliminary drop of one cell was made to verify the aircrew bombing offsets.

(C) A BRIC setting of 194 ft was used, and the aircraft flew at 1,400 ft AGL and 425 KIAS. The 194-ft BRIC setting was used because study of the previous multiple-carton impact pattern indicated that this BRIC setting resulted in an acceptable pattern density which built up rapidly and that the maximum possible density could be achieved and shown to be consistent with the limited number of cartons available. Furthermore, a comparison check of the resultant pattern using the new configuration against that achieved with the steel-cable modifications was desired.

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TABLE XII. LETHAL AREA BUILDUP DATA, MISSION 18, PASS 2.

Parameters Involved	Subrectangle Number	Assumed Kill Radii For Each Bomb											
		R=5[1] ft		R=8 ft		R=10 ft		R=12 ft		R=15 ft		R=20 ft	
		Kill Area[2] (ft^2)	Kill ($)[3]	Kill Area (ft^2)	Kill ($)	Kill Area (ft^2)	Kill ($)	Kill Area (ft^2)	Kill ($)	Kill Area (ft^2)	Kill ($)	Kill Area (ft^2)	Kill ($)
Overall Pattern Length = 2,217 ft	1	2,540	11.3	5,140	22.8	6,806	30.3	8,388	37.3	10,320	45.9	12,916	57.4
Overall Pattern Width = 331 ft	2	4,364	19.4	8,604	38.2	11,252	50.0	13,572	60.3	16,224	72.1	19,512	86.7
Subrectangle Length = 152 ft	3	9,636	42.8	14,940	66.4	17,360	77.2	19,048	84.7	20,604	91.6	21,840	97.1
Subrectangle Width = 148 ft	4	9,968	44.3	16,256	72.2	18,720	83.2	20,124	89.5	21,344	94.9	22,124	98.3
Subrectangle Area = 22,496 ft^2	5	7,944	35.3	14,164	63.0	16,692	74.2	18,300	81.3	19,848	88.2	21,380	95.0
XX = 180°, ZX = 2.0	6	5,784	25.7	11,176	49.7	14,168	63.0	16,572	73.7	18,936	84.2	21,024	93.5
Grid Delta = 2.0 ft^2	7	4,944	22.0	9,628	42.8	12,344	54.9	14,436	64.2	16,552	73.6	18,984	84.4
Length of Pattern Considered = 1,824 ft	8	4,704	20.9	9,704	43.1	12,768	56.8	15,180	67.5	17,756	78.9	20,000	88.9
	9	5,904	26.2	11,916	53.0	15,440	68.6	18,084	80.4	20,492	91.1	21,872	97.2
	10	5,524	24.6	10,992	48.9	14,288	63.5	16,964	75.4	19,392	86.2	21,156	94.0
	11	4,168	18.5	8,564	37.2	11,020	49.0	13,188	58.6	15,604	69.4	18,264	81.2
	12	2,760	12.3	6,112	27.2	8,536	37.1	10,552	46.9	13,680	60.8	17,256	76.5

* Pattern length considered in study was greater than that containing 2.0 σ of the bombs.
1 Assumed kill radius for each bomb.
2 Area covered by all bombs considered for subrectangle.
3 Percent of subrectangle of area covered by bombs.

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(U) All the cartons functioned, and those actually observed at functioning opened properly. Because of the large number dropped, tracking data from release to functioning was obtained on just one carton. This is presented in Appendix II, Table II-1, Parts 2 and 5. The project personnel observing the mission estimated the majority of the carton functioning times to be between 3 and 5 sec.

(S) The impact pattern plot (Fig 37) indicated that, throughout, the major part of the pattern, there were apparent void areas not covered by the bombs. However, in the lethal area build-up study (Table XII) for R 20 ft for each bomb, an average of 87.5 percent of the area included in the effective pattern was covered by at least one bomb. Additionally, it can be seen that a fairly uniform coverage was obtained for five-sixth of the effective pattern. As in the previous missions, variations in the pattern density are best explained by the variations in carton timer functionings, the orientation of the carton when it opens, and the usual random behavior of "maverick" bombs. The last two factors cannot be controlled, and control of timer functioning is limited by the inherent error of the timer and the man setting it before the mission. The impact position data for the plot is presented in Appendix V.

(S) A comparison of the pattern for pass 2 of this mission and pass 2 of mission 16 shows that the two patterns were almost identical with respect to bomb density. (Compare Figs. 33 and 37.) Comparison with pass 2 of mission 15 (Fig. 27 and 28, Table V) confirmed that the 3,000-lb test nylon harness was much more successful in duplicating the impact pattern of steel-cable cartons than the 1,500-lb test nylon. Although only three cells (9 cartons) were dropped on pass 2, mission 15, maximum density was not achieved until 900 ft down the pattern length, whereas maximum density for the equivalent condition during mission 16 was achieved approximately 300 ft from the start of the pattern and substantially sustained until the final 200 ft. Maximum density for pass 2, mission 18, was achieved 450 to 600 ft from the start of the pattern length.

(U) The results of mission 18 showed that the major problems of carton functioning had been solved. This configuration was immediately put into full-scale production.

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PHASE II - SUMMARY.

(U) The result of missions 6 through 18 were:

1. . carton modification had been made which would produce repeatable carton functioning characteristics that would disperse the BLU-3/B bombs in an acceptable manner.

2. The impact patterns resulting from this dispersion method were repeatable and controllable within the limits of timer accuracy with respect to length and density.

3. The dud rate for the BLU-3/B bombs was 6.4 percent average (disregarding the questionable accuracy of the dud rate for mission 7).

PHASE III

(U) Prior to flying mission 19, a First Article Configuration Inspection (FACI) was conducted on the production dispenser, cartons, and the related AGE.

(U) The AGE supplied by the contractor has been described in Section II. Each item was inspected and subjected to normal operating procedures, and all were found to operate satisfactorily. In particular, the inclusion of the movable platen assembly on the MHU-74/E adapter cluster bomb lift, the MHU-77/M dispenser handling trailer, the MHU-72/E adapter handling carrier, and the MHU-75/E adapter safeing retainers resulted in vast improvements in the handling and loading procedures of the dispensers and cartons.

(C) Mission 19 was a full-load (72 cartons) drop from a B-47 at WSMR. Initial production cartons loaded with BLU-3/B bombs with live detonators were used. The release altitude and airspeed were 425 KIAS and 800 ft AGL. A HRIC setting of 100 ft was employed.

(U) Because of the very low bombing altitude, the carton timers were set for 3 sec since it was desirable to have the bombs disperse as quickly as possible while insuring that the cartons would clear the bomb bay of the aircraft before functioning.

(U) One carton failed to open, and from 5 to 10 cartons were observed to open just below the aircraft. Inspection of the aircraft and a review of the photo-chase and bomb-bay film showed that one carton functioned as it left the bomb bay with the carton top lifting back into the bomb bay, puncturing the aft bulkhead and the empty fuel cell.

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(U) The early carton functionings and the damage to the aircraft caused concern over the quality control of the banding of the cartons and the operation of the timers. The possibility that collisions among the cartons caused the early functionings was considered. However, no conclusive evidence was available to support this possibility. Previous experience had shown, however, that quality control of the banding of the cartons was a critical factor relative to early functionings.

(C) The dud rate for mission 19 was 1.4 percent; 77 duds were found out of 5,254 bombs from 71 functioning cartons.

(S) The impact pattern was excellent, having a total length of 4,532 ft and a total width of 806 ft. However, the effective pattern dimensions equivalent to 2 σ in length and width were 3,130 ft long and 218 ft wide. The impact position data is presented in Appendix IV.

(C) Figure 39 shows the impact plot and Figure 40 is the graph of the lethal area coverage. Table XIII contains the lethal area build-up study. Comparison of Figure 40 with the graphs obtained for missions 15, 16, and 18 reveals that the dispersion mechanism (i.e., dispenser/carton) consistently produced repeatable, almost identical patterns.

(U) Missions 20 and 21 were the initial HE tests for the SUU-24/A/B BLU-3/B dispenser system flown by a B-47 and B-52 aircraft, respectively. The purpose of these missions was to determine whether any problem (evident only when HE BLU-3/B bombs were used) would arise from carton and bomb interaction or bombs interacting or colliding during free fall.

(U) Twenty-four cartons were released from the B-47, one on the first pass, two on the second pass (one each from adjacent cells), and 21 from seven cells on the third pass. A BRIC setting of 100 ft was used on passes 2 and 3. The carton timers were set for 3 sec to insure ample separation of the carton from the aircraft before functioning.

(C) All cartons released cleanly. However, several cartons were observed to open within 1 sec after release on pass 3. Film coverage showed that these early openings were a direct result of carton collisions. Sixteen dud bombs were found of the 1,776 bombs dropped for a dud rate of 0.90 percent. Three airbursts were observed close to the ground. These were attributed to falling bombs being struck by fragments of bombs detonating on the ground.

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TABLE XIII. LETHAL AREA BUILDUP DATA, MISSION 13.

Parameters Involved	Subrectangle Number	Assumed Kill Radii for Each Bomb											
		R=[illegible] ft		R= ft		R=[illegible] ft		R=[illegible] ft		R=[illegible] ft		R=[illegible] ft	
		Kill Area[2] (ft²)	Kill (%)[3]	Kill Area (ft²)	Kill (%)	Kill Area (ft²)	Kill (%)	Kill Area (ft²)	Kill (%)	Kill Area (ft²)	Kill (%)	Kill Area (ft²)	Kill (%)
Overall Pattern Length - 4,535 ft	1	5,572	22.5	22,504	25.5	[illegible]	55.1	[illegible]	[illegible]	[illegible]	5[illegible].5	[illegible]	[illegible]
Overall Pattern Width - 806 ft	2	6,[illegible]	24.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible].5	[illegible]	[illegible]
Subrectangle Length - 222.8 ft	3	11,656	24.0	[illegible]	45.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Subrectangle Width - 218 ft	4	13,[illegible]06	27.6	2[illegible],500	[illegible]	[illegible]	57.[illegible]	[illegible]	[illegible]	[illegible]	72.0	[illegible]	[illegible]
Subrectangle Area - 48,[illegible]67 ft	5	19,340	42.[illegible]	[illegible]	65.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
NK - N[illegible], W - 2.0	6	17,[illegible]16	35.9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible].5	[illegible]	[illegible]
Grid Delta - 2.0 ft[2]	7	26,[illegible]04	55.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible].[illegible]	[illegible]	[illegible]
Length of Pattern Considered - 3,556 ft	8	20,264	[illegible].7	[illegible]	[illegible].0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible].[illegible]	[illegible]	[illegible]
• Pattern length considered in study was greater than that containing 2.06 σ of the bombs.	9	25,[illegible]45	[illegible].[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible].[illegible]	[illegible]	[illegible]
	10	[illegible]5,[illegible]20	[illegible].[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible].[illegible]	[illegible]	[illegible]
[1] Assumed kill radius for each bomb.	11	25,[illegible]	[illegible].[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible].[illegible]	[illegible]	[illegible]
[2] Area covered by all bombs considered for subrectangle.	12	[illegible]0,[illegible]22	[illegible].[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible].[illegible]	[illegible]	[illegible]
[3] Percent of subrectangle of area covered by bombs.	13	[illegible]5,[illegible]00	[illegible].[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible].[illegible]	[illegible]	[illegible]
	14	7,[illegible]08	[illegible]6.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	65.[illegible]	[illegible]	[illegible]
	15	[illegible],25[illegible]	[illegible].[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible].[illegible]	[illegible]	[illegible]
SECRET	16	[illegible],[illegible]36	[illegible].[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible].[illegible]	[illegible]	[illegible]

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(C) It was possible to obtain an impact pattern for pass 3 by keeping it separate from the first two passes on the range. The centers of the detonation craters were plotted. There were 1, 465 separate impacts plotted from the 1,554 bombs dropped on the pass. The impact position data are presented in Appendix IV. Figure 41 shows the pattern. Figure 42 shows the lethal area graph and Table XIV shows the lethal area build-up study. The effective pattern is approximately 2,000 ft long by 140 ft wide. The center portion has less bomb density than either end, and the down-range end is the most dense area. The probable cause of the variation in pattern density is that some cartons functioned late (approximately 1/2 to 1 1/2 sec late, thus dropping their bombs further down range).

(U) Mission 21 was conducted with the B-52 specifically to ascertain if collisions would occur between the cartons when released alternately from the rear and forward dispensers. Collisions did occur, causing the cartons to break open. A study of the release conditions by the Ballistics Division of AF Armament Laboratory indicated, however, that no danger to the aircraft from exploding bombs existed.

(C) The functioning rates of the cartons and bombs were very good. Two of the 47 cartons failed to open, and one opened so close to the ground that the majority of the bombs failed to arm. The bombs from these three cartons were not considered in the bomb dud rate computation. There were 52 duds out of the 3,256 bombs considered for a dud rate of 1.5 percent.

(U) No impact pattern plots were made because the three passes were overlayed and indistinguishable.

(C) Mission 22 was conducted with a B-52 carrying two dispenser loads of high-explosive BLU-3/B bombs. All were released on one pass. The mission altitude was 800 ft AGL and the delivery airspeed was 550 KIAS. A BRIC setting of 76 ft was used. No phototheodolite cameras were available to confirm the delivery parameters.

(U) Prior to conducting the mission, the 144 cartons were modified with an aluminum plate riveted to the carton top. This was configuration 12 (Appendix I, Fig. 1-9). The purpose of the plate was to eliminate early carton openings due to inflight collisions. The plates originally had sharp right-angle edges. However, during the modification process the edges were beveled to eliminate binding and to allow the flanges of the carton sides to fit properly. The ethafoam packing material over the top layer of bombs was reduced in thickness from one-fourth to one-eighth in. to minimize the pressure of the

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TABLE XIV. LETHAL AREA BUILDUP DATA, MISSION 20, PASS 3.

Parameters Involved	Subrectangle Number	Assumed Kill Radii For Each Bomb											
		R=5[1] ft		R=8 ft		R=10 ft		R=12 ft		R=15 ft		R=20 ft	
		Kill Area[2] (ft^2)	Kill ($)[3]	Kill Area (ft^2)	Kill ($)	Kill Area (ft^2)	Kill ($)	Kill Area (ft^2)	Kill ($)	Kill Area (ft^2)	Kill ($)	Kill Area (ft^2)	Kill ($)
Overall Pattern Length = 4,535 ft	1	5,572	11.5	12,304	25.5	17,364	35.8	22,196	45.7	28,308	58.3	35,396	73.2
Overall Pattern Width = 806 ft	2	6,980	14.4	15,168	31.2	20,944	43.1	26,436	54.4	33,264	68.5	41,316	85.1
Subrectangle Length = 222.8 ft	3	11,696	24.0	22,016	45.3	27,508	56.6	31,628	65.1	36,400	74.9	41,312	85.1
Subrectangle Width = 218 ft	4	13,408	27.6	23,900	48.4	28,060	57.8	31,128	64.1	34,864	72.0	38,640	79.1
Subrectangle Area = 46,567 ft^2	5	19,940	41.1	31,826	65.5	36,516	75.2	39,728	81.8	43,012	88.6	45,588	93.9
NX = NY, NX = 2.0	6	17,416	35.9	30,072	61.9	35,660	73.8	40,004	82.4	43,956	90.5	46,660	96.1
Grid Delta = 2.0 ft^2	7	26,764	55.1	38,584	79.4	41,668	86.2	43,576	89.7	45,088	92.8	46,528	95.8
Length of Pattern Considered = 3,596 ft	8	20,264	41.7	33,016	68.0	37,684	77.6	40,484	83.4	43,112	88.8	44,944	92.5
	9	25,548	48.1	34,700	71.4	38,720	79.7	41,424	85.3	44,000	90.6	46,276	95.3
	10	25,120	51.7	36,832	75.8	42,348	87.2	44,788	92.2	46,584	95.9	47,770	98.2
	11	25,444	52.4	39,544	81.4	43,656	89.9	45,416	93.5	46,564	95.9	47,508	97.8
	12	20,612	42.0	32,992	67.9	37,648	77.5	40,692	83.8	43,680	89.9	45,720	94.1
	13	20,504	42.4	32,368	66.6	36,668	75.5	39,360	81.0	41,732	85.9	44,476	91.6
	14	7,868	16.2	16,016	33.0	21,400	44.1	26,096	53.7	31,644	65.2	37,644	77.5
	15	4,256	8.8	8,976	18.5	12,416	25.6	15,712	32.4	20,188	41.6	26,456	54.4
	16	1,776	3.7	4,056	8.4	5,804	12.0	7,408	15.3	9,568	19.7	13,152	27.1

* Pattern length considered in study was greater than that containing 2.0 σ of the bombs.

[1] Assumed kill radius for each bomb.
[2] Area covered by all bombs considered for subrectangle.
[3] Percent of subrectangle or area covered by bombs.

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plate against the flanges. Additionally, a silicone grease was applied to the edges of the plates to reduce any frictional forces. The release sequence of the dispensers was also modified (to its present mode) before the mission in an attempt to eliminate collisions among the cartons.

(U) All the timers were set for 4 sec. Originally, a 3-sec setting was planned; however, when attempting to set the timer on 3 sec by the prescribed method of allowing the dial to run past 3 sec and then resetting it to 3 sec, the first three cartons' retaining bands were released when the dial was on 1 sec. The timers were then set on 4 sec by running them down to 2 sec and "click" setting them back to 4 sec (1 click equals 1 sec). This method prevented inadvertent openings when setting the timer and insured a minimum of 2 sec of fall after release from the aircraft.

(C) During the release of the cartons, collisions did occur, and some cartons opened almost immediately. A review of 35mm Mitchell camera film indicated that approximately 11 cartons opened as a result of the collisions. Considering the number of cartons released, the small number of early openings was judged to be a result of the modified carton tops and the release sequence; both features were to be incorporated in production items. Very few airbursts of the bombs were observed. No exact count is available, but estimates range from five to ten. Eight cartons failed to function. Discounting these cartons, there were 154 duds for a dud rate of 1.53 percent. The target damage and analysis results are presented in Appendix VI.

(C) Mission 23 was conducted with a B-47 aircraft, carrying a dispenser load of high-explosive BLU-3/B bombs, against the target array at Hill AFB, Utah (Appendix V). Two passes were made, the first down the west side of the array using a 100-ft BRIC setting, the second down the east side of the array using a 200-ft BRIC setting. Thirty-six cartons (1/2 load) were released each pass. Both passes were flown at 1,000 ft AGL and 425 KIAS.

(C) Two cartons failed to function. Excluding these, the bomb dud rate was 1.62 percent for pass 1 and 1.54 percent for pass 2.

(U) During pass 2 the aircraft incurred a puncture in the fuselage near the right side of the wheel-well door. Analysis of the Mitchell camera film indicated that a carton top had broken loose as a result of a collision and that it had been lifted upward by the airstream with sufficient force to puncture the metal fuselage.

(U) The target damage and analysis results for both passes are presented in Appendix VI.

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PHASE III - SUMMARY

(U) Missions 19-23 conducted in Phase III provided the following information:

1. The production carton functioned as designed and the stiffened top reduced the number of early openings.

2. Bomb impact position data for one full SUU-24/A dispenser containing 72 cartons and 5,528 BLU-3/B bombs could be extrapolated to determine the probable impact pattern from two dispensers.

3. The final production AGE was superior to the prototype equipment used during the first two test phases.

4. The BLU-3/B bombs could be delivered on target with repeatable densities using low-level delivery tactics.

5. The dud rate for the BLU-3/B bombs was less than 2 percent for all the HE missions.

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SECTION VI

CONCLUSIONS

1. (C) The ADU-253/B cluster bomb adapter can be released safely from the B-52 aircraft at a maximum demonstrated airspeed of 350 KIAS in a low-altitude delivery.

2. (C) The ADU-253/B cluster bomb adapters cannot be released from the B-47 aircraft without the possibility of damage to the aircraft from carton components released prematurely as a result of collisions among the cartons below the aircraft.

3. (U) The ADU-253/B cluster bomb adapter opens and allows the BLU-3/B bombs to disperse in a consistent and satisfactory manner.

4. (U) The Aerospace Ground Equipment developed for the SUU-24/A weapon systems meets all systems support requirements.

5. (U) The length and density of the BLU-3/B impact pattern can be controlled by varying the aRIC setting and is dependent upon the accuracy of the carton timers.

6. (C) The effective width of the BLU-3/B pattern is narrow (150 - 250 ft) and cannot be controlled within the spectrum of test parameters employed for this test.

7. (C) The dud rates for the BLU-3/B bomb when delivered from the SUU-24/A dispenser at low altitudes (800 - 3,000 ft), averaged 2.9 percent for the last nine missions.

8. (C) The SUU-24/A dispenser system in the B-52 and B-47 aircraft was shown to be a highly reliable and an effective system when employed against the composite target array constructed on the Hill AFB, Utah, bombing range.

9. (S) The following conclusions are based on Mission 22 in which the munitions were released from an altitude of 800 ft at 350 KIAS, giving an average effective pattern density of approximately 88.9 sq ft per bomb (effective impact pattern 5,300 ft long by 150 ft wide for two dispensers).

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a. (S) The BLU-3/B bomb delivered from the SUU-24/A dispenser was shown to be highly effective against thin-cased munitions in the open, in wood storage shacks, and in shipping containers, causing secondary fires and rendering useless those items penetrated.

b. (S) The SUU-24/A dispenser - BLU-3/B system was shown to be highly effective against light, unarmored vehicles such as jeeps, trucks, sedans, and shop vans.

c. (S) The SUU-24/A dispenser - BLU-3/B system was shown to be highly effective against revetted aircraft and aircraft in the open.

d. (S) The SUU-24/A dispenser - BLU-3/B system was shown to be highly effective against POL stored in the open.

e. (S) The SUU-24/A dispenser - BLU-3/B system was shown to be effective against a simulated revetted SAM site.

f. (S) The SUU-24/A dispenser - BLU-3/B system was shown to be hi · effective against personnel in the open, in vehicles, and in foxholes and trenches when the bomblet exploded within the trench or foxhole.

10. (U) When a cell of ADU-253/B canisters is released from the SUU-24/A dispenser carried in either the B-47 or B-52 aircraft, the canisters are "sheltered" for a period of time before they emerge into the airstream. The duration of the sheltering depends on the position of the canister within the cell, but can vary greatly from one release to another.

11. (U) The ADU-253/B cluster bomb adapter filled with BLU-3/B bombs has acceptable ballistic accuracy for use as an area weapon. However, the variation in sheltering effect and in timer functioning may result in gaps in the impact pattern.

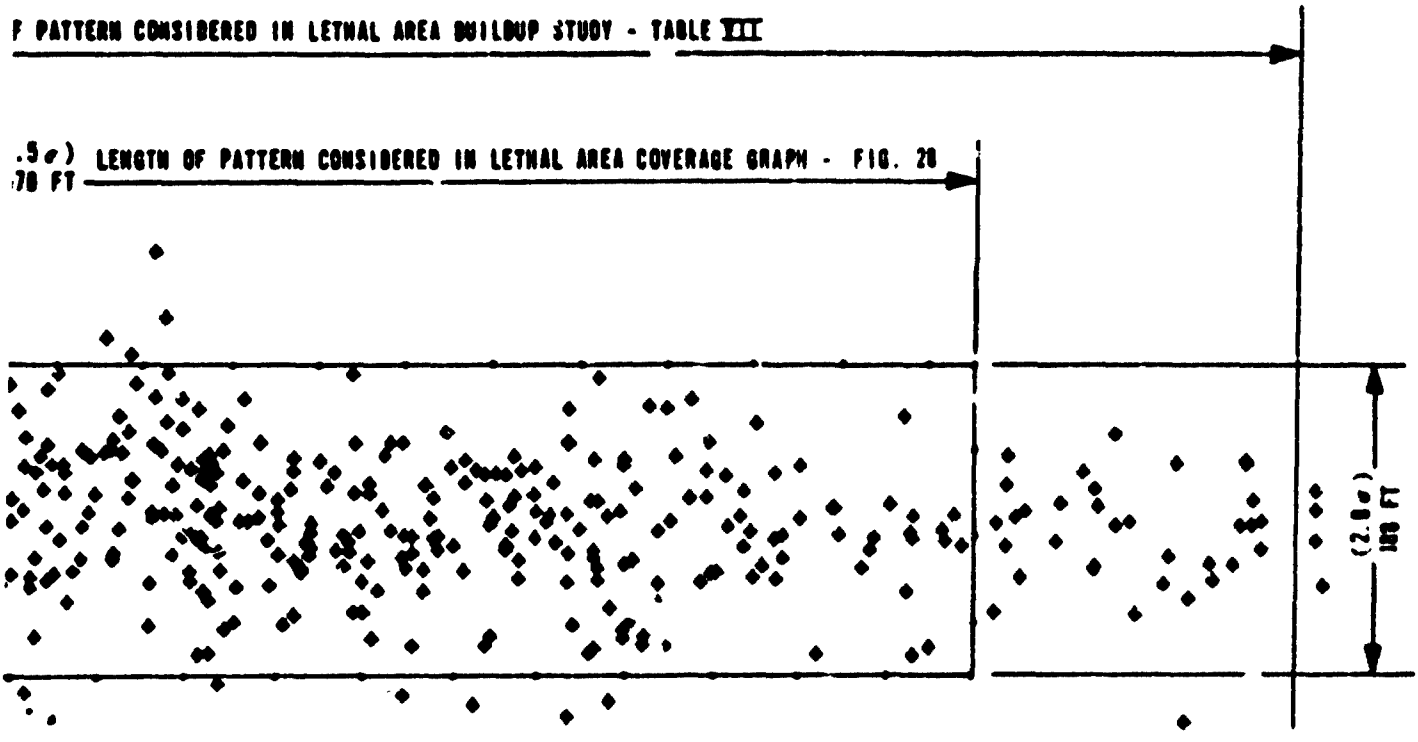
12. (C) Sufficient ballistic data for the ADU-253/B cluster bomb adapter (with nylon webbing harness) and the BLU-3/B bombs were obtained to produce aircrew weapon delivery data for low-altitude releases of this munition from the B-47 and B-52 aircraft.

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SECTION VII

RECOMMENDATIONS

APGC Recommends:	AFATL Comments:
1. (U) That the concept of a spinning carton for the BLU-3/B bomb be investigated with emphasis on achieving large lateral dispersion of the bombs.	1. (U) Concur, if the BLU-3/B or other nonself-dispersing munitions are planned for extensive use.
2. (U) That a self-dispersing munition equivalent in effectiveness to the BLU-3/B bomb be developed for use with the SUU-24/A dispenser system.	2. (U) The BLU-26/B bomb is designed for this purpose.
3. (C) That additional test missions be conducted with the BLU-3/B bomb to obtain data for bomb dispersion and pattern densities when delivered from medium and high altitudes.	3. (C) Concur, provided high-altitude employment of the BLU-3/B is planned by SAC.
4. (C) That the BLU-3/B bomb not be dispensed from the B-47 aircraft unless protection is provided for the aft bulkhead of the bomb bay.	4. (U) Concur.



15, Page 2.

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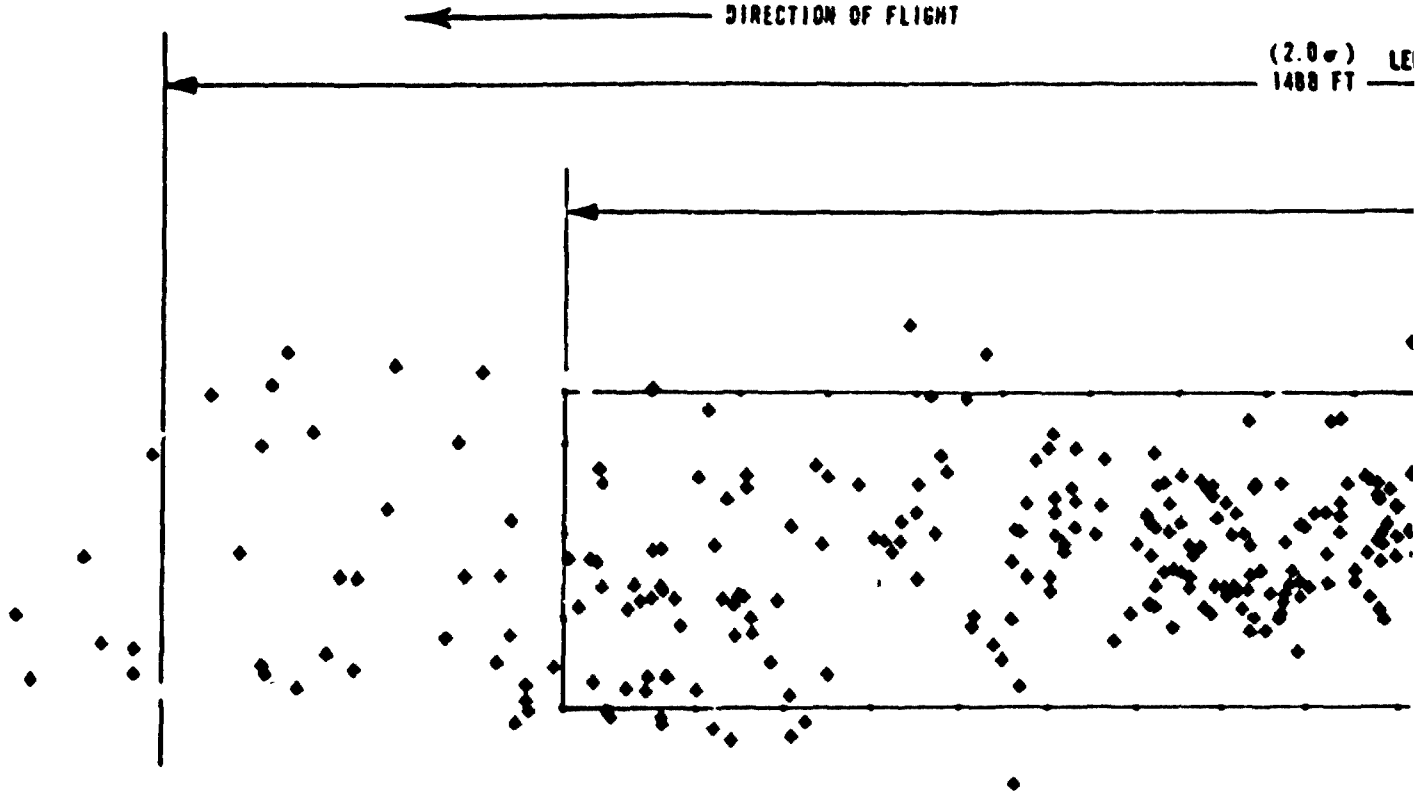
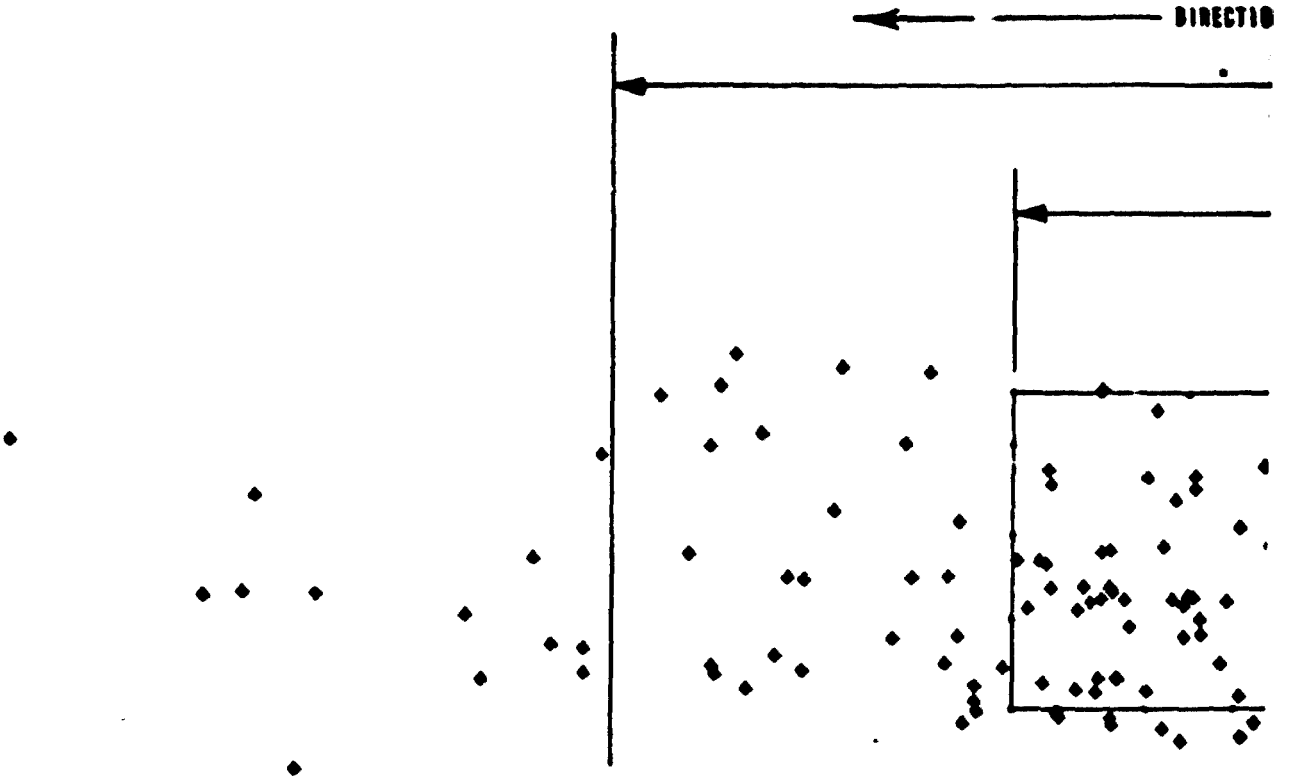


Figure 27. Impact Pattern Plot, Mis

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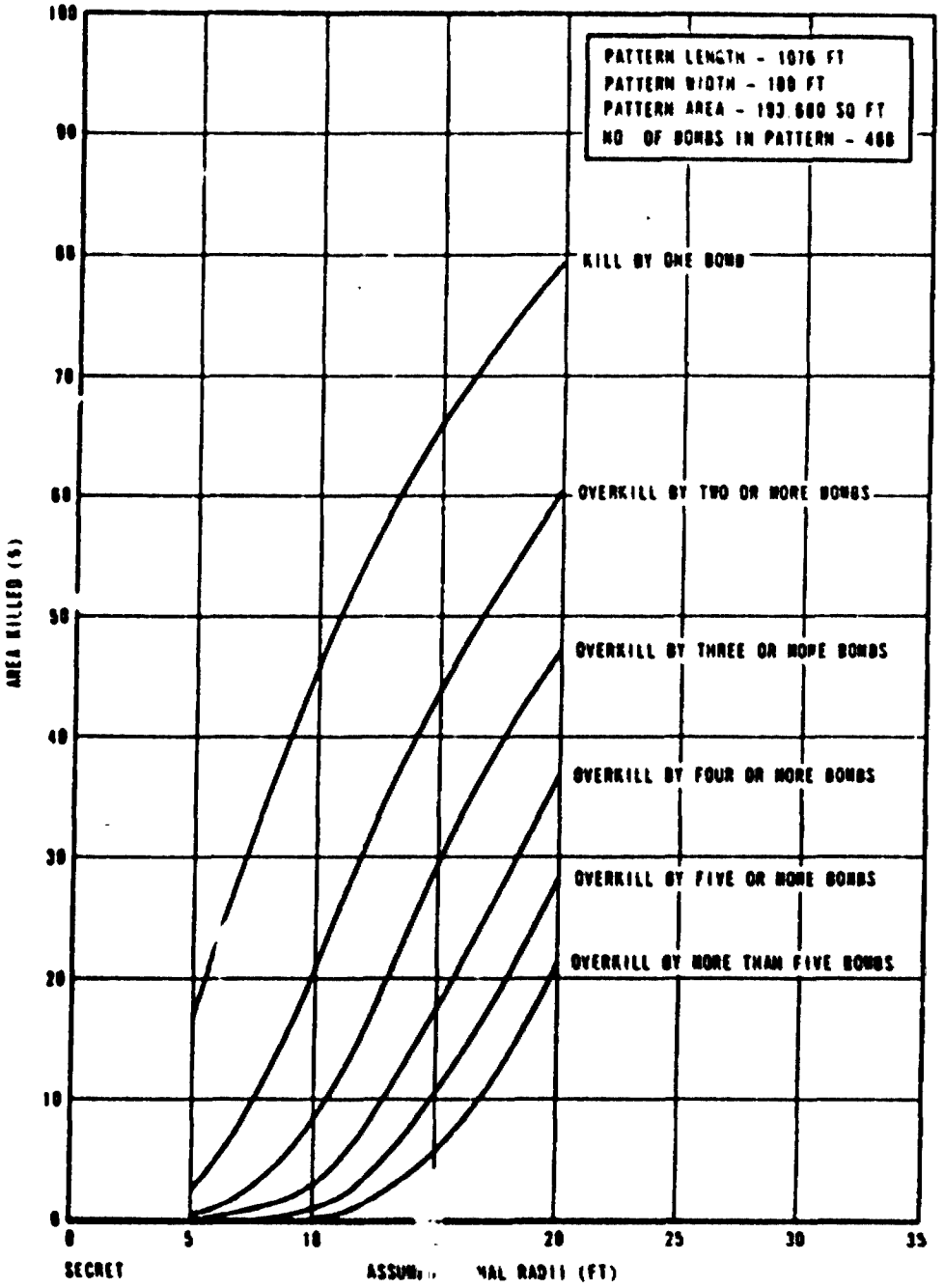
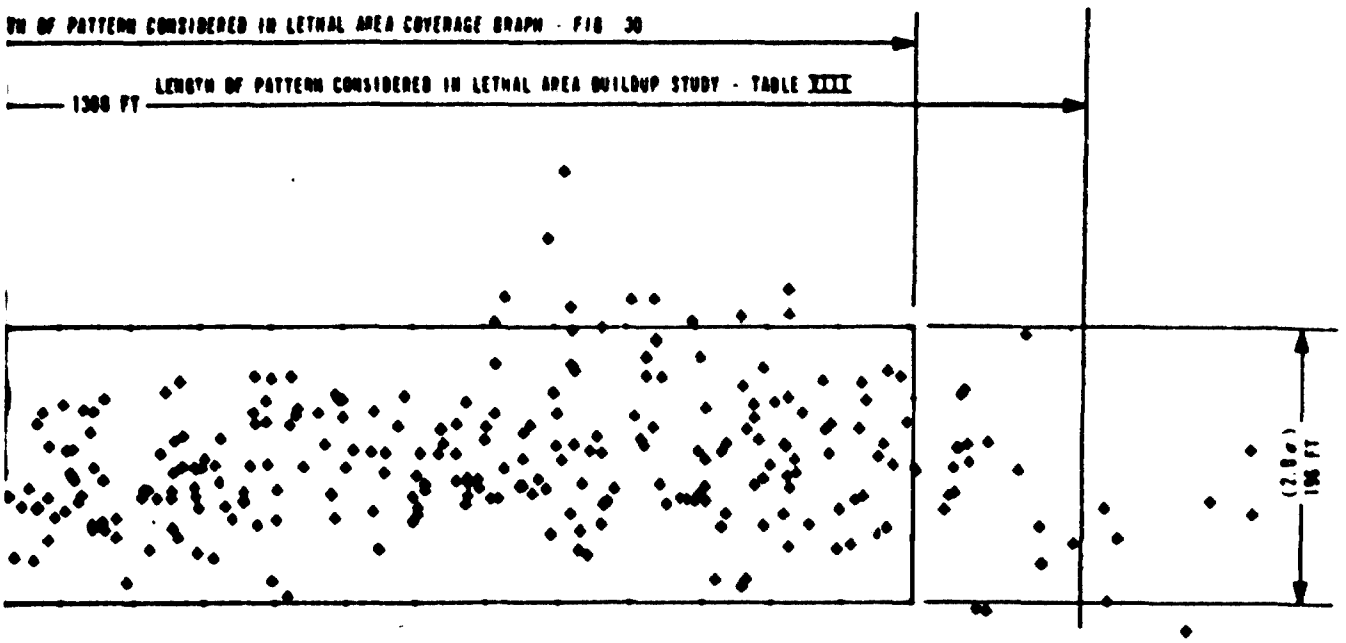


Figure 28. Effective Impact Pattern Area and Overkill Area vs Assumed Bomb Effective Radii, Mission 15, Pass 2.

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15, Pass 5.

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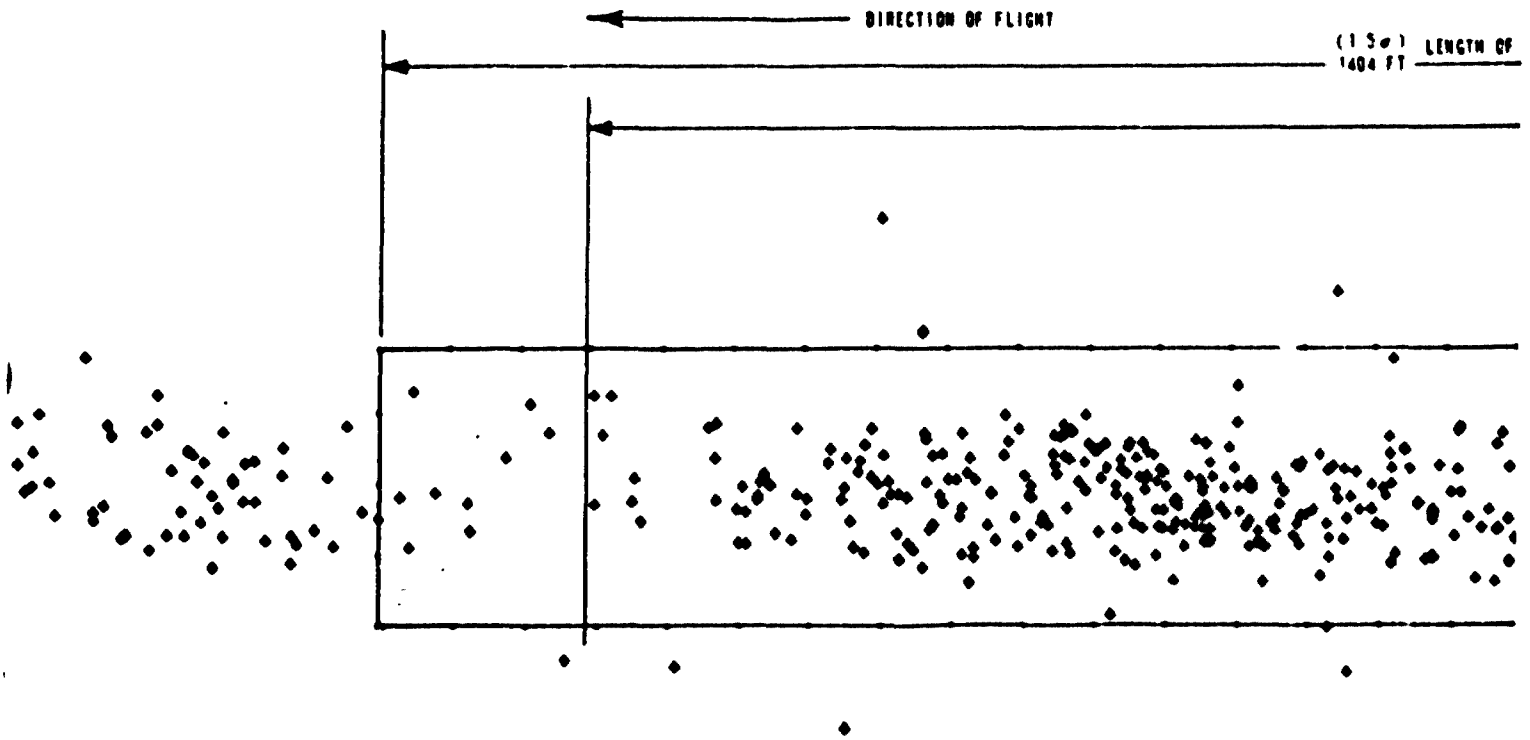
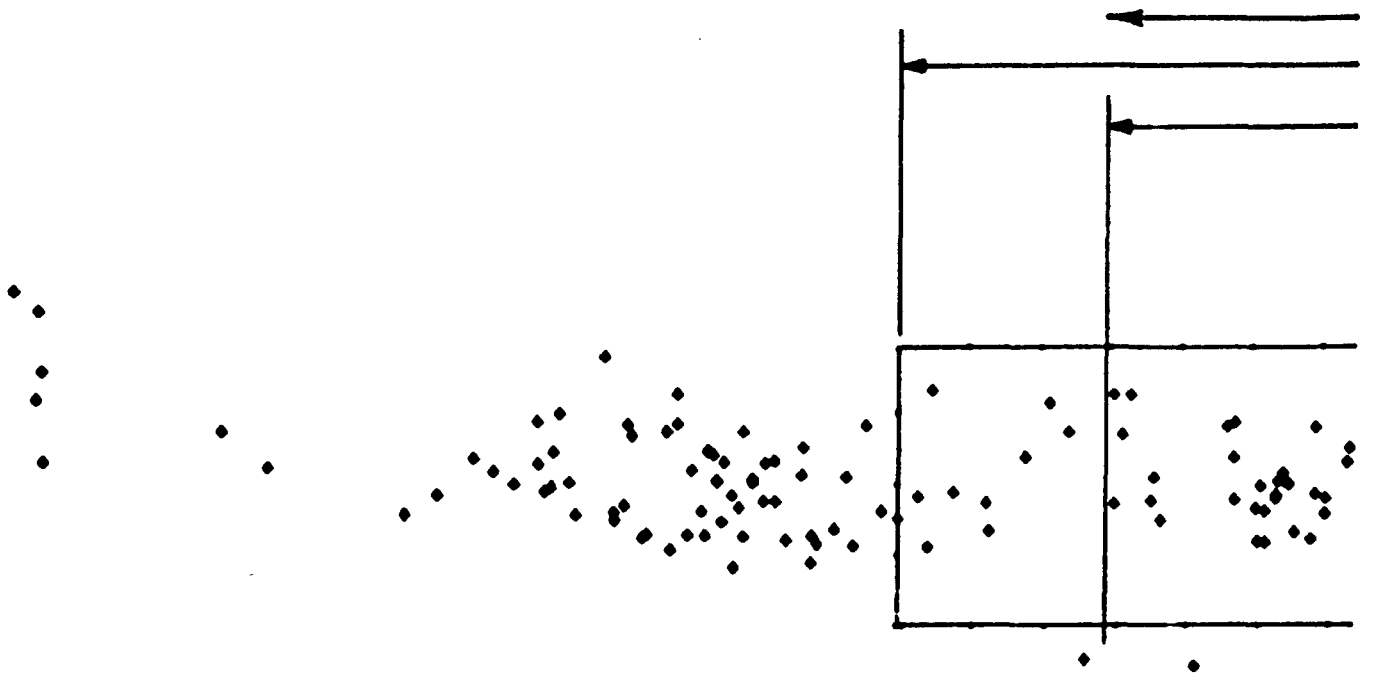


Figure 2. Impact Pattern Plot, Mission 15.

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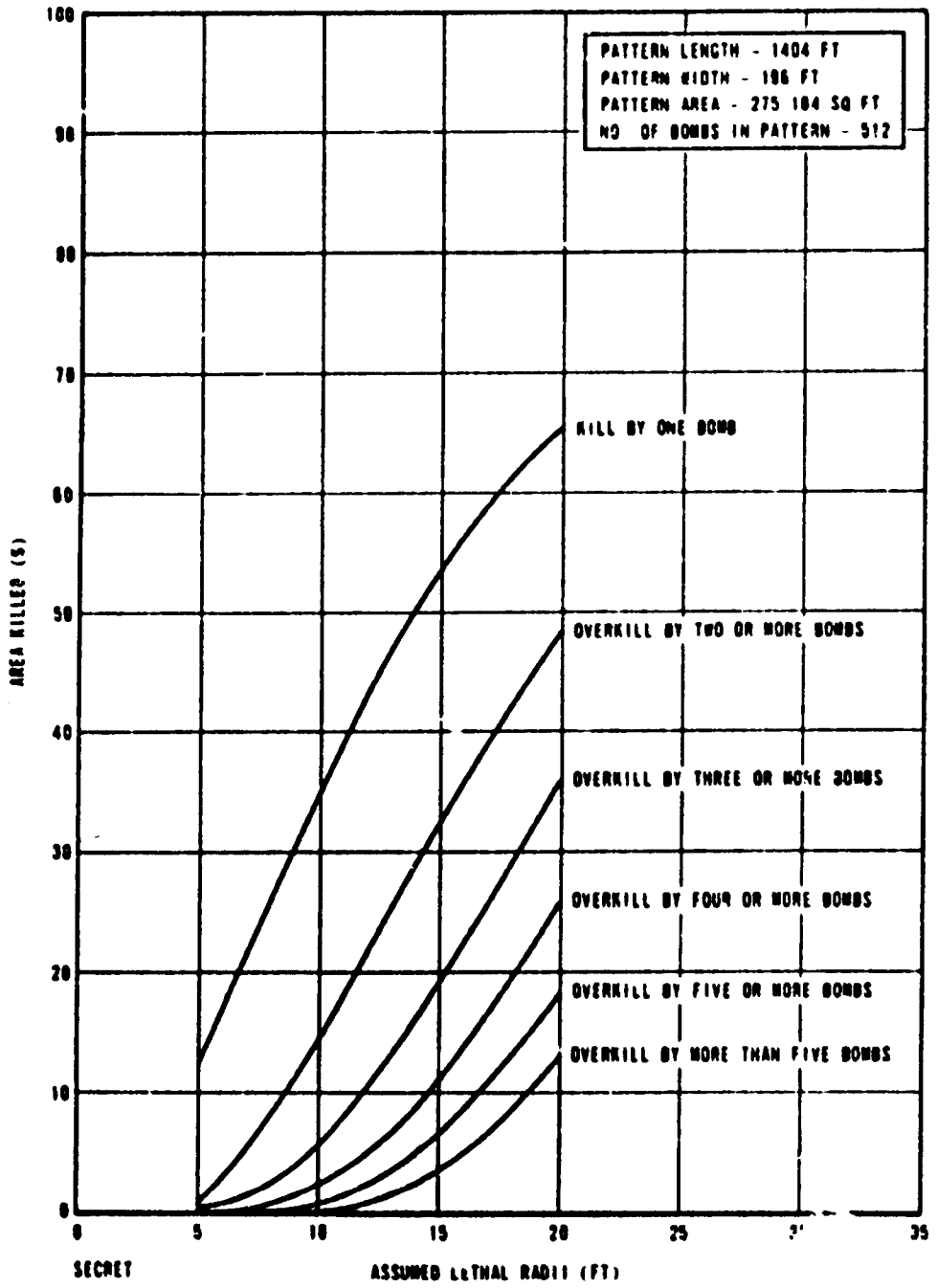
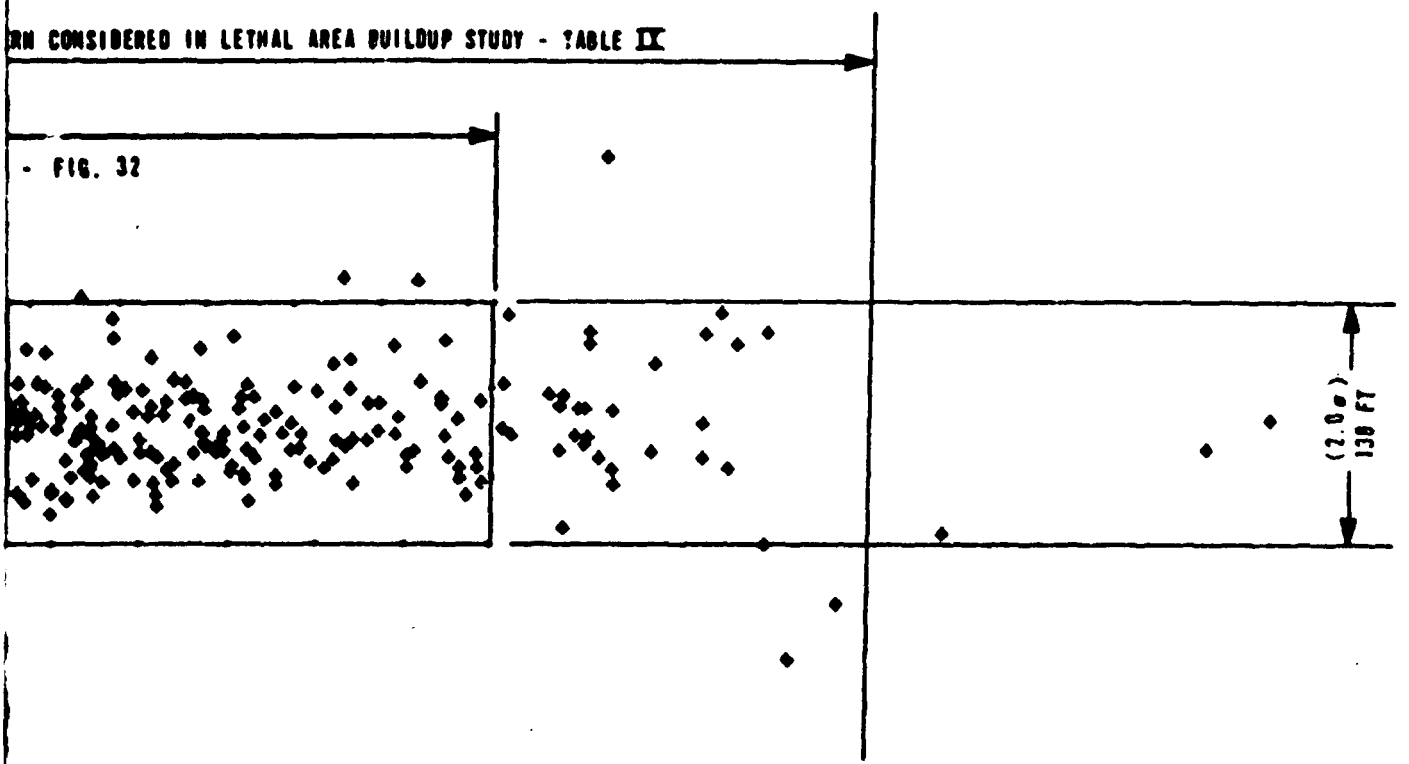


Figure 30. Effective Impact Pattern Area and Overkill Area vs Assumed Bomb Effective Radii, Mission 15, Pass 3.



16, Pass 1.

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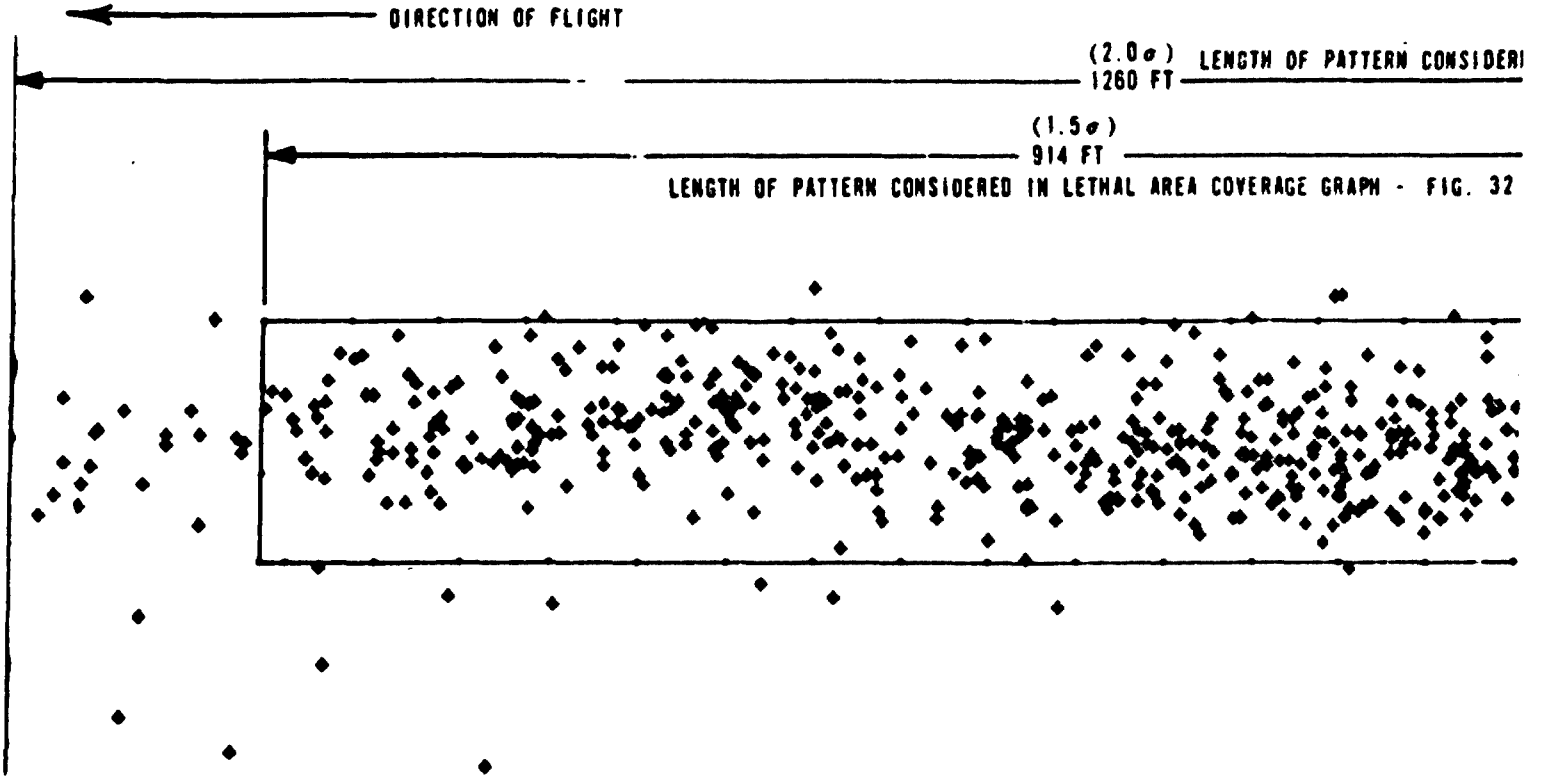
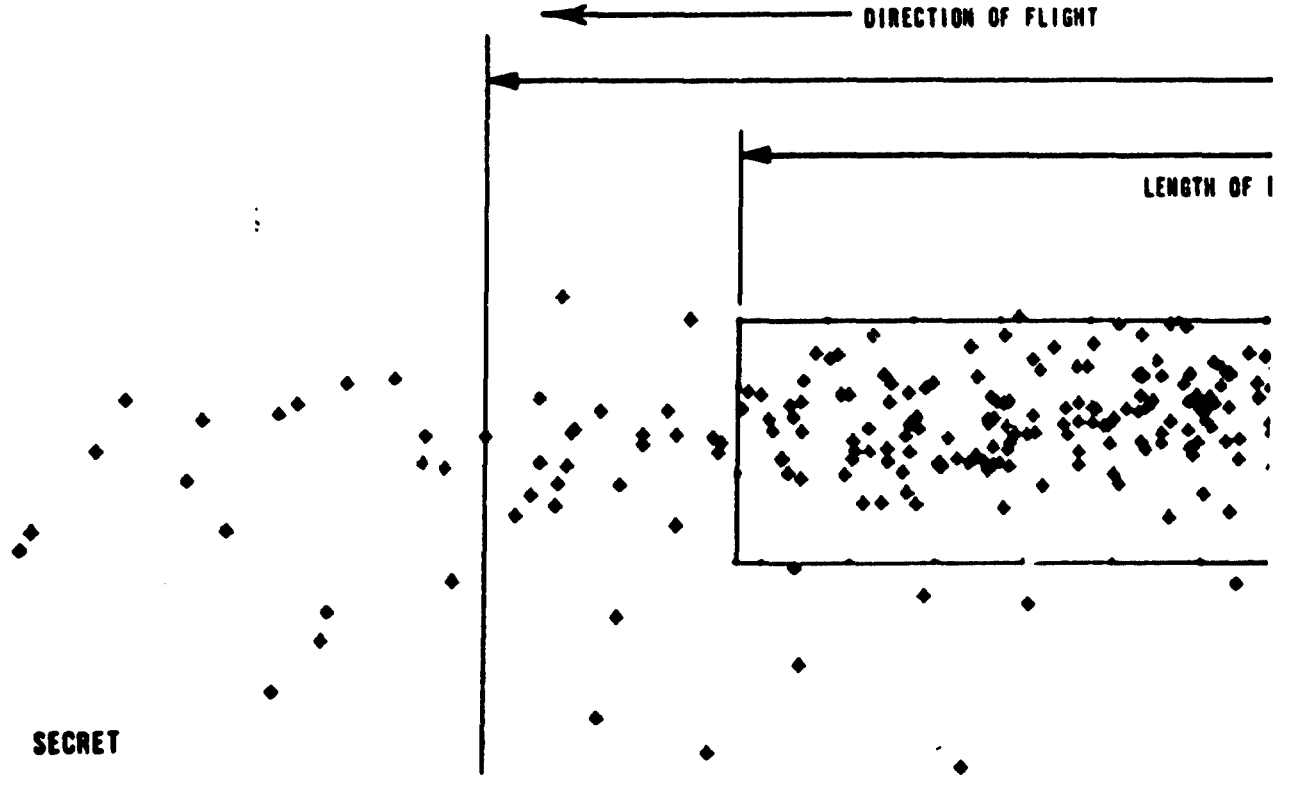


Figure 31. Impact Pattern Plot. Mission 30, Pass

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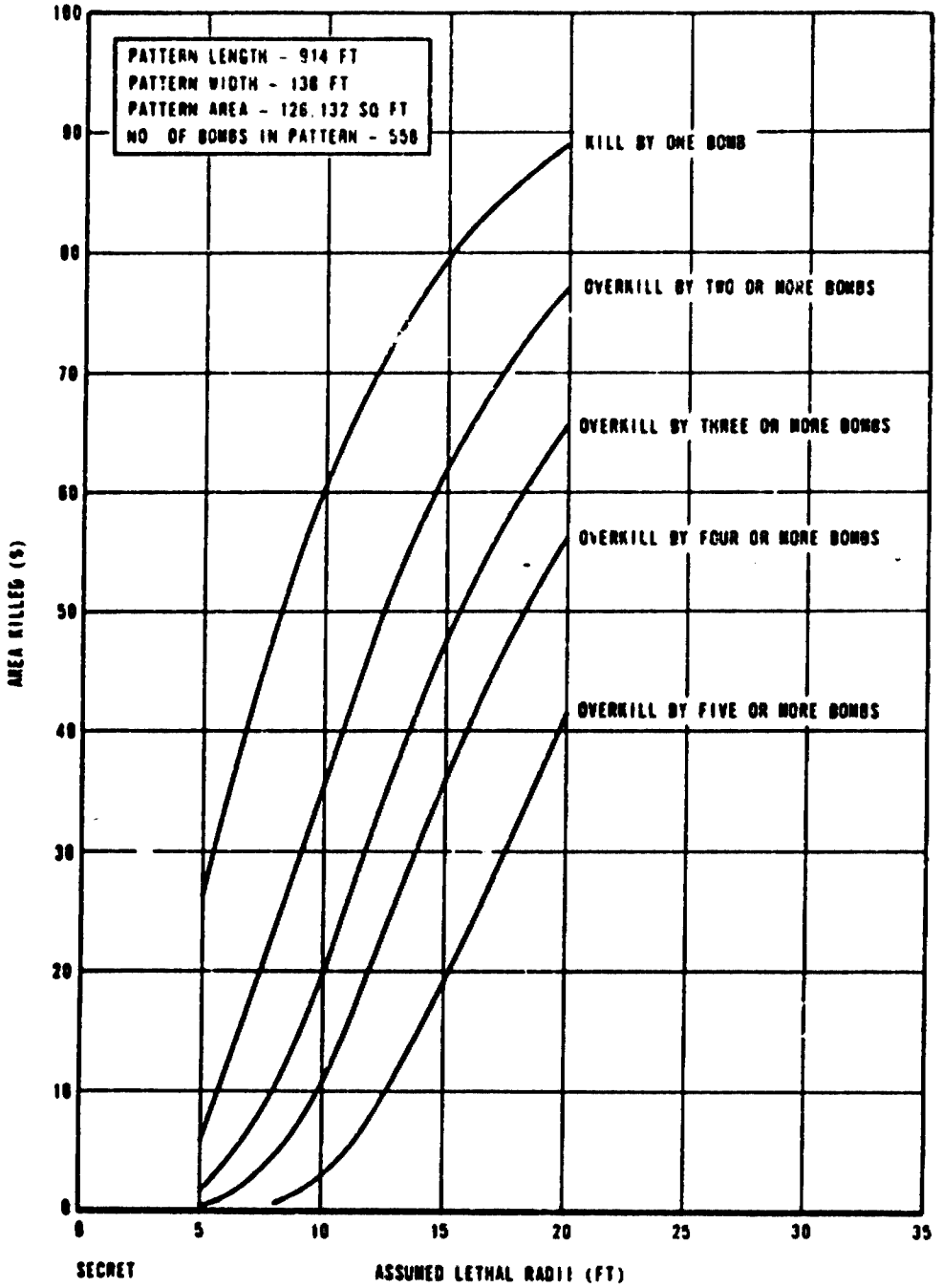
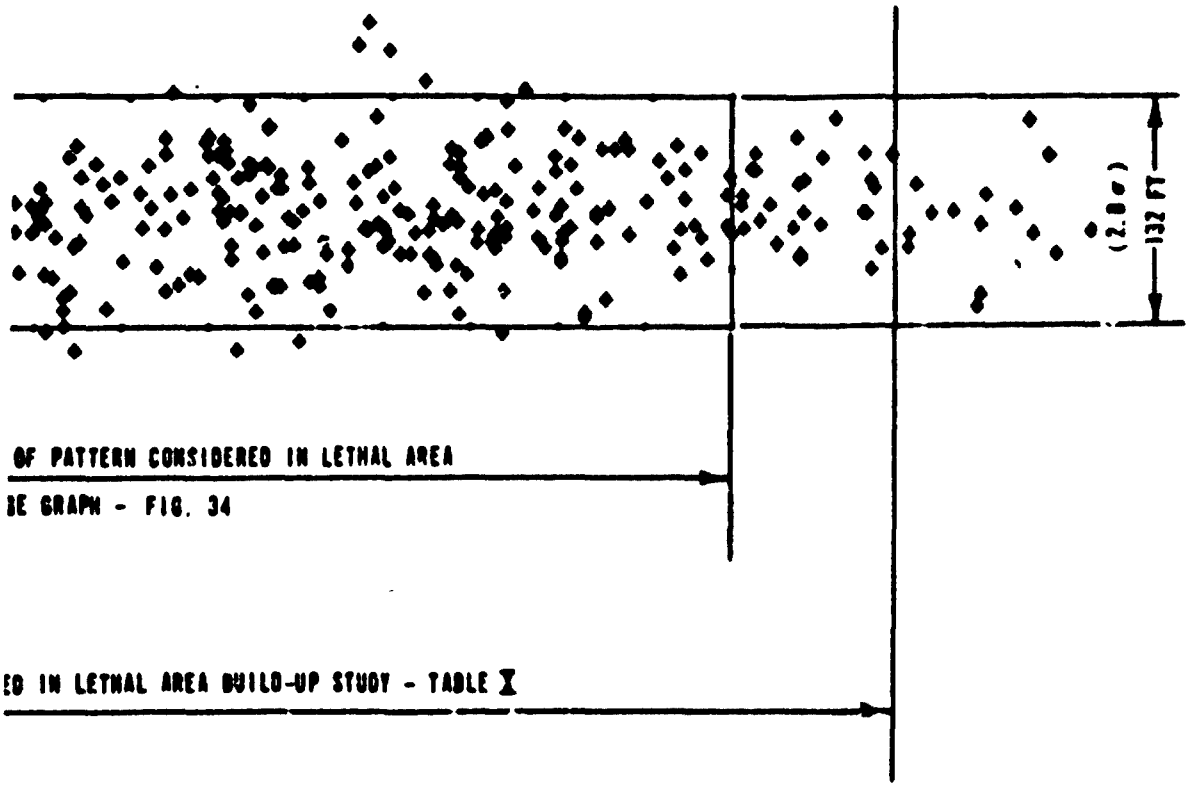


Figure 32. Effective Impact Pattern Area and Overkill Area vs Assumed Bomb Effective Radii, Mission 16, Pass 1.

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sion 10, Pass 2.

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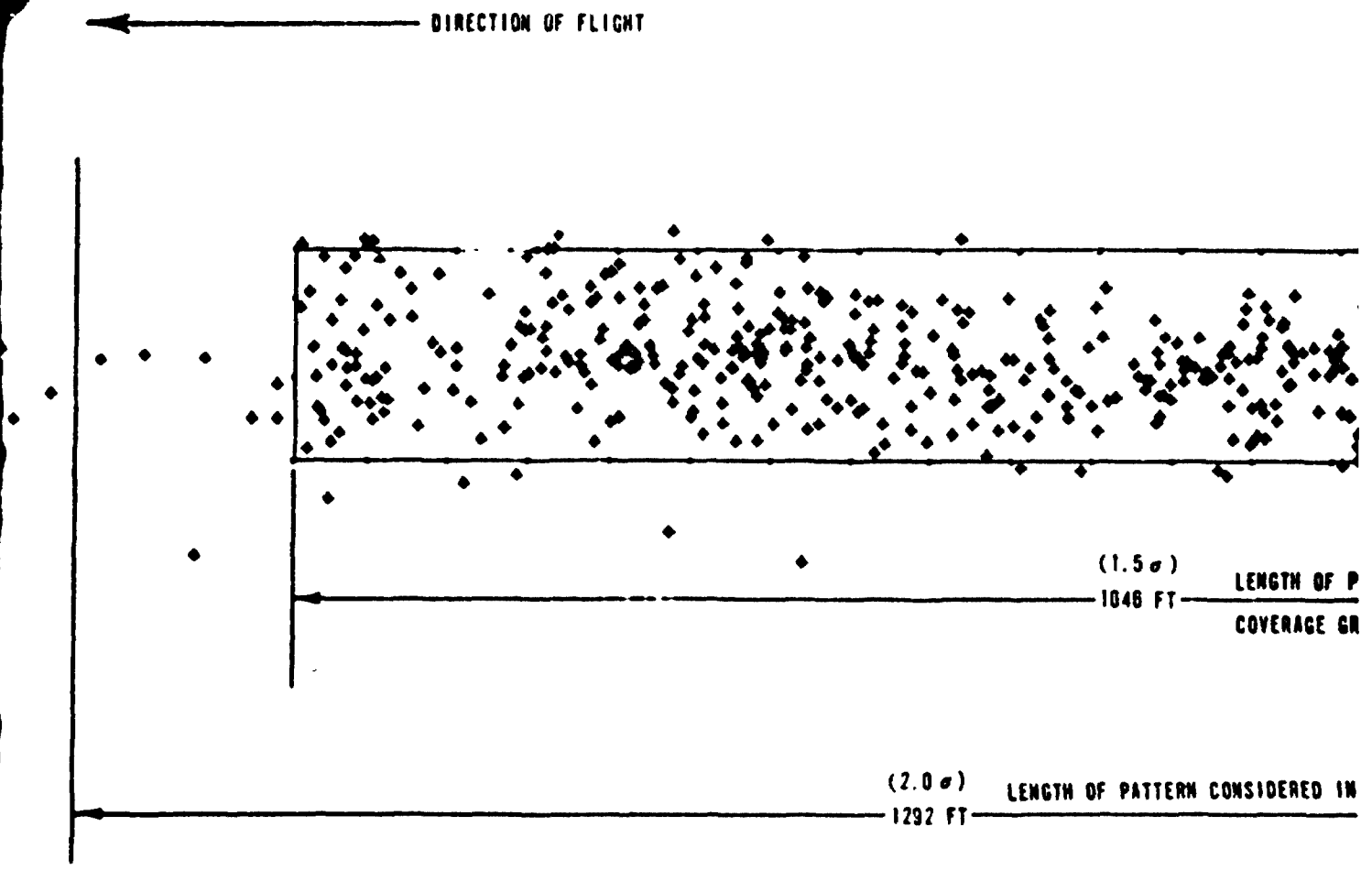
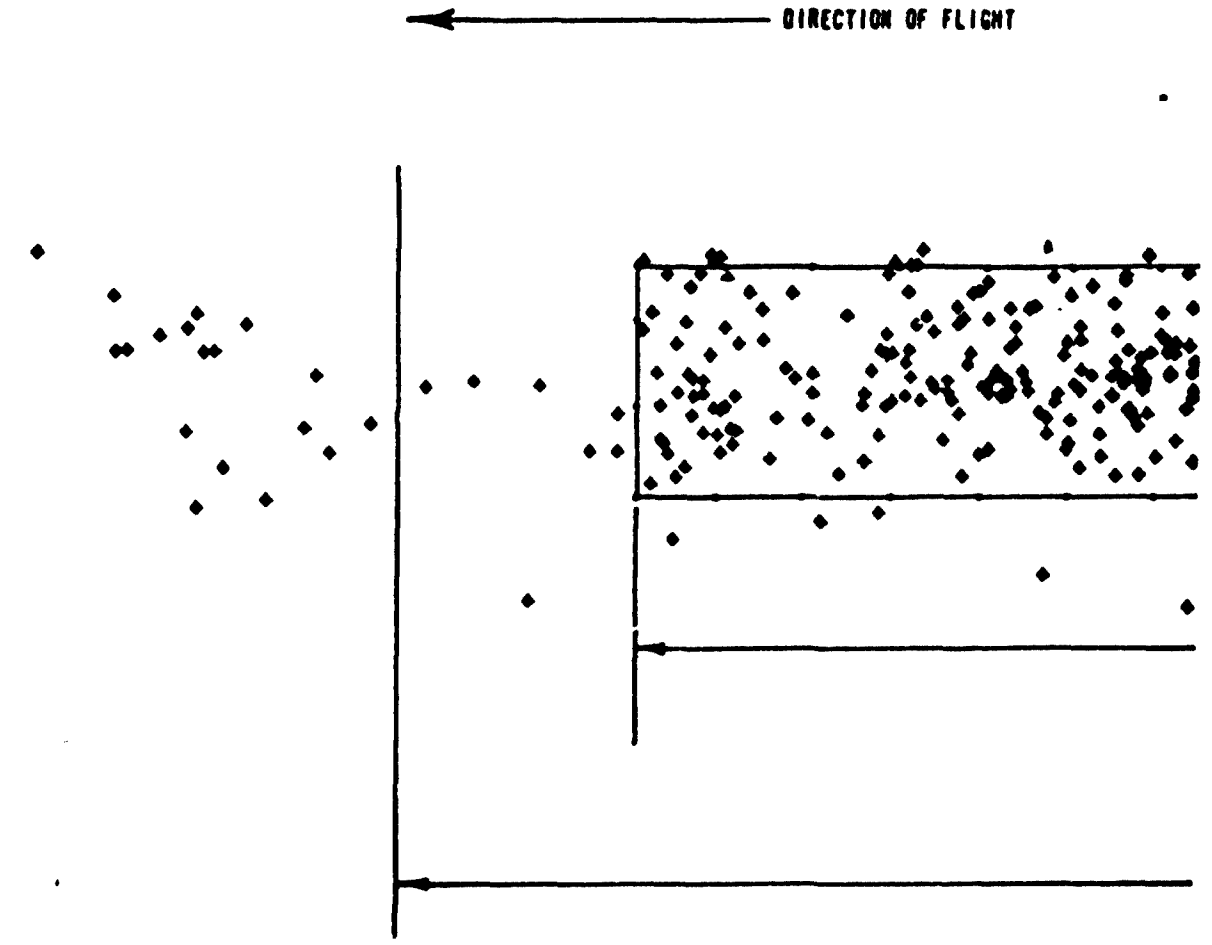


Figure 55. Impact Pattern Plot. Mission

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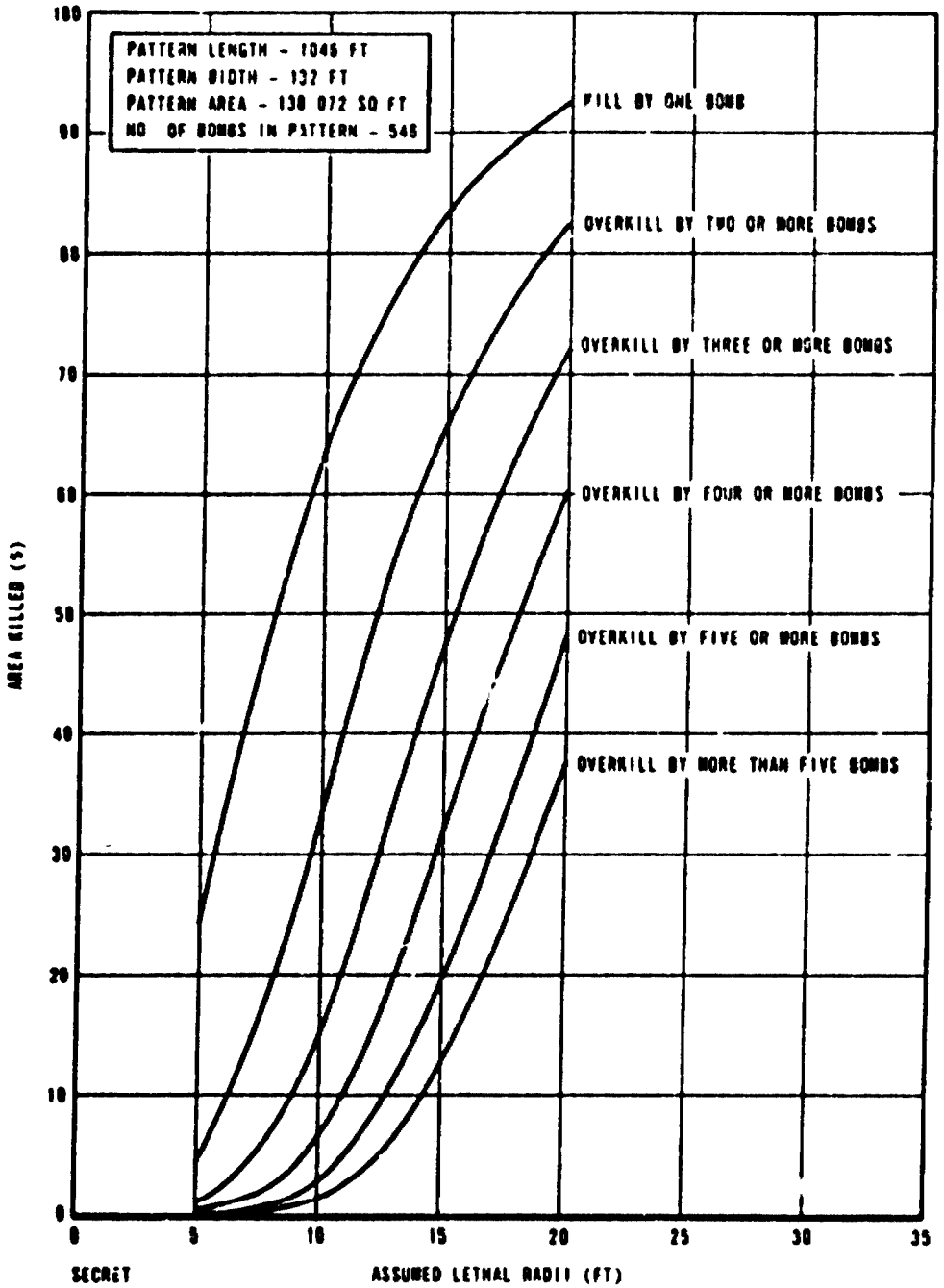
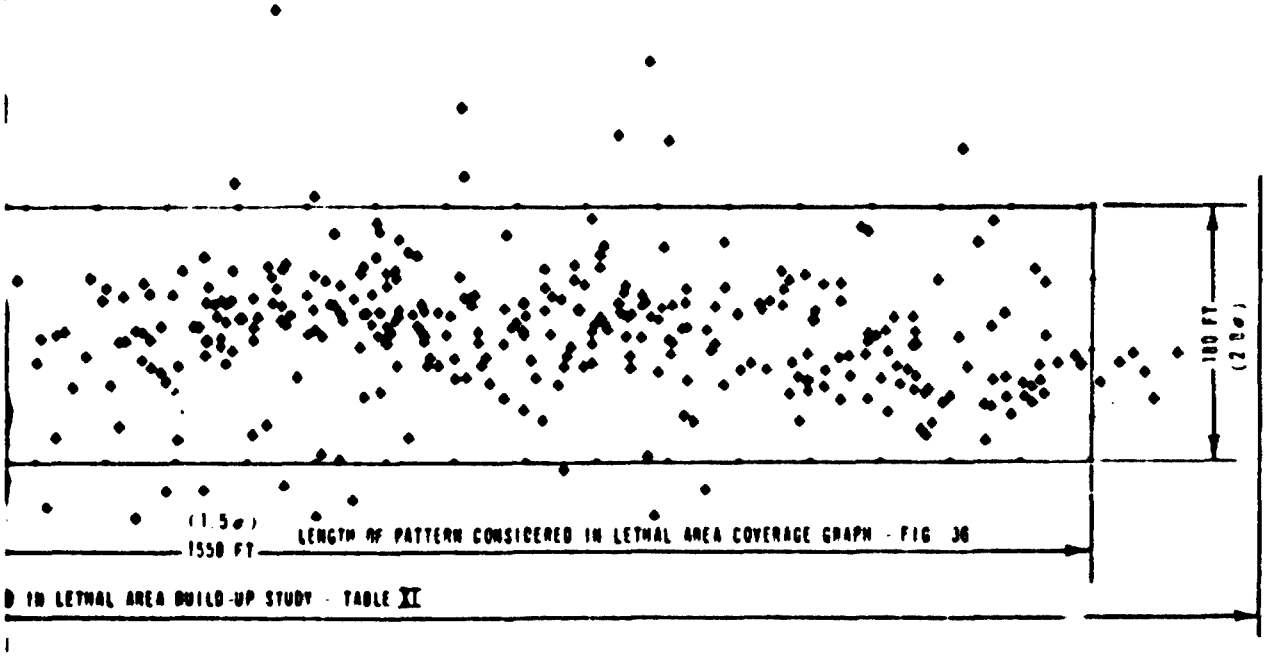


Figure 34. Effective Impact Pattern Area and Overkill Area vs Assumed Bomb Effective Radii, Mission 16, Pass 2.



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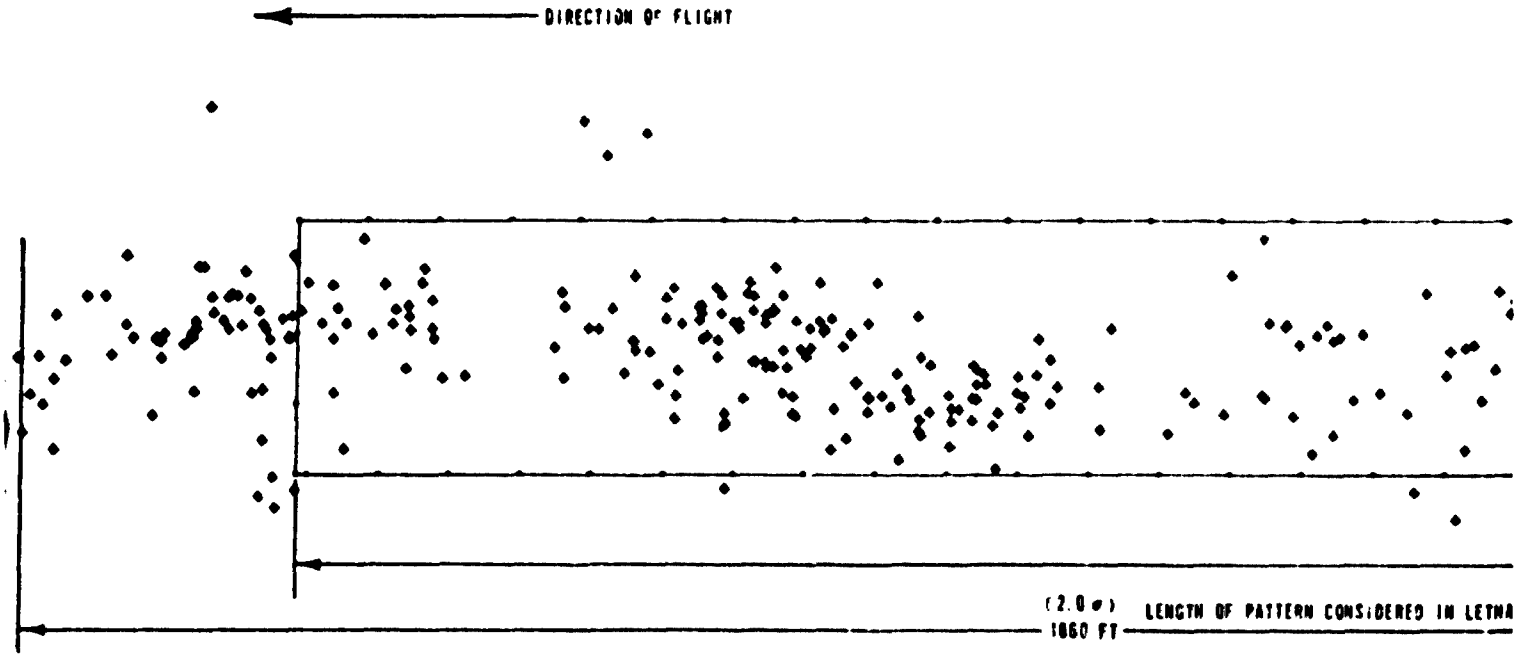


Figure 55. Impact Pattern Plot, Mission 10, Pass

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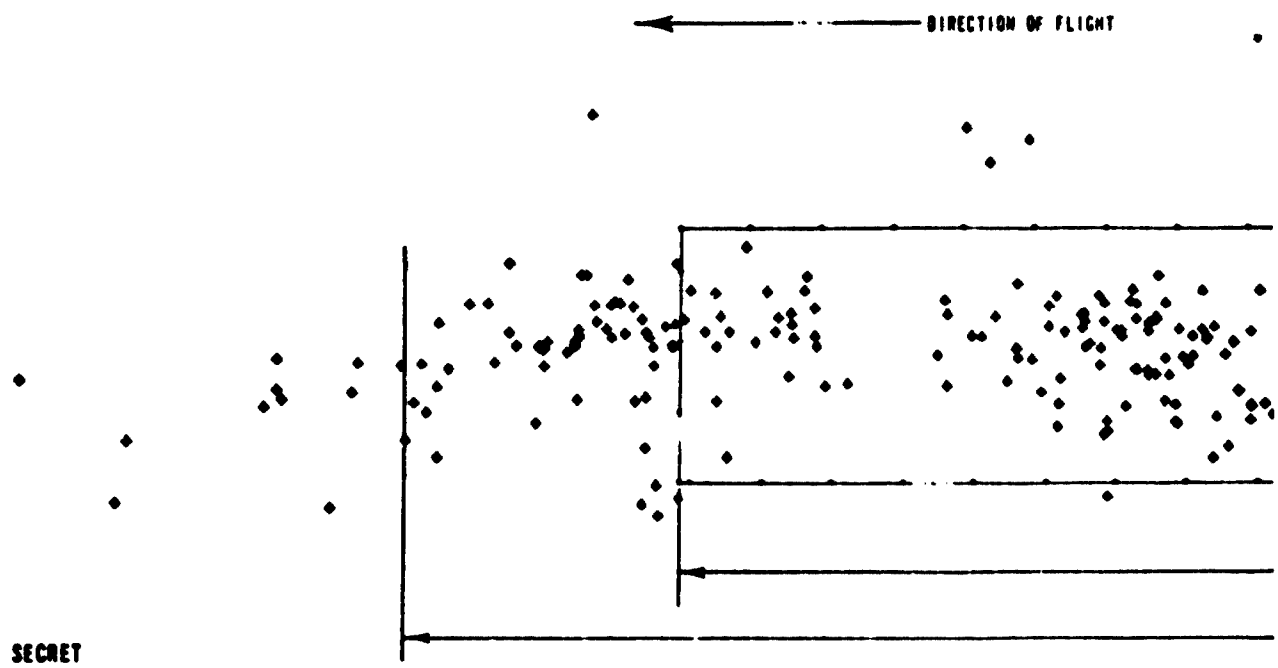


Figure 5

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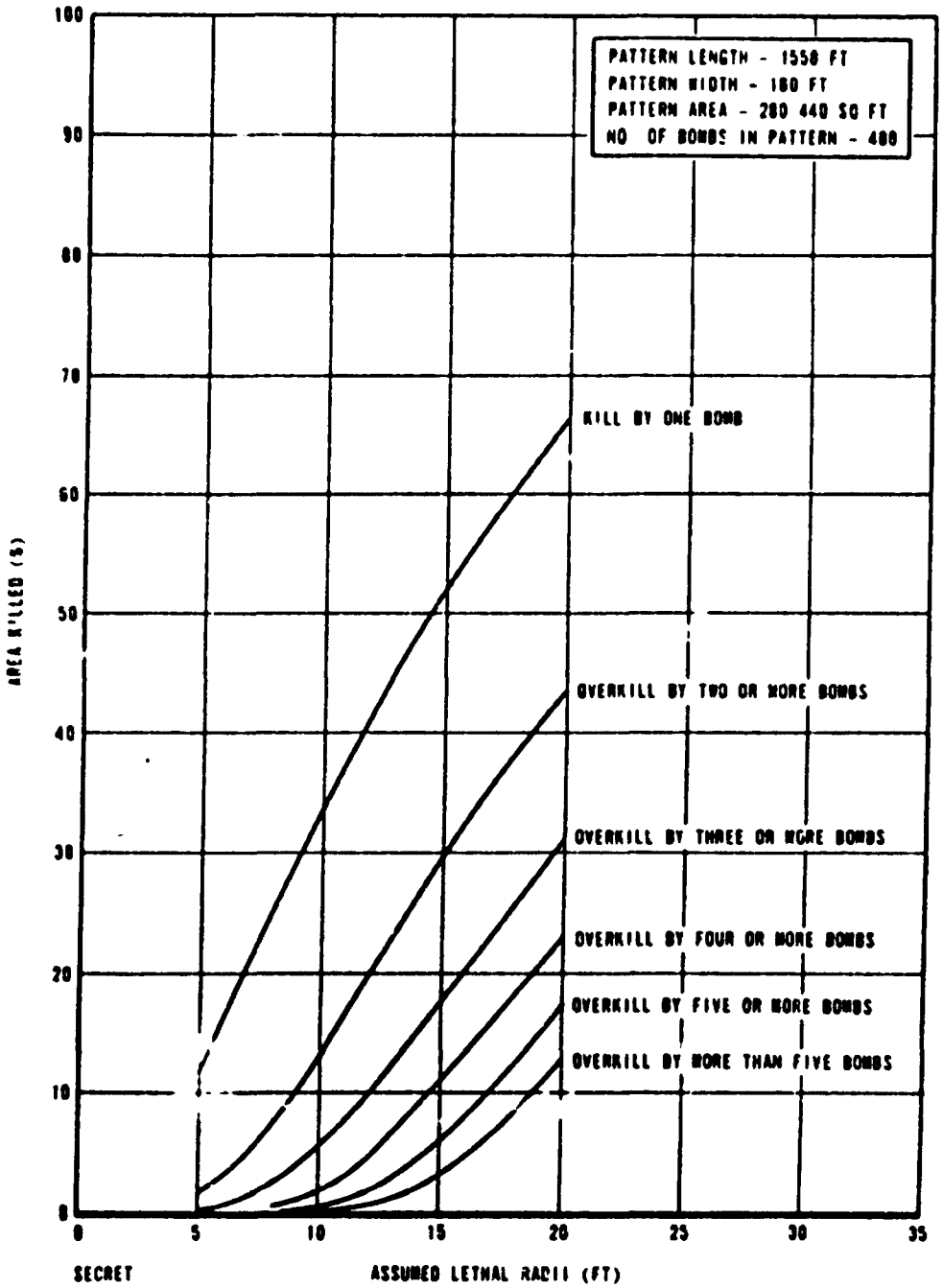
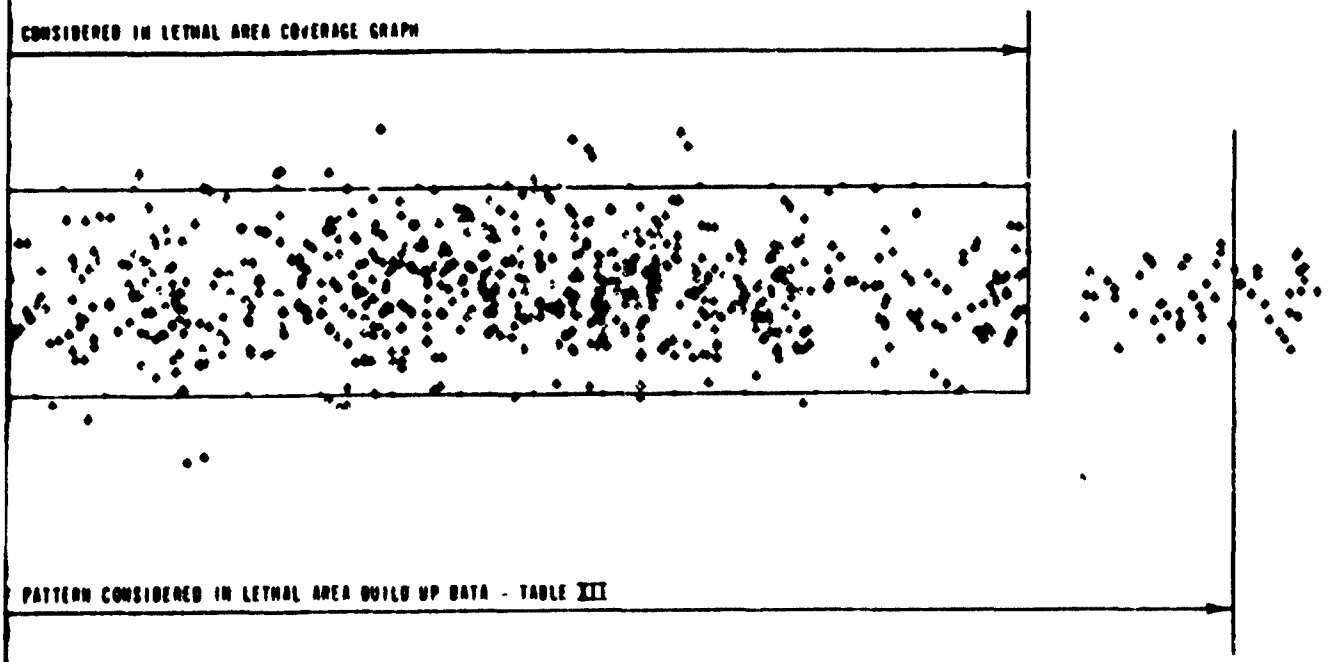


Figure 36. Effective Impact Pattern Area and Overkill Area vs Assumed Bomb Effective Radii, Mission 16, Pass 3.



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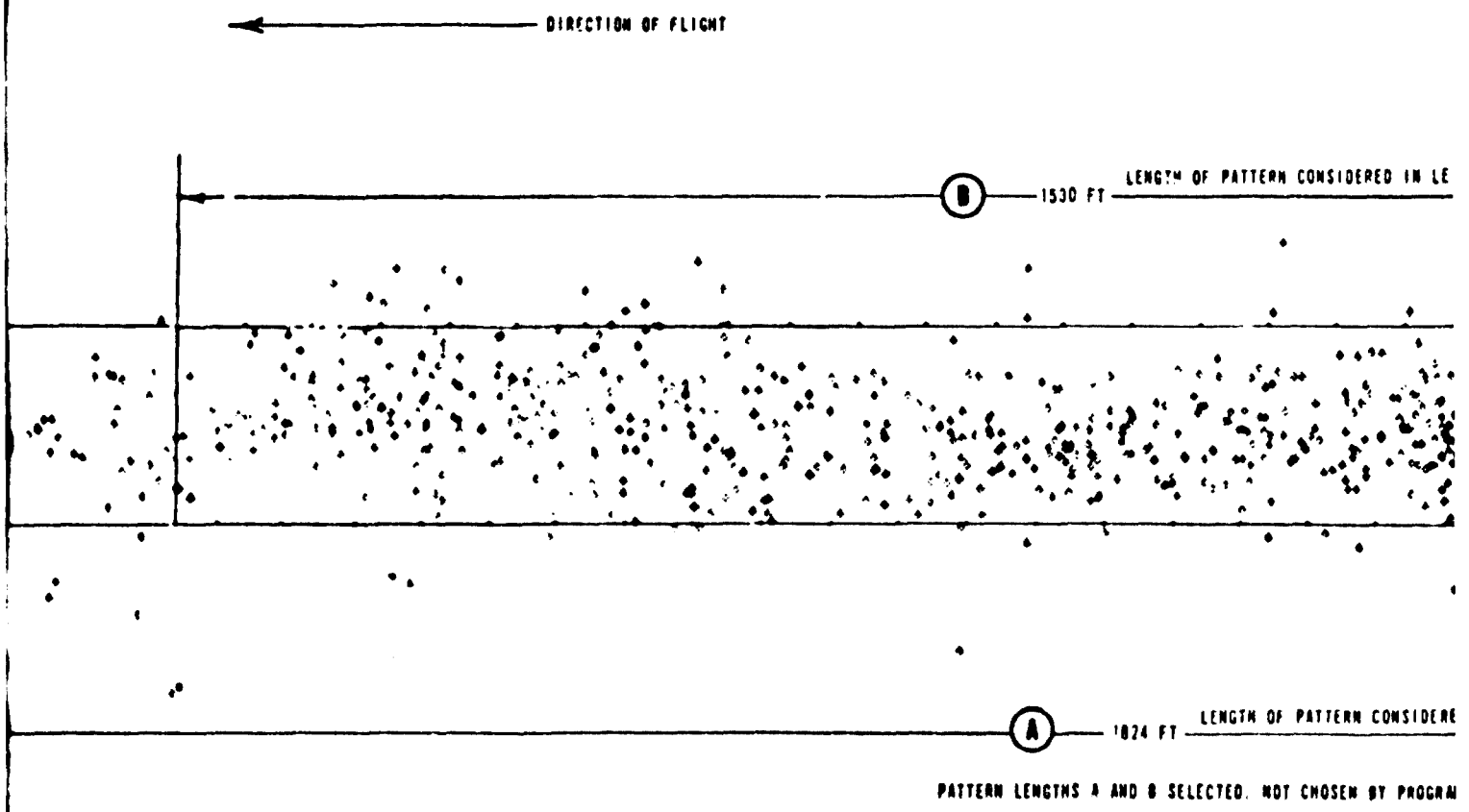
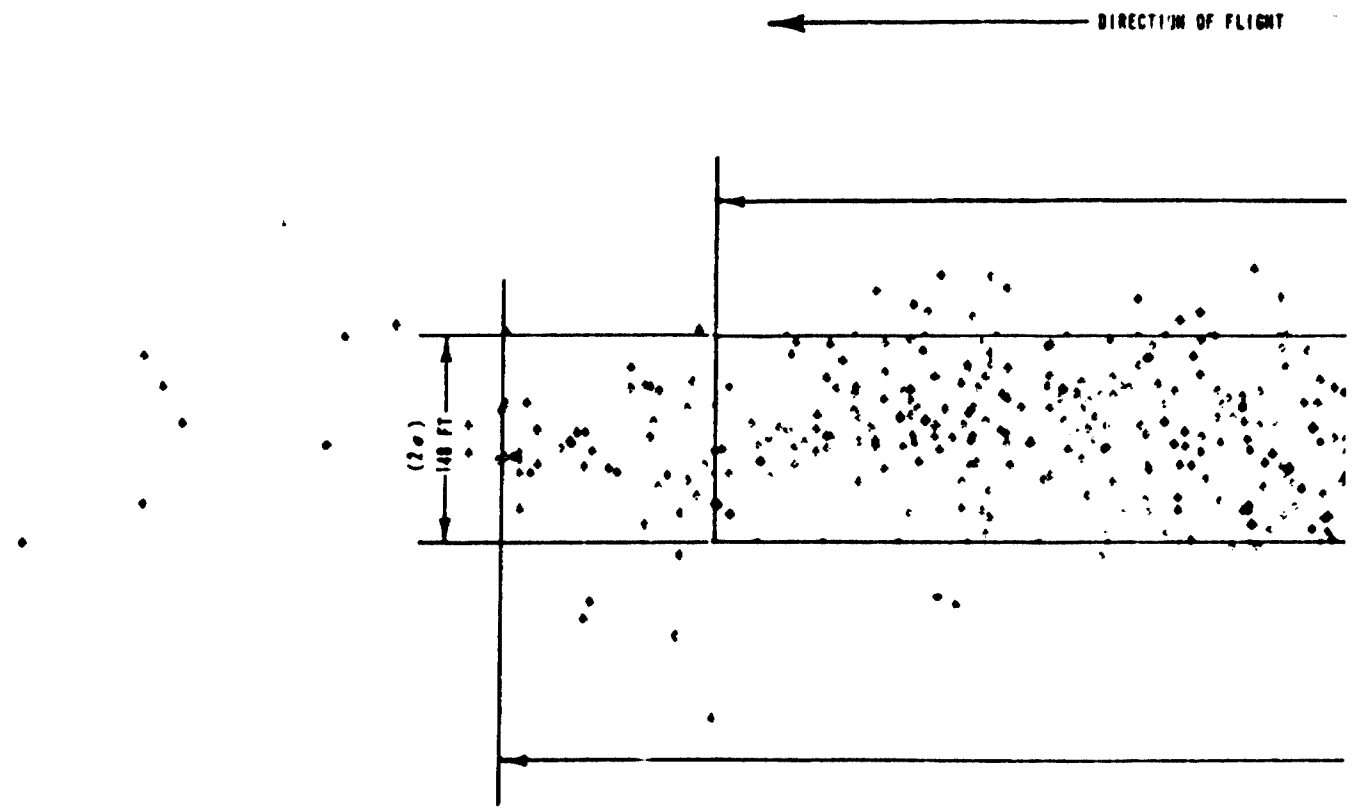


Figure 37. Impact Pattern Plot, Mission 1, Pass 2.

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Figure 57.

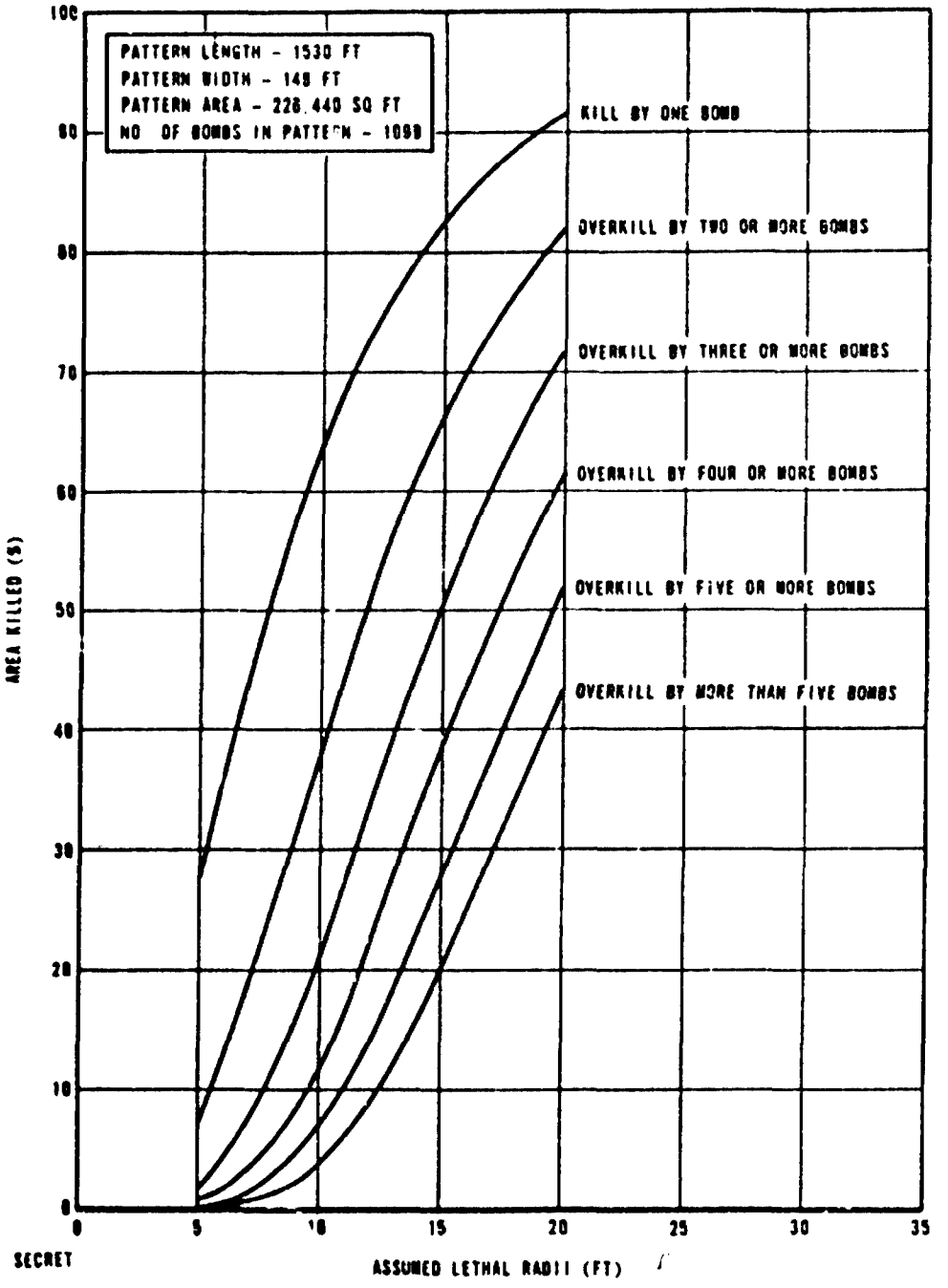
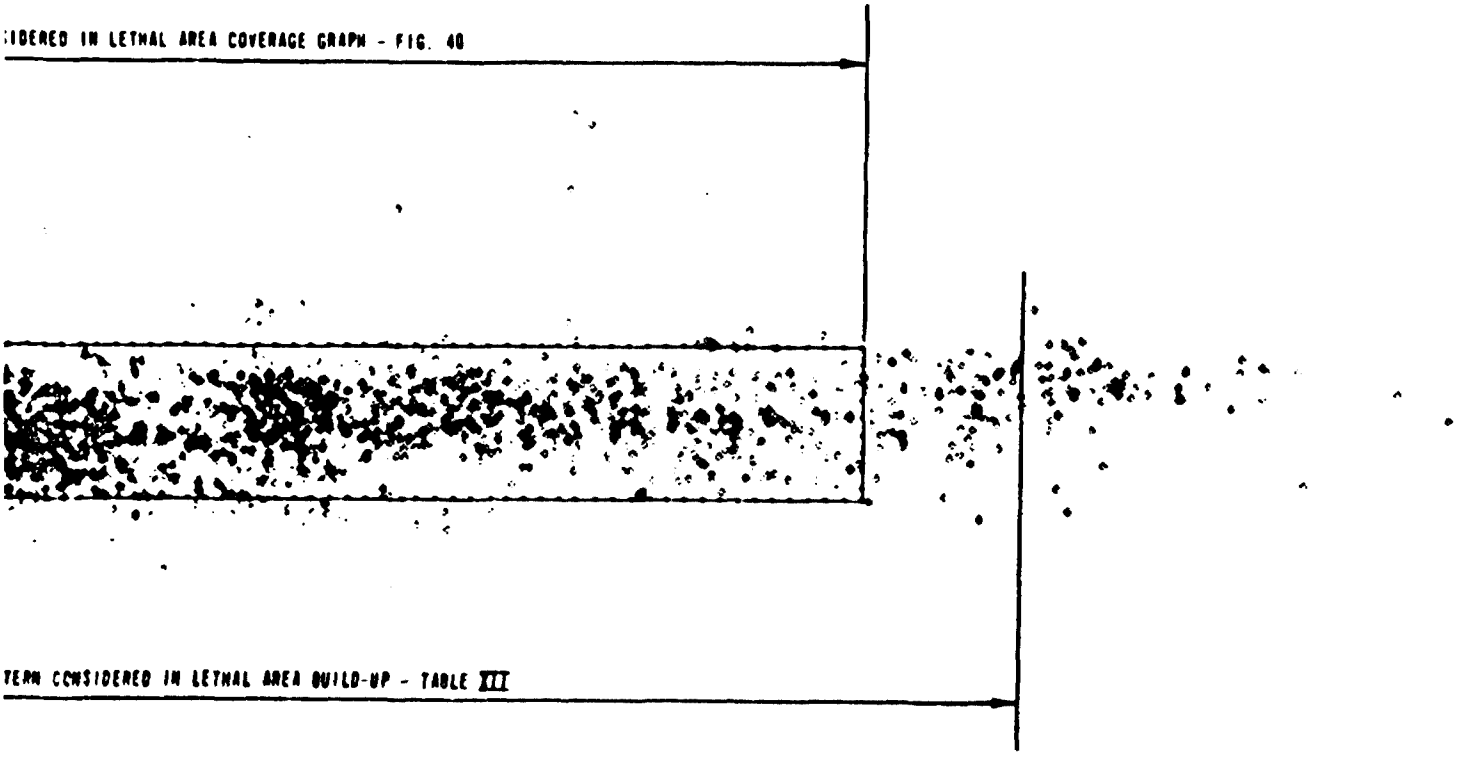


Figure 38. Effective Impact Pattern Area and Overkill Area vs Assumed Bomb Effective Radii, Mission 18, Pass 2.



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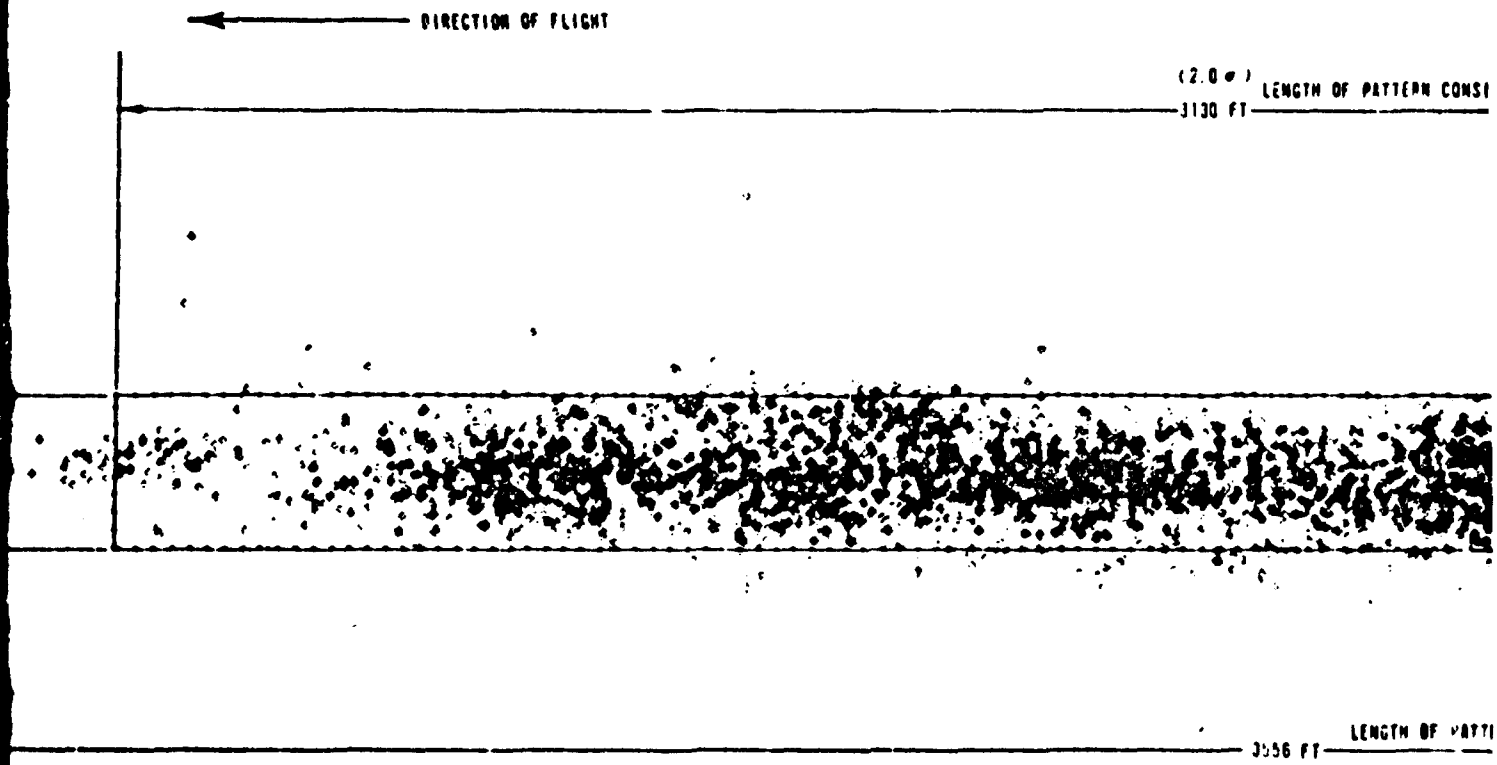
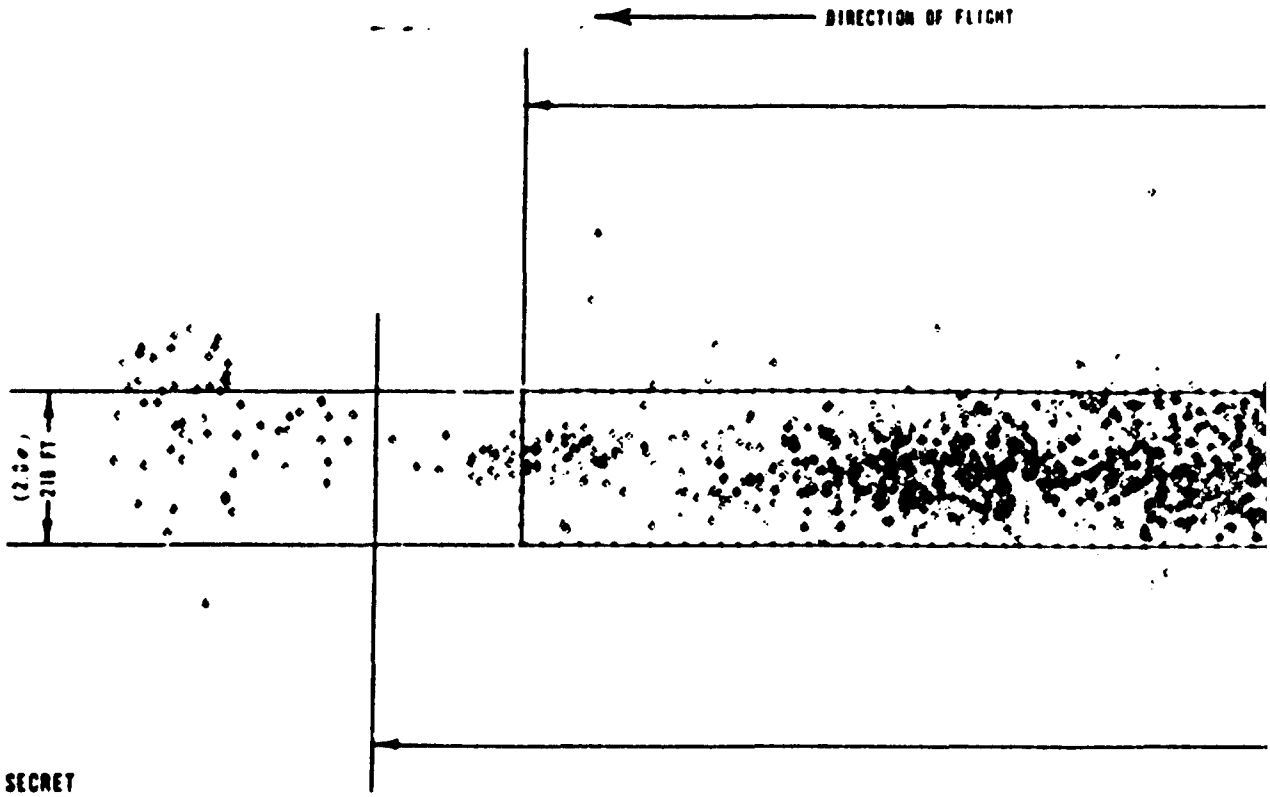


Figure 59. Impact Pattern Plot, Mis.

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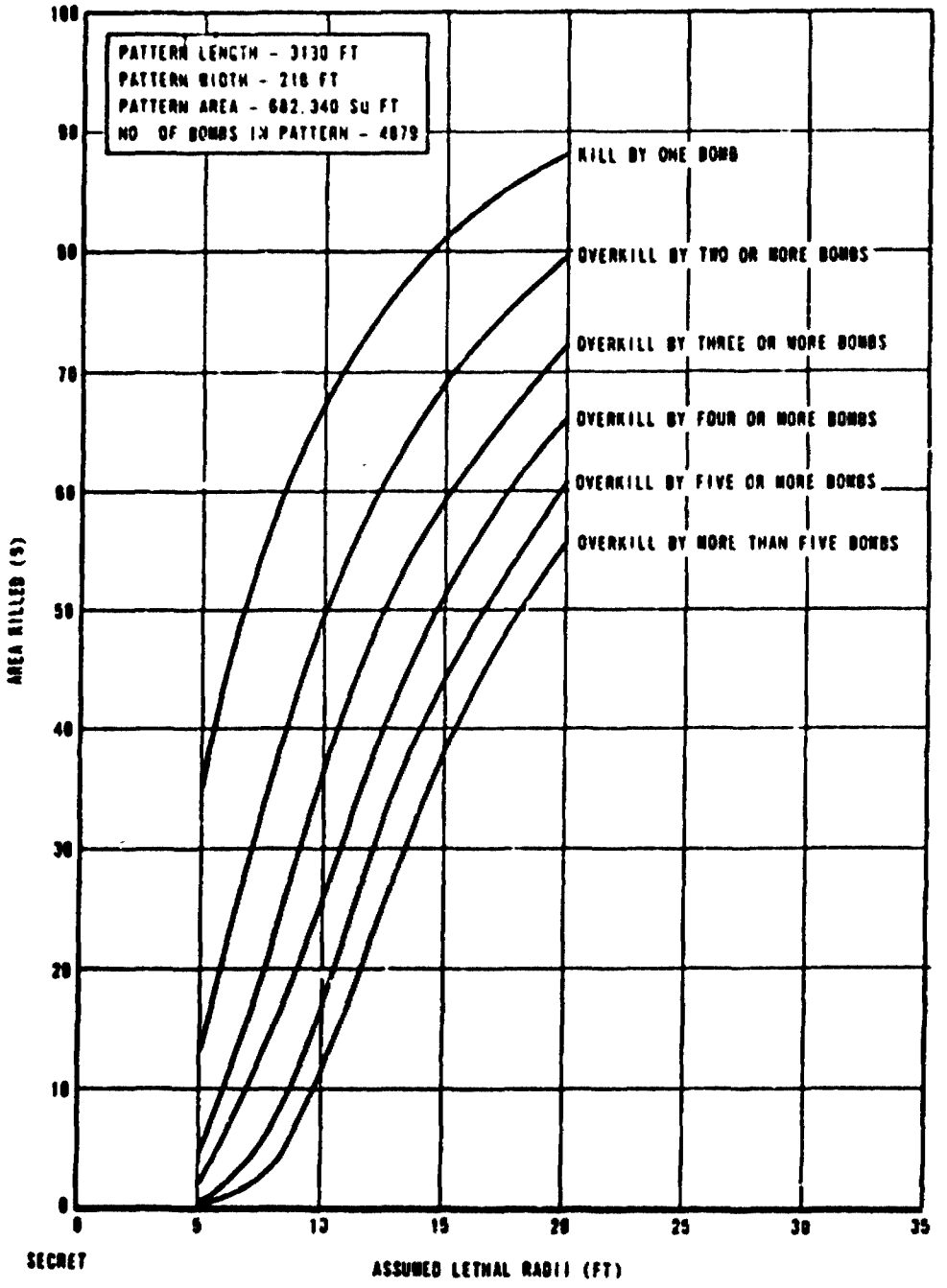
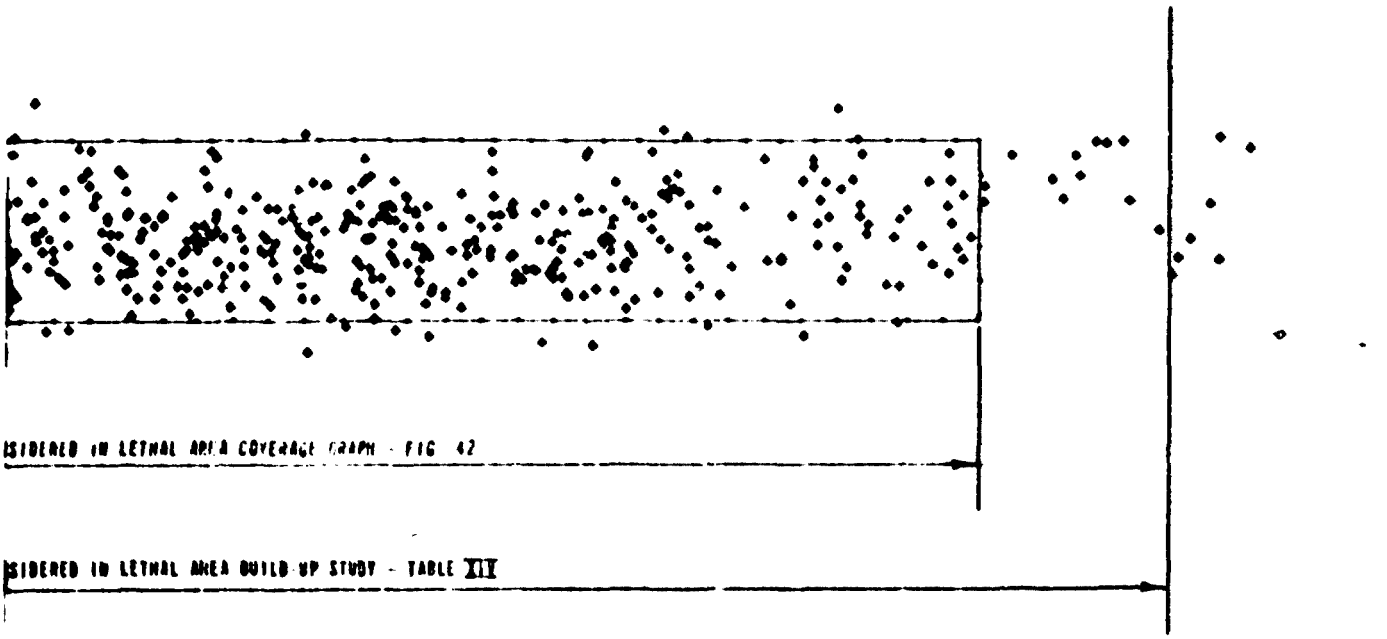


Figure 40 Effective Impact Pattern Area and Overkill Area vs Assumed Bomb Effective Radii, Mission 19.

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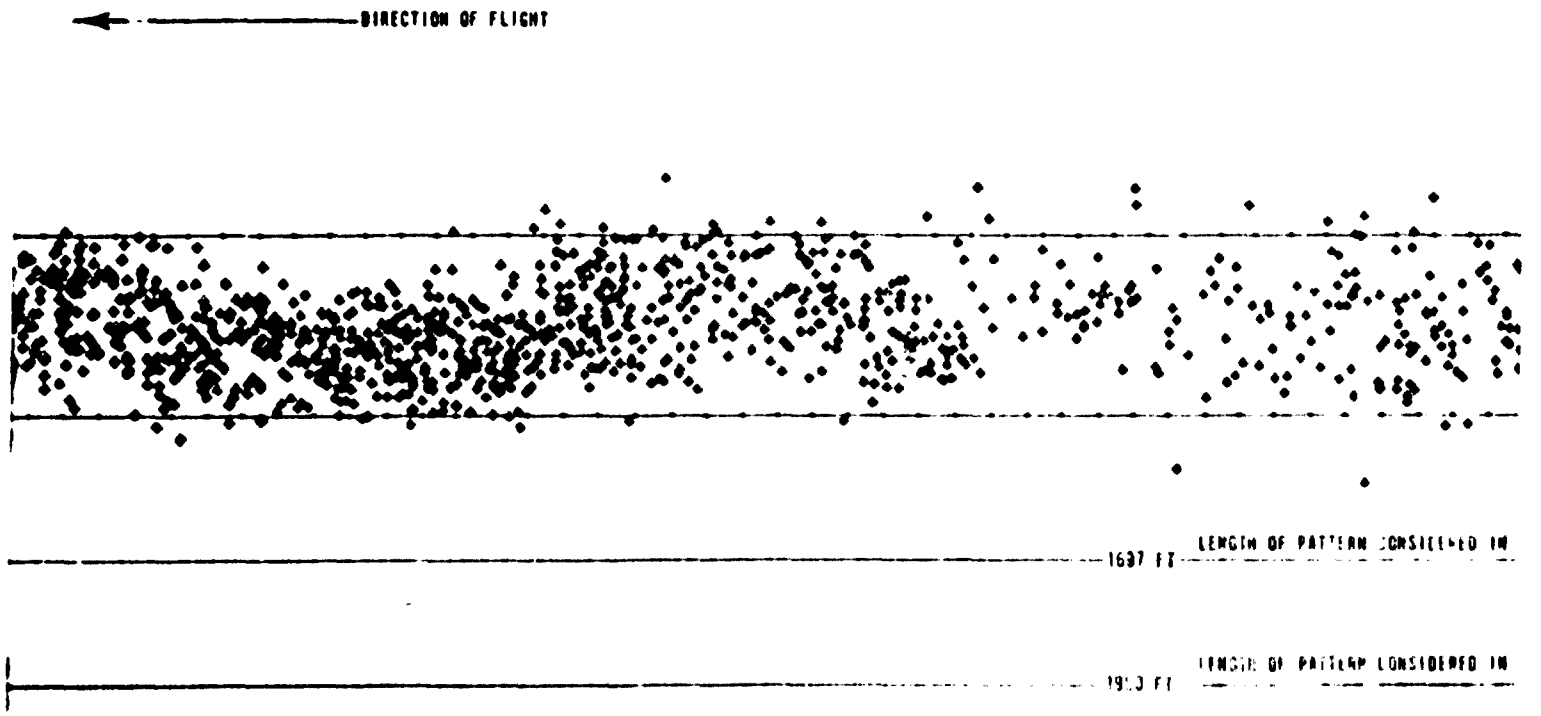
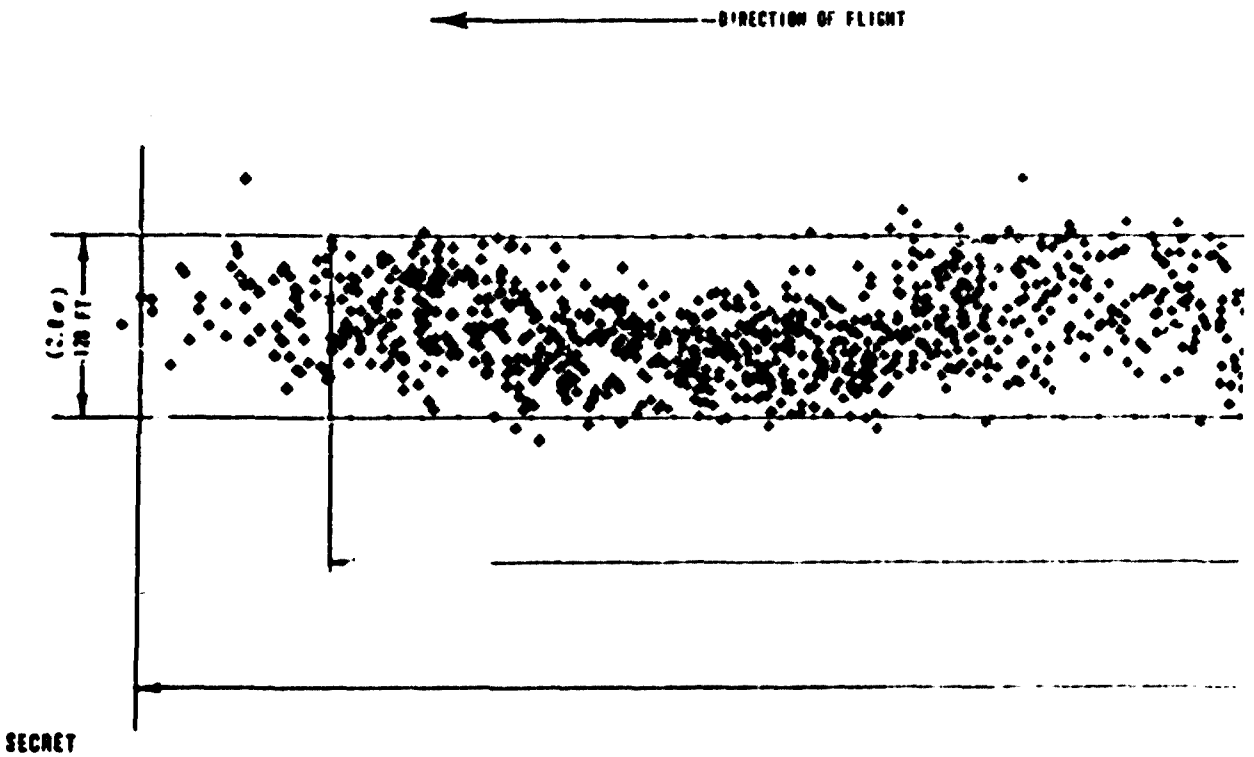


Figure 41. Impact Pattern Plot. [illegible]

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Figure

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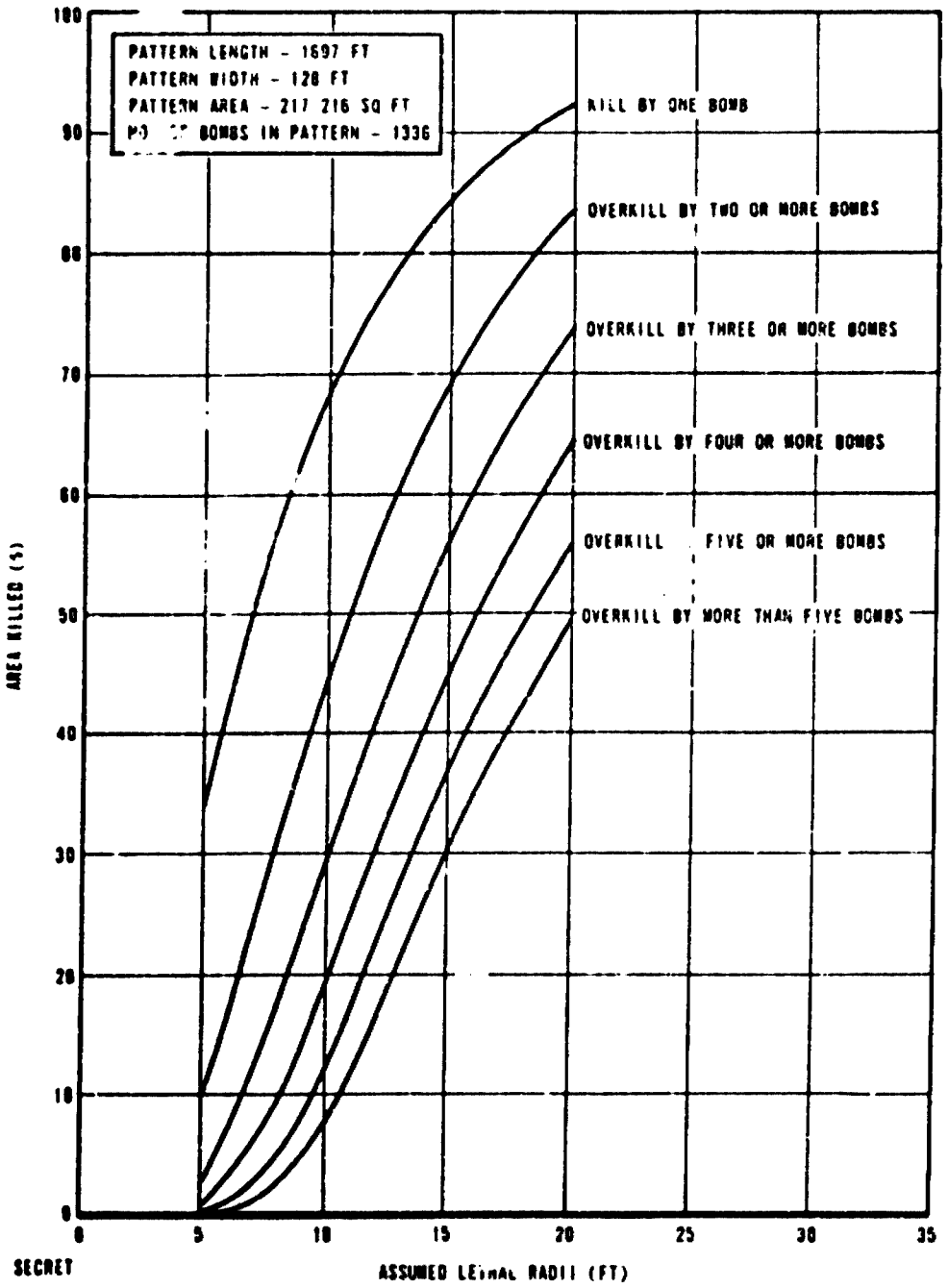


Figure 42. Effective Impact Pattern Area and Overkill Area vs Assumed Bomb Effective Radii, Mission 20, Pass 2.

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APPENDIX I

DESCRIPTIONS OF THE MODIFICATIONS INCORPORATED IN CARTON DESIGNS DURING TESTING

Previous pages were blank, therefore not filmed.

TABLE I-1. CARTON CONFIGURATION DATA.

Carton Configuration No.	Carton Sides		Timer No.			LD's per Carton			Carton Modifications										Wind Tab		HE Bomb
	Smooth	Ribbed	1	2	3	0	25	7+	1	2	3	4	5	6	7	8	9	10	Old	New	
1	x		x				x		x										x		
2	x			x			x		x										x		
3	x			x			x			x									x		
4	x			x			x				x								x		
5	x			x		x						x							x		
6	x			x		x							x						x		
7	x			x		x								x					x		
8	x			x				x							x				x		
9	x			x				x								x			x		
10		x			x			x									x			x	
11		x			x												x			x	x
12		x			x													x		x	x

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CARTON MODIFICATION NO.

1. No Modification: Cardboard tubes to separate the vertically stacked bombs.

2. Dowel and Spring Modification (Fig. I-1): Two dowel designs were used. The first design consisted of a solid dowel 7 in. long and 1 in. in diameter separated from a 2 1/2-in. by 1-in. diameter dowel by a spring having approximately 20 lb tension. Two of this type were positioned vertically at the rear of the carton. The second design consisted of a dowel 10 in. long and 1 in. in diameter with a 1 1/2-in. long, 1/4-in. diameter extension at each end. A spring was fitted over the extensions. Two of these were then positioned on the carton bottom parallel to the front and back.

3. Steel Cable Modification (Fig. I-2): A single 6-ft piece of steel cable, rated at approximately 800-lb pull, was looped through two holes 1 in. apart in the center of the carton top and clipped (swedged) together. The remaining length of cable was routed down the rear and looped through two holes, 1 in. apart, in the rear center of the carton bottom.

4. Dowel and Spring Modification (Fig. I-3): The modification was essentially the same as described in No. 2 above. However, the dowel and spring combination was encased in an aluminum tube and restrained in the tube by removable cotter pins. This arrangement reduced considerably the work required for installation in the carton.

5. Steel Cable (Fig. I-4): This modification consisted of a four-cable bridle arrangement with each cable attached to a corner of the carton top and a single cable attached to the apex of the bridle with its remaining end attached to the center rear of the carton bottom. The cable in the bridle was rated at 860 lb; the cable in the long connector was rated at 1120 lb.

6. Steel Cable (Fig. I-5): This modification was similar to the one described in No. 5 above. However, a metal sleeve (thimble) was incorporated in the loop of the single connector cable. The connector cable was looped around the thimble which had a grooved track, and swaged in place. The double connecting loop of the bridle apex was looped through the thimble.

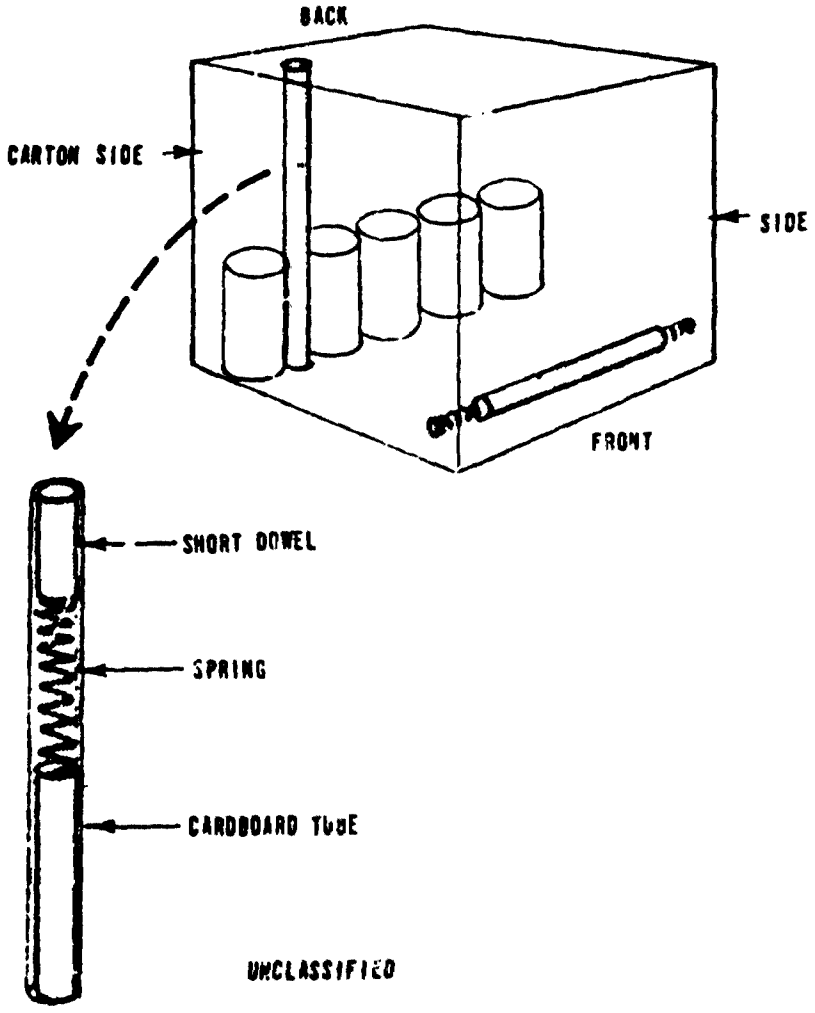


Figure I-1. Dowel and Spring Modification No. 2.

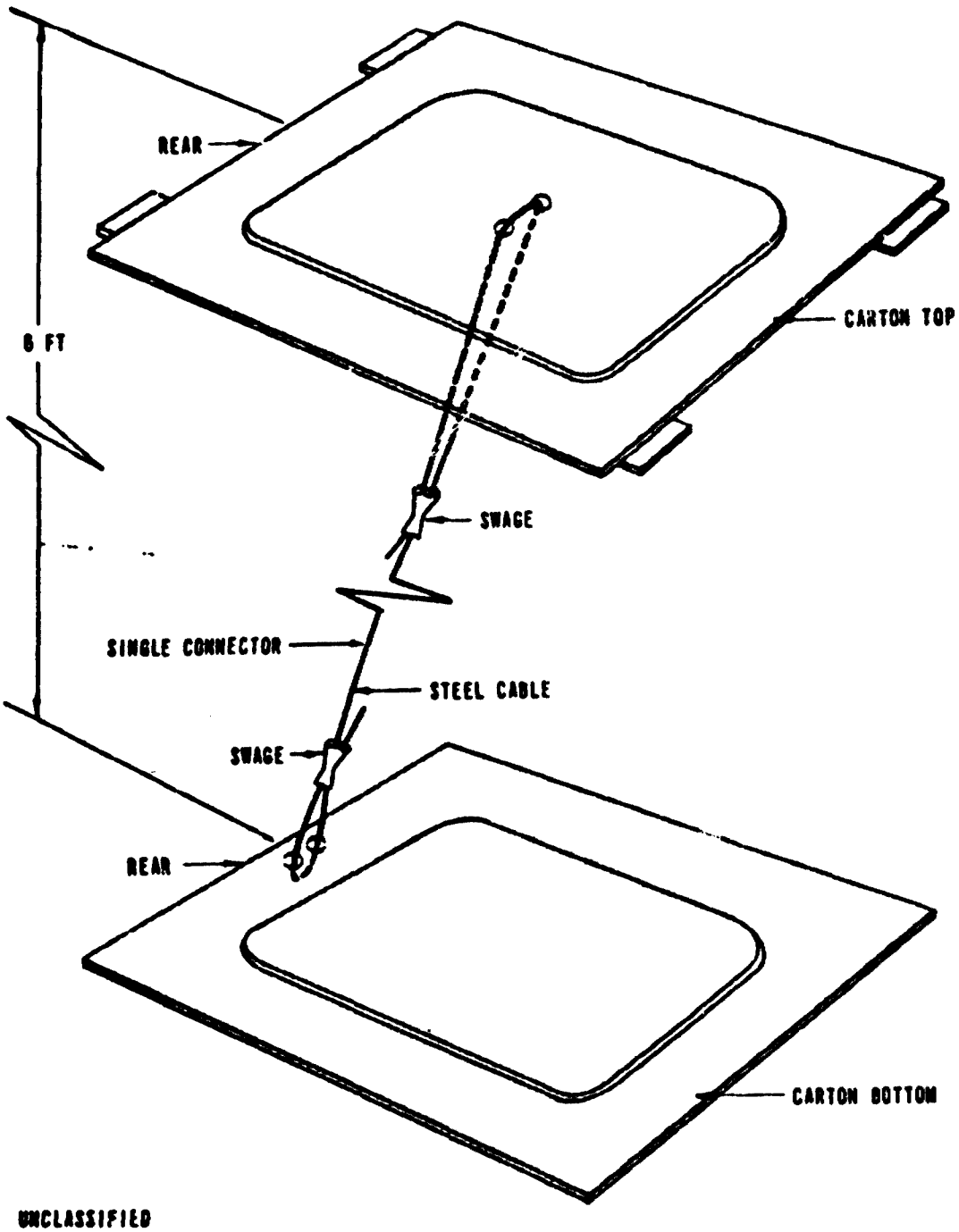


Figure I-2. Modification No. 3.

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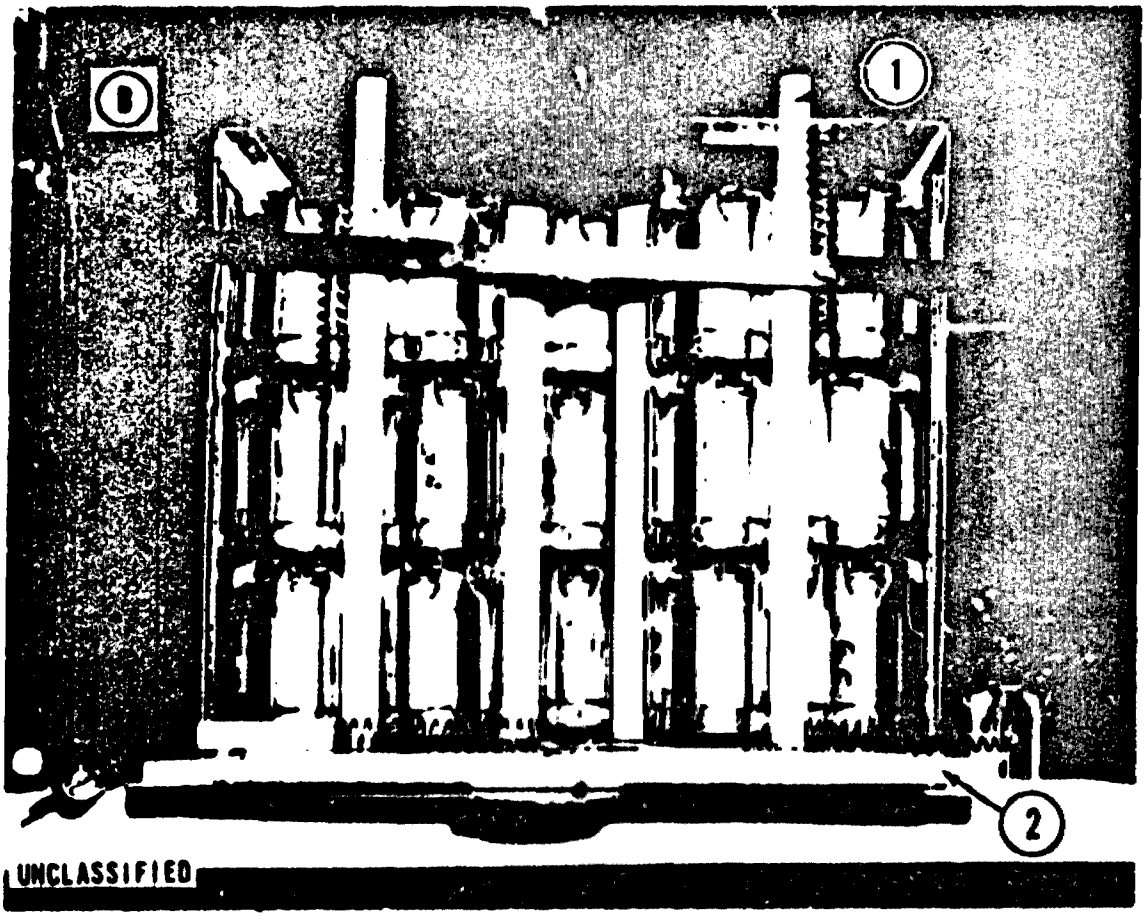


Figure I-3. Dowel and Spring Modification No. 4. (1) Vertical Dowel, (2) Horizontal Dowel. (Lower picture shows installation.)

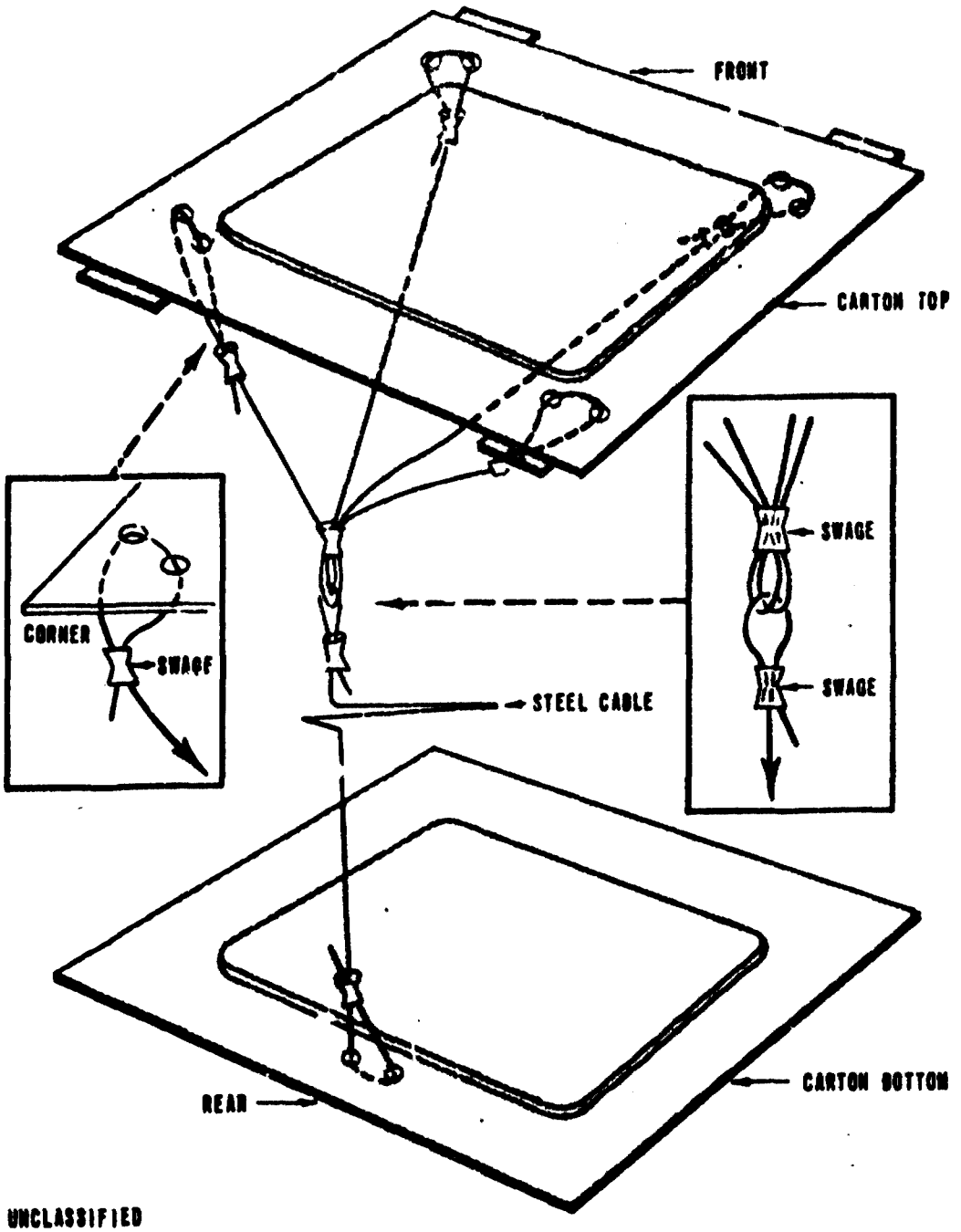


Figure I-4. Modification No. 5.

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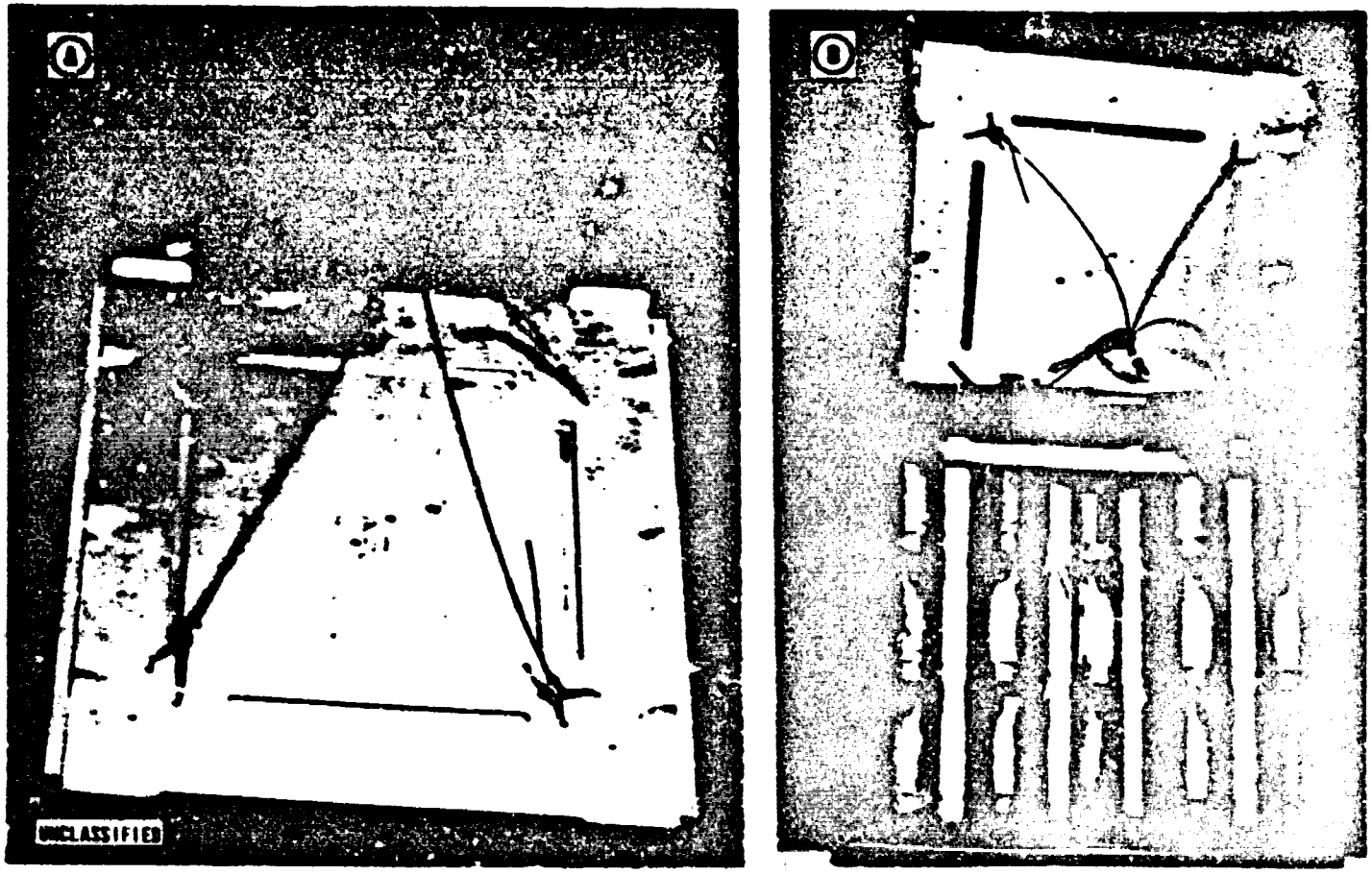


Figure I-5. Modification No. 6. Steel Cable Shown Connected to the (A) Top and (B) Bottom of the Carton.

7. Steel Cable (Fig. I-6): This modification, fabricated by the manufacturer, did not conform to the design recommended by PGOW to AFATL (Fig. I-7). In its original configuration, the modification was constructed by routing two cables through four holes in the carton top, slipping the two short and two long ends together to form a bridle and attaching the remaining long ends to the carton bottom. This configuration was modified prior to flight by attaching clips (swaged) to [illegible]le which was routed over the carton top at each of the holes in the top.

8. Nylon Bridle (Fig. I-8): This design employed a nylon bridle arrangement to the carton top and a direct connection to the carton bottom. The separate ends of the nylon were attached to the carton top and bottom by a ring and pin arrangement. The complete harness was tested to 2400 lb by the contractor. The nylon itself was rated at 1500-lb test.

9. Nylon Bridle: The same basic design as No. 8 above was used except that: (a) the nylon was rated to 3000-lb test, (b) the straps were looped directly to the pins, eliminating the ring, and (c) the bridle apex was formed using double loops.

10. Stiffened Top (Fig. I-9): Identical nylon bridle as No. 9 above was used. A 1/8-in. thick aluminum plate was attached to the underside of the carton top. The front of the plate extended about 1/4-in. from the front and the rear. The sides of the plate fit within the confines of the four doublers.

TIMERS

Timer No. 1 (Fig. I-10) was the timer originally utilized in APGC Project 2502W2. It consists of a standard T-5 timing mechanism and dial, an arming lever, an activating arm connected to a torsion spring, and spring-wound threaded shaft and nut combination which holds the ends of the retaining band in place. The retaining band is prevented from slipping by two holes in its ends which fit over two roll pins adjacent to the threaded shaft.

To operate the timer, the arming lever, which is normally flush with the face of the timer, is rotated 90 deg. As the carton is lifted into the cell of the dispenser the arming lever strikes the edge of the cell wall and rotates downward another 90 deg. This 180-deg rotation releases the activating arm which then contacts the cell wall. When the carton is released from the dispenser, the activating arm springs out starting the timer mechanism. When the zero position on the dial is reached, the timing mechanism activates a spring which rotates the threaded shaft forcing the nut of the shaft. By means of a

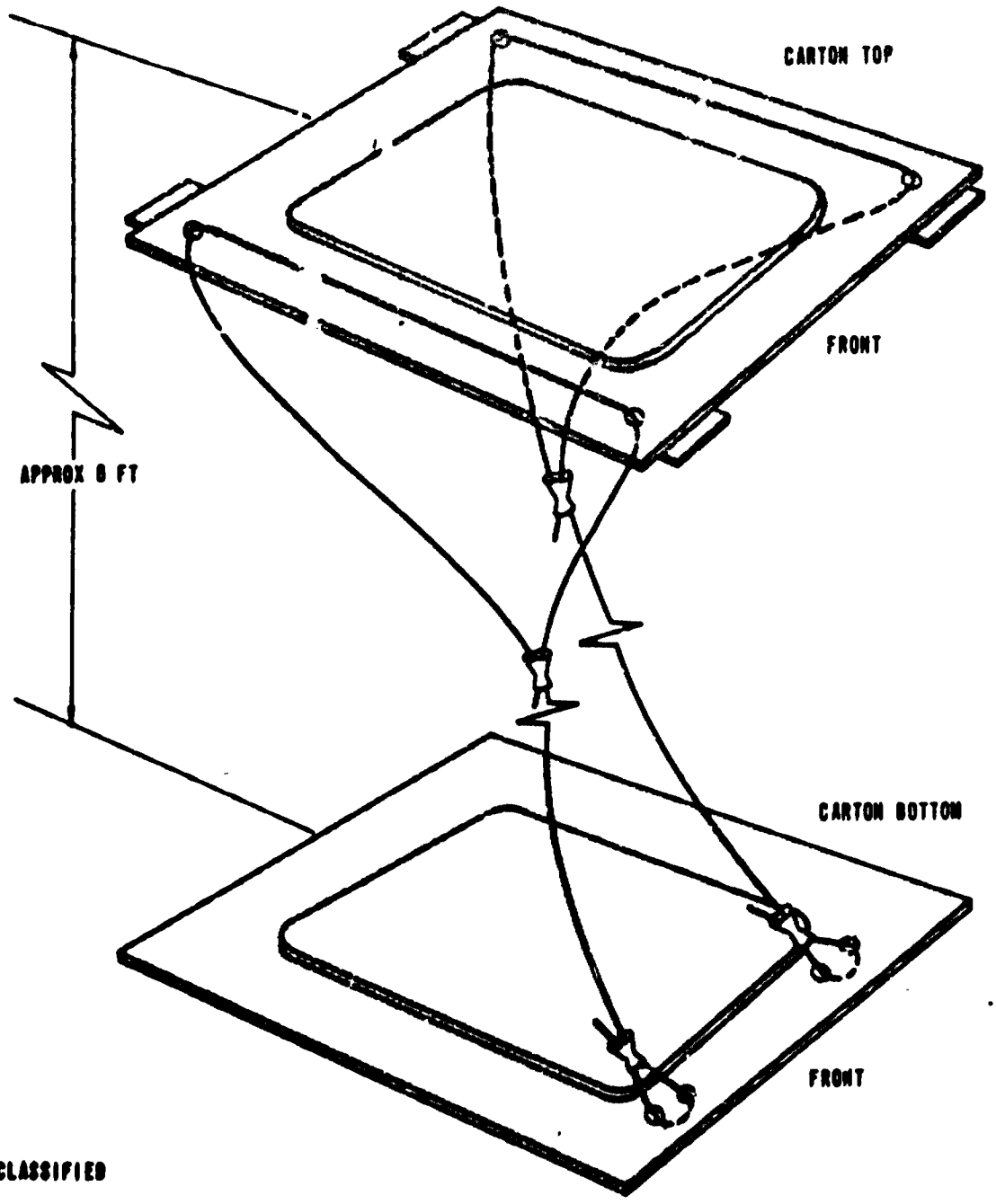
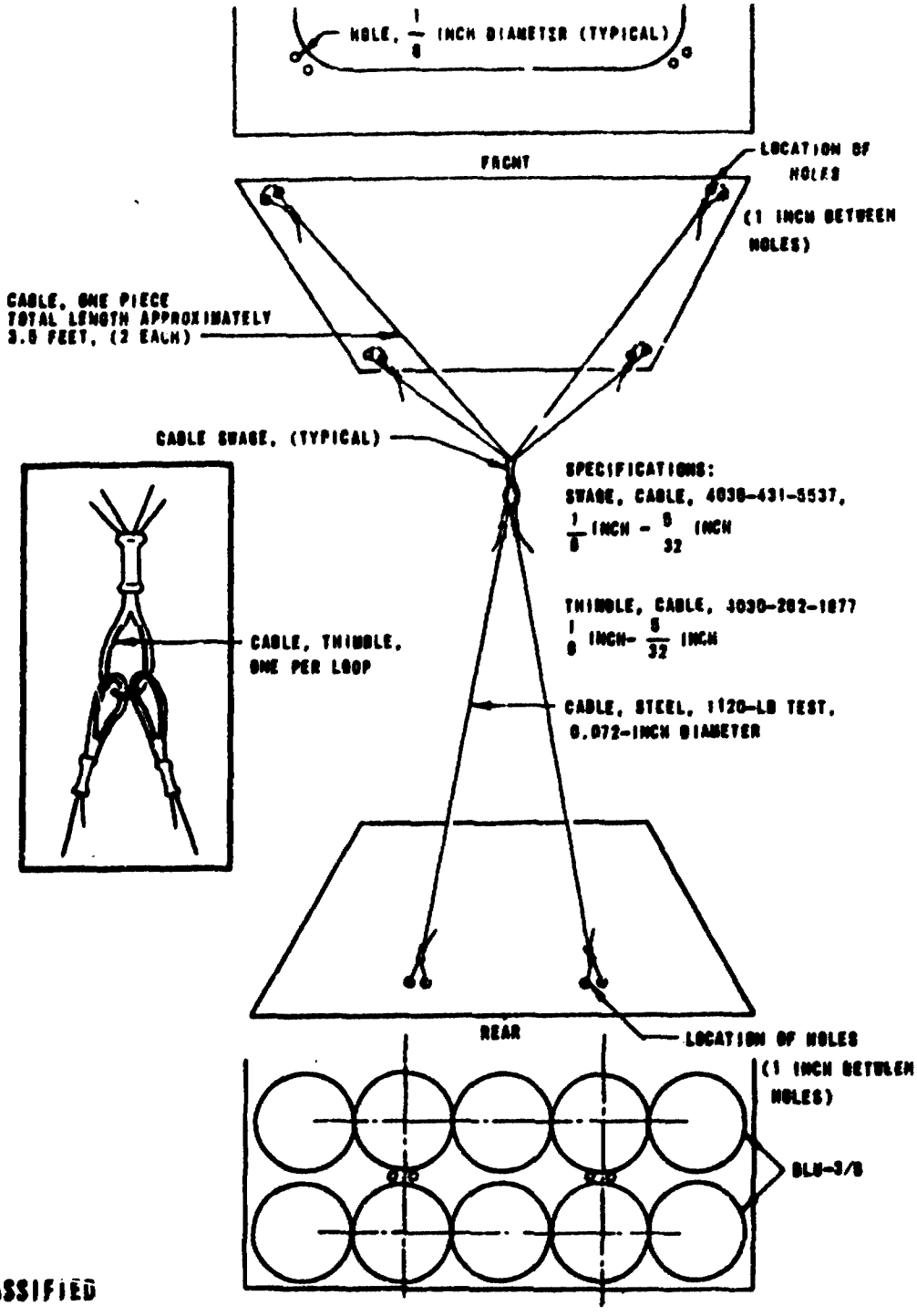


Figure I-6. Modification No. 7. Steel Cable Arrangement.



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Figure I-7. Steel Cable Modifications Recommended by APGC to AFATL (Not Fabricated).

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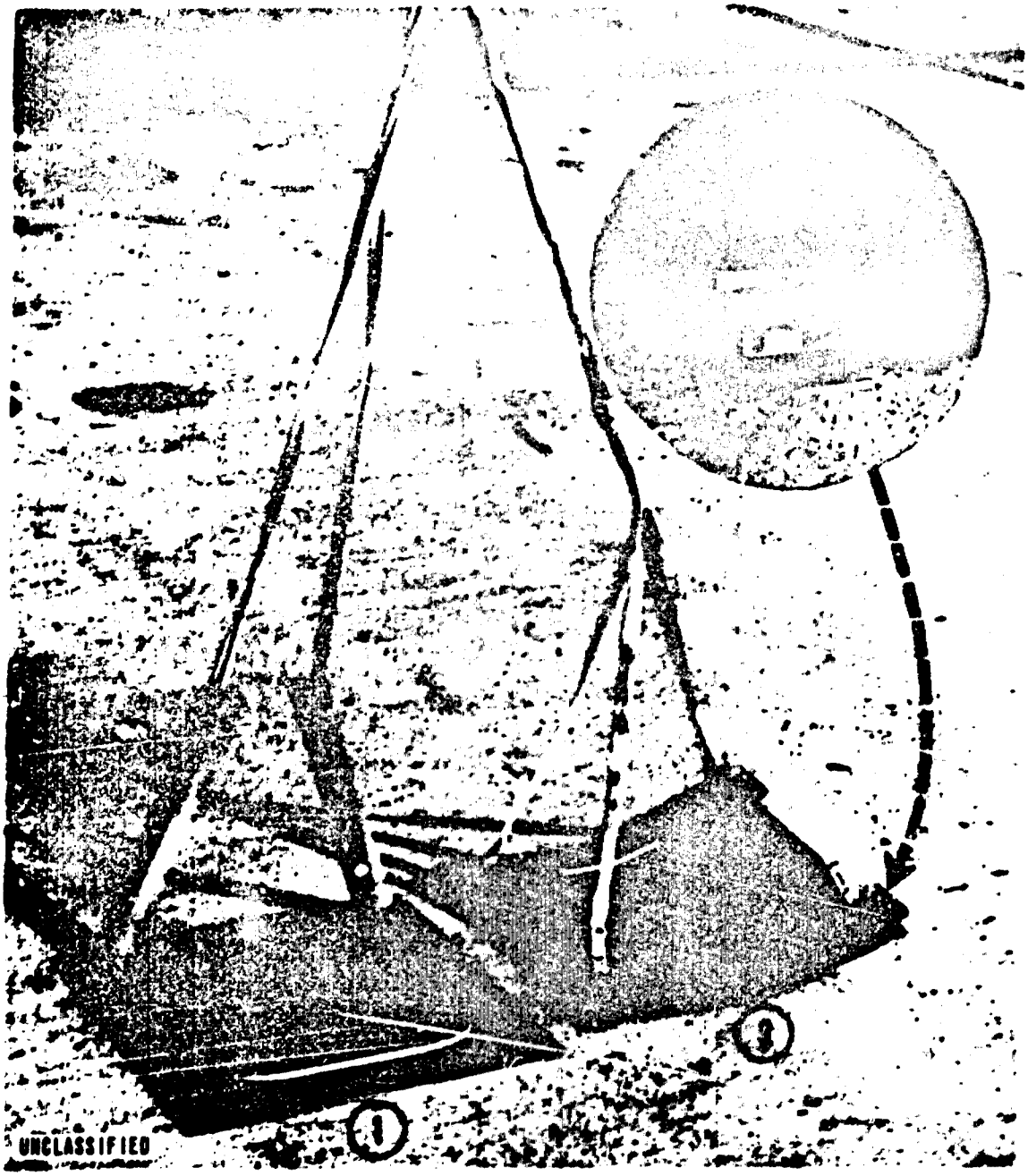


Figure I-8. Modification No. 8 Showing Doubler, Pin, and Ring Arrangement. (1) Bottom of Carton, (2) Top of Carton Bent During a Mission.

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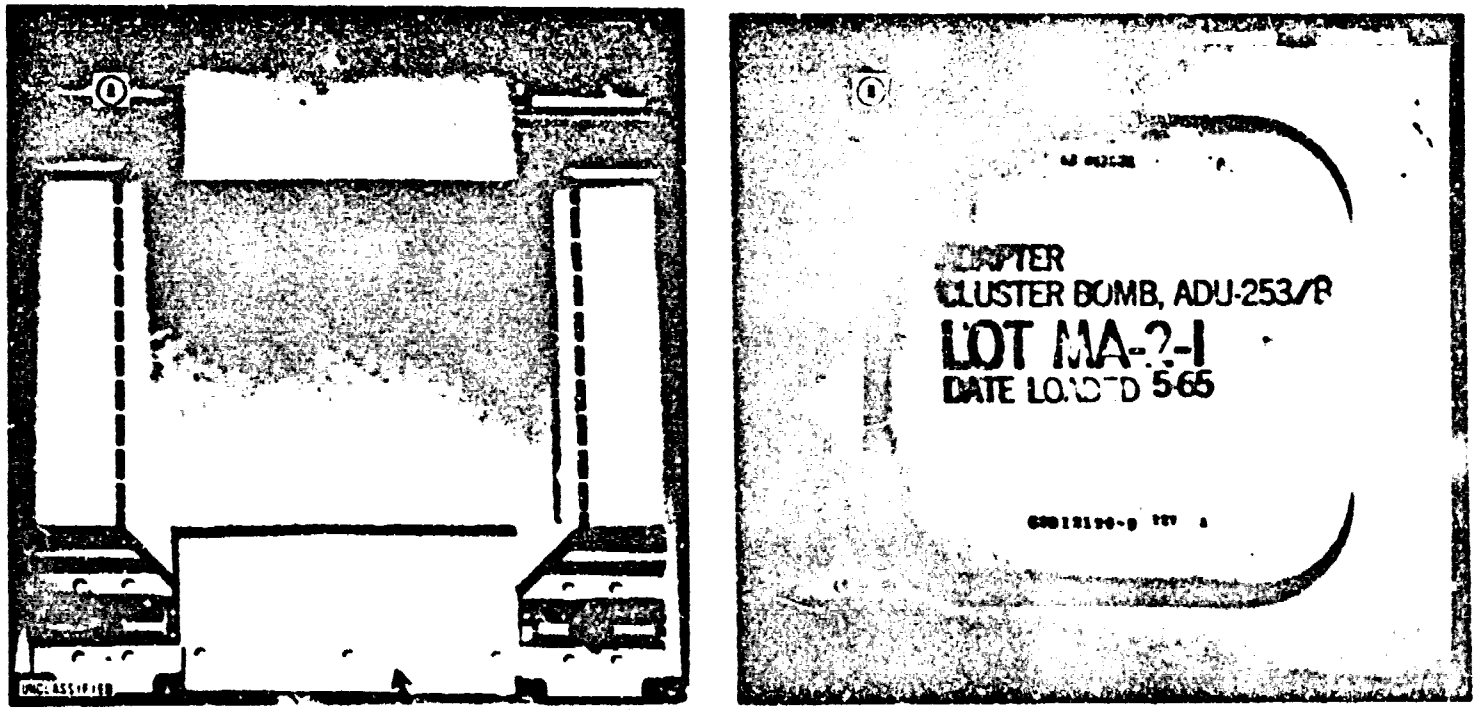


Figure I-9. Modification No. 10. (A) Aluminum Plate on Underside of the Top, (B) Overside of the Top. Arrows Point Cut Where Plate Extends Over the Top.

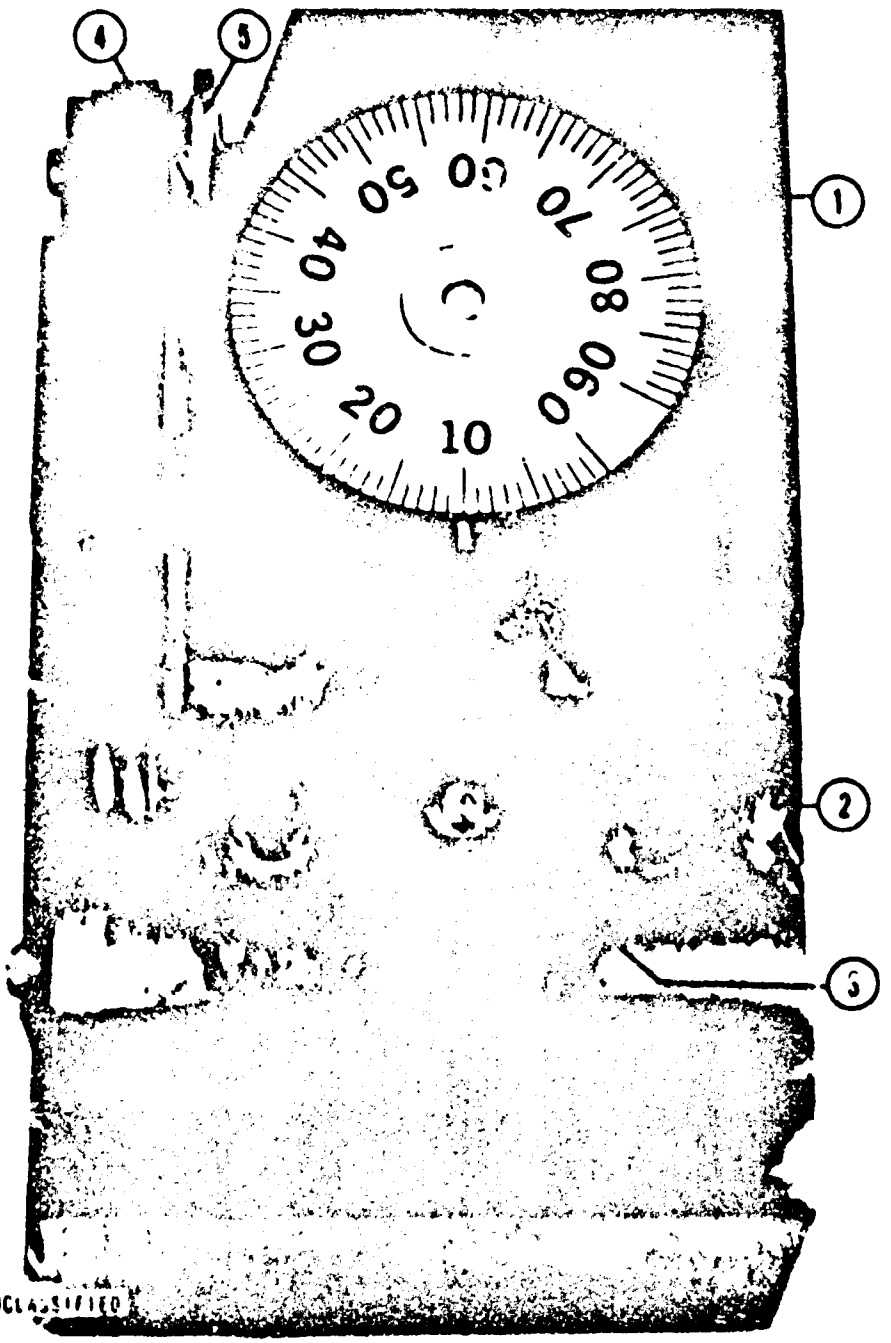


Figure I-10. Timer No. 1. (1) T-5 Timing Dial, (2) Roll Pin, (3) Nut, (4) Arming Lever, and (5) Activating Arm.

slit in its edges, in which the ends of the retaining band fit, the nut carries the band ends off the roll pins permitting the band to separate. The carton sides then fall away.

Timer No. 2 (Fig. I-11) incorporated essentially the same operating features as Timer No. 1 with the following exceptions: (a) the activating arm was smaller and required less spring tension, (b) instead of the threaded shaft and nut combination, two arms with hooked ends were used to hold the bands. The arms were held in the locked position by a cam on the dial of the timing mechanism. When the zero position was reached, the latch arms were free to pivot and release the ends of the retaining band. This was done by the force of the band on the latches.

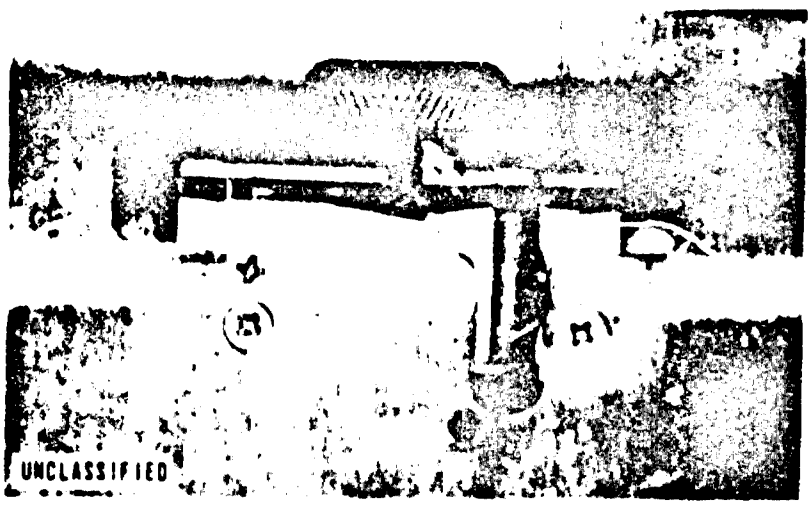


Figure I-11. Timer No. 2.

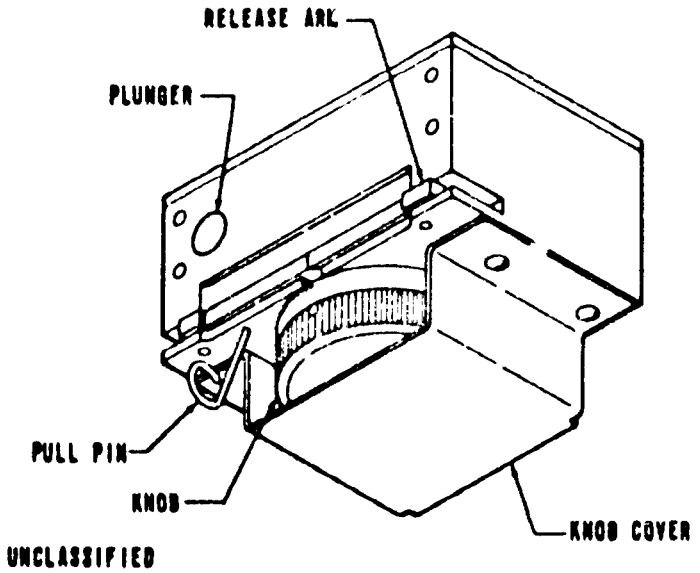


Figure I-12. Timer No. 3. Described in Section II.

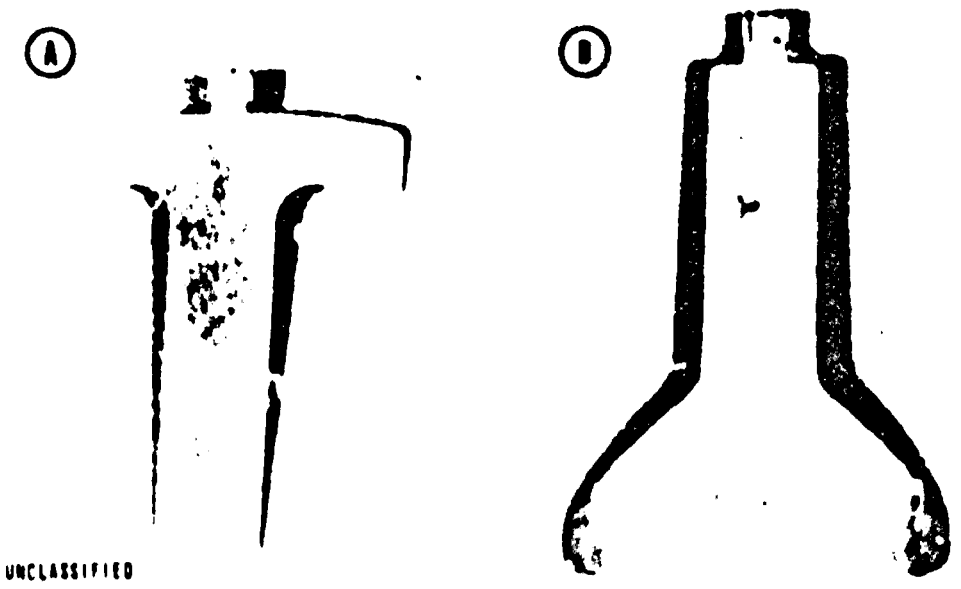


Figure I-13. Wind Tabs. (A) Old Type, (B) New Type.

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APPENDIX II

COMPARISON OF OBSERVED AND COMPUTED DATA

This appendix contains the ballistic results of the test as prepared by the Ballistics Division of the Air Force Armament Laboratory, RTD.

Due to the nature of the test missions (i.e., extremely short flight durations for the cartons and bombs), only limited cinetheodolite tracking was available for ballistic time-space-position analysis.

BEHAVIOR OF THE BLU-3/B BOMB

As noted in the description section, BLU-3/B bombs are loaded into the AIU-253/B carton in the closed configuration. Therefore, when the bomb emerges from the carton into the airstream, it must orient itself so that the airstream gets underneath the free end of the wind tab, flipping the tab backward and thereby unlocking the vane-keeper strap. This allows the spring-loaded vanes to snap backward to their open position. This will probably occur with the vanes pointed into the airstream [illegible]e, in the opened configuration, they point in the same direction as did the free end of the wind tab. If so, the bomb must flip over to get the nose pointed in the direction of flight. It is certain that there is a wide variation in the times at which the wind tabs are stripped off the 74 bombs in a carton. This variation is one of the important factors in the dispersion of the bombs.

The opening of the vanes allows the arming sequence of the bomb to start.

BOMB-BAY SHELTERING OF CARTONS

Since the cartons within a cell depend on gravity (i.e., no ejection force) to cause them to emerge from the cell, there is a significant period of time between the retraction of the electromagnetic release mechanisms in a cell and the emergency of the three cartons from the cell, and is different for each of the three cartons.

The release mechanisms are approximately 2 in. above the bottom of the cell and each carton is approximately 15.10 in. high. Therefore, considering vacuum conditions only, it would take the following times for the cartons to [illegible]r a cell after the withdrawal of the release mechanisms:

Position of Carton in Cell	Drop for Carton to Clear Dispenser (ft)	Time for Carton to Clear Dispenser (sec)
Bottom	1.26	0.28
Middle	2.36	0.38
Top	3.46	0.46

In both the B-47 and B-52 aircraft, the bottom of the dispenser is a few inches above the bottom of the bomb bay. Also the B-47 aircraft has a spoiler immediately in front of the bomb bay. In addition, there is probably some airstream pressure against the bottoms of the cartons as well as a certain amount of friction between the cartons and the walls of the cells.

All of the above adds up to a "sheltering effect" for the cartons after "pickle" or release by the aircraft. During this sheltered period, the carton effectively rides along with the aircraft and is not whipped backward by the airstream. Photographs indicate that a carton may float along with the aircraft until it has dropped below the bottom of the bomb-bay doors. The actual duration of this sheltering is a variable from release to release. In reducing the data for this test, a sheltering time for each carton was derived by extrapolating backward along the trajectory from the first data points of the observed trajectory.

REDUCTION OF FIELD DATA

In order to analyze the ballistic performance of the ADU-253/B munition carton from release to functioning (i.e., carton opening), theoretical trajectories were computed on the IBM 7094 computer using the following information:

1. Release velocities as obtained from the reduced theodolite data for the aircraft at "release time." The assumption was made that the release time on the theodolite film, as obtained from the aircraft release tone, was the time when the release mechanisms were retracted at the bottom of the cell.

2. Release positions obtained from aircraft phototheodolite data for the aircraft at release time and corrected as follows:

a. Since film measurements were made on the nose of the aircraft, positions were corrected to the location of the dispenser on the aircraft.

b. The carton was sheltered (as discussed in section titled Bomb-Bay Sheltering of Carton, above) and during this time it traveled with

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the aircraft. Therefore, the release positions were corrected by an amount equal to:

Release Velocity (f/s) X Time of Sheltering (sec)

3. Gravity release, i.e., zero ejection velocity.

4. A carton weight of 136 lb; carton dimensions of 14 3/8 in. x 14 3/8 in. x 13 5/32 in.

5. A drag coefficient (K_D vs Mach number) previously derived for a tumbling object.

6. Observed winds, temperatures, and densities aloft.

7. The particle equations of motion (see Table II-1, Part 4).

In order to analyze the ballistic performance of the BLU-3/B bomb, theoretical trajectories were computed on the IBM 7094 computer using the following information:

1. Initial positions and velocities of the carton at opening as determined from reduced phototheodolite data. (It was assumed that initial BLU-3/B positions and velocities were identical to those of the carton at opening.)

2. Bomb weight of 1.74 lb; bomb diameter of 2.70 in.

3. A drag coefficient equal to 8.451 times the Gavre drag coefficient. (It was assumed that the vanes opened immediately upon release.)

4. The MPI (mean point of impact) of the bombs from a carton.

5. Observed winds, temperatures and densities aloft.

6. Heights of targets as follows:

WSMR Range - 3900 ft above MSL (mean sea level).

APGC Range 52 - 104 ft MSL.

APGC Ranges 70 and 71 - 128 ft MSL

7. The particle equations of motion (see Table II-1, Part 4).

The production model ADU-253/B munition carton, which is assembled with the nylon webbing harness, is the standard configuration. Therefore, complete data (for both carton and bombs) are given only for the cartons, either original or production models, which incorporated the nylon webbing harness. The only exception to this is that all of the data obtained for the cartons with long trajectories is given, since there were no changes made to the exterior of the carton which would result in major changes in the ballistics of the carton.

The ballistic trajectory of the complete munition is divided into two parts: the trajectory of the intact ADU-253/B carton and the trajectories of the BLU-3/B bombs from that carton. The trajectory of the carton begins with its release from the aircraft and ends with the functioning of the carton. The trajectories of the bombs begin with the functioning of the carton and end with the impact of the bombs on the target area (represented by the mean point of impact of the bomb pattern on the target area).

For this report, the functioning time of the carton means the time that the BLU-3/B bombs began to disperse from the carton, and does not mean the time when the timer functioned or when the carton started to open.

No times of flight, no striking velocities, and no striking angles for BLU-3/B bombs were obtained for any releases made during this test.

THE BALLISTIC RESULTS

The ballistic results presented in Table II-1 give the results of the comparison of the observed and computed trajectory data for the following:

Part 1. The data are for cartons which had long trajectories. These cartons were all original-type cartons and were tested at WSMR.

Part 2. The data are for the cartons with nylon webbing harness which were tested at AFGC. The data are for the carton from release to functioning.

Part 3. The data are for the same releases given in Part 2, above, but they represent the total trajectory from release of the carton to impact (MPI) of the BLU-3/B bombs on the target area.

The data presented in Table II-1 is identified by a mission number and a pass/carton number. A pass/carton number of 4-1 means that this munition was the first carton (i.e., the bottom carton loaded in a cell) released on Pass No. 4; 4-2 means that it was the second (or middle) carton released from the cell; while 4-3 means that it was the third (or top) carton released from the cell.

The data given in Part 1, Table II-1, are for cartons (released at WSMR during the earlier part of the test) which had much longer trajectories than did the cartons released later in the test. Some of the cartons fell intact, some functioned along the trajectory, while others moved out of the field of view when the cinetheodolites happened to track more than one carton. The observed termination altitude above target represents the last point at which reliable data were obtained. It is noted that in only one instance, Pass 2 on Mission 3, could the cinetheodolites track two cartons for any length of time.

The longer trajectories were valuable in helping to establish the ballistics of the carton. The longer trajectories were for the original carton, which should be ballistically similar to the modified, or standard, carton. On all of the releases of the standard carton, the timers were set at too short a time (3 sec) to provide really usable information on the ballistics of the carton.

The data given in Part 1, Table II-1, consist of the deviations (ΔX, ΔZ, and ΔT) between the observed and the computed data. Since the carton is an unstabilized, tumbling object, the ΔX's (observed minus computed range) and the ΔT's (observed minus computed time) for these longer trajectories are considered to be quite reasonable. The magnitude of some of the ΔZ's (observed minus computed deflection) seem to be too large to be real, but no error could be found in the data.

It is noted that for the longer trajectories, data were obtained for cartons released from each of the three positions in a cell (bottom, middle, and top) which helped in determining an average sheltering effect of 0.4, 0.6, and 0.8 sec, respectively, for cartons released from a cell (see above).

For an explanation of the observed time of flight and the sheltered time see the discussion concerning the data given in Part 2, Table II-1.

Part 2, Table II-1, gives the results of a comparison of observed and computed data (ΔX, ΔZ, and ΔT) for the trajectories of the cartons assembled with nylon webbing harness. All of the trajectories are relatively short (with the longest trajectory being 4.08 sec). The computed trajectories used the derived sheltered time and the observed functioning time.

Mission 15 was conducted with three cartons loaded in the cell. The data obtained are for the third (top) carton released from the cell. Mission 17 was conducted with only one carton in a cell. Mission 18 was conducted with three cartons in a cell (data given is for the bottom carton in the cell).

The observed time of flight presented in this table is the time from pickle of the cell by the bombardier to the time of functioning of the carton.

It, therefore, contains the sheltered time, or the time from pickle until the carton is free in the airstream. During this period of time the carton emerges from its cell and rides along with the aircraft. The average sheltered time for the first carton released from the cell is approximately 0.40 sec. Since the average observed time of flight for these cartons was 3.13 sec, the average time from sheltered release (when the carton emerges into the airstream) to functioning of the carton is approximately 2.73 sec.

The probable errors (PE's) and circular probable errors (CEP's) given in this part are considered to be reasonable for this type of munition.

The observed data for several of the cartons terminated before functioning occurred, with only a time of functioning being provided. These trajectories were compared at their last observed point, not at the time of functioning (see Remarks).

Part 3, Table II-1, gives the results of a comparison of observed and computed ranges (ΔX) and deflection (ΔZ) only for the trajectories of the complete munition from the pickle of the cell by the bombardier to the impact of the bombs (represented by the MPI) on the target area. These data are for the cartons assembled with the nylon webbing harness (the data for the carton from pickle to functioning is given in Part 2, Table II-1). No ΔT's can be given for the entire trajectories because no times of flight were obtained for the BLU-3/B bombs from carton functioning to impact. However, the computed (or theoretical) times of flight for the trajectories are given for information only. Since there are no observed times of flight to compare them with, there is no way to judge their accuracy.

In computing the theoretical trajectories for this part, the derived sheltered time and observed functioning time for the carton was used.

Table II-2 contains the drag coefficient (K_D vs Mach number) derived for the intact ADU-253/B carton containing BLU-3/B bombs and is identical with the K_D vs Mach number derived (from an earlier test) for a similar intact carton loaded with BDU-30/B bombs.

For the longer carton trajectories (see Part 1, Table II-1) the cartons moved through a range of Mach numbers from release at approximately M = 0.25. The longer trajectories were obtained at WSMR where the height of target is 3900 ft above MSL. For the carton releases at APGC (given in Part 2, Table II-1) where the height of target area is 128 ft above MSL, the cartons moved through a range of Mach numbers from release at approximately M = 0.65 to a value of M = 0.35 at functioning.

Table II-3 contains the drag coefficient (K_D vs Mach number) derived for the BLU-3/B bomb released from the ADU-253/B carton assembled with the nylon webbing harness. This drag coefficient is not the same as that derived for the BLU-3/B bomb dispensed by other methods (i.e., from the SUU-7/A or SUU-14/A dispensers).

The reason for this is the type of trajectory that was involved in deriving the drag coefficient.

First, the bombs when they emerge from the carton at functioning probably have a different (but unknown) velocity than did the carton just prior to functioning. This is the result of the jerk caused by the carton lid whipping backward in the airstream and transmitting it to the bottom of the carton through the nylon harness.

In addition, since the carton is tumbling during its flight, it may have almost any attitude at the time it functions. This means that the BLU-3/B bombs will have random attitudes at the time they emerge into the airstream and that the time when the individual wind tabs strip off the bombs, allowing the stabilizing vanes to pop out, will be variable and unpredictable. The ballistics of the BLU-3/B bomb in the closed configuration is entirely different from that of the bomb in the open configuration.

The drag coefficient derived for the bomb indicates that the bomb moves through a range of Mach numbers from approximately M = 0.35 at functioning (i.e., opening of vanes) to M = 0.12 at impact. The value at impact is theoretical only, since no observed data were obtained for the bomb.

TABLE II-1, PART 1. RESULTS OF THE COMPARISON OF OBSERVED AND COMPUTED DATA FOR THE ADU-253/B CARTONS WHICH HAD LONG TRAJECTORIES. (ALL RELEASES AT WSMR; HEIGHT OF TARGET IS 3900 FT MSL.)

Mission Number	Pass/ Carton	Aircraft Type	Release Altitude Above Target (ft)	Termination Altitude Above Target (ft)	Drop (ft)	Release Mach No.	Observed Time of Flight[1] (sec)	Sheltered Time[2] (sec)	Trajectory Arc Length (ft)	ΔX (ft)	ΔZ (ft)	ΔT (sec)	Remarks[3]
2	[illegible]	B-47	[illegible]	[illegible]	27[illegible]	[illegible]	5.25	5.75	21[illegible]	52	- 25	0.06	1
	3 - 2	B-47	3025	792	2255	.71	16.05	.70	5215	-15	- 97	.00	1
3	2 - 2	B-52	1[illegible]1	[illegible]	1[illegible]	.69	14.05	.70	[illegible]01	11	-124	.07	1
	2 - 3	B-52	1[illegible]1	[illegible]	2 -	.[illegible]	5.[illegible]5	.70	[illegible]	71	- [illegible]	- .07	1
	3 - 2	B-52	15[illegible]2	[illegible]	[illegible]	.[illegible]	13.17	.70	[illegible] 1	30	7	.40	1
	[illegible] - 2	B-52	122[illegible]	2	11[illegible]	.[illegible]	11.42	.40	35[illegible]	35	52	.43	1
5	[illegible] - 1	B-[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	10.11	.40	[illegible]	-2[illegible]	- [illegible]	.03	1
[illegible]	[illegible] - 1	B-52	1[illegible]	1[illegible]	11[illegible]	.[illegible]	10.[illegible]	.[illegible]	[illegible]	59	-10[illegible]	.10	1
							Average (n = [illegible])		[illegible]	32	- [illegible]	.1[illegible]	
							PE			2[illegible]	[illegible]1	.12	
							CEP (ft)			5[illegible]			
							CEP (mils)			1[illegible]			

[1] The observed time of flight is from release of a cell by the bombardier to carton functioning.
[2] The sheltered time is from release of the cell until the carton emerges into the airstream.
[3] See paragraph reference in part [illegible], Table II-1.

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TABLE II-1, PART 2. RESULTS OF THE COMPARISON OF OBSERVED AND COMPUTED DATA FOR THE ADU-253/B CARTON ASSEMBLED WITH NYLON WEBBING HARNESS FROM RELEASE TO FUNCTIONING. (ALL RELEASED FROM B-47 AIRCRAFT AT APGC; HEIGHT OF TARGET IS 128 FT ABOVE MSL.)

Mission Number	Pass Carton	Range	Release Altitude Above Target (ft)	Release Mach No.	Release Angle (deg)	Functioning Altitude Above Target (ft)	Obs.(?) Time of Flight[1] (sec)	Filtered(?) Time[2] (sec)	Trajectory Arc Length(?) (ft)	ΔX (ft)	ΔZ (ft)	ΔT (sec)	Remarks[3]
15	4 - 3	70	[illegible]	.65	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	- 2	[illegible]	1, 2
	5 - 3	70	[illegible]	[illegible]	1.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
17	1 - 1	71	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2	[illegible]	[illegible]	[illegible]
	2 - 1	71	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	3 - 1	71	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible] - 1	71	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	5 - 1	71	1351	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1
	[illegible] - 1	71	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	7 - 1	71	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	8 - 1	71	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1
	[illegible] - 1	71	[illegible]	[illegible]	[illegible]	12-1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.1	[illegible]
	10 - 1	71	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	11 - 1	71	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1
	12 - 1	71	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1
	[illegible] - 1	71	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1
	[illegible] - 1	71	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1[illegible]	1 - 1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	71	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

[1] The observed time of flight is [illegible]

[2] The filtered time [illegible]

[3] See [illegible] reference [illegible]

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TABLE II-I, PART A. RESULTS OF THE COMPARISON OF COMPUTED AND OBSERVED DATA FOR THE MK-82 CB CARTON LOADED WITH BLU-27/B BOMBS AND ASSEMBLED WITH NYLON WEBBING HARNESS (FROM RELEASE OF THE CARTON TO THE MPI OF THE BOMB PATTERN), (B-52 RELEASED FROM B-52 AIRCRAFT AT APGC; HEIGHT OF TARGET IS 123 FT ABOVE MSL.)

Mission Number	Item Carton	Release Altitude Above Target (ft)	Release Mach No.	Observed Functioning Time* (sec)	Trajectory Arc Length (ft)	ΔN (ft)	ΔC (ft)	Computed Time of Effect (sec)	Remarks
1	1 - 1	1	.8	9	2	-.7	11	1.1	
	1 - 2	1,1	.8	..	-1	-11	1.1	1..	
1	1 - 1	1..	.8	..	1			..	
	2 - 1	1..	.8	..	.1			1..	
	3 - 1	1..	.8	..		1	..	1..	
	4 - 1	1..	.8	..			-	1..	
	5 - 1	1.1	.8	..				1..	
	6 - 1	1..	.8	..	.1	1..		1.1	
	7 - 1	1..	.8	..		-11		1..	
	8 - 1	1.1	.8	..				1.1	
	9 - 1	1..	.8	..		-11		1..	
	10 - 1	1..	.84	..	--	--	--	--	1
	11 - 1	1..	.82	..		- 1		1..	
	12 - 1	1..	.8	..		-	1	1.1	
	1 - 1	1	.82	..		-1..		1..	
	1.. - 1	1..	.8	..		-11	1..	1..	
1	1 - 1	1..	.8	..	--	--	--	--	1
	2 - 1	1..	.8	..	-1	-1	11	1..	
		(Average n = 1.)				1	..	1..	
		FI					2		
		CEP (ft)				1.1			
		CEP (mils)				2			

* The observed functioning time is from pickle of the cell by the bomb arrester to functioning of the carton.

\# See paragraph reference in Part A, Table II-I.

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TABLE II-1, PART 4. REMARKS, DEFINITIONS, AND SYMBOLS.

A. REMARKS (applicable to Parts 1 through 4, Table II-1).

Remark 1 (reference Part 1, Table II-1). No times for the sheltered effect were observed. The times were derived by extrapolating backward from the first data points of the observed trajectories.

Remark 2 (reference Part 2, Table II-1). The observed data ended at 2.14 sec after pickle, although the time of functioning was determined to be 3.54 sec. The observed and computed data are compared at 2.14 sec.

Remark 3 (reference Part 2, Table II-1). The observed data ended at 2.00 sec after pickle, although the time of functioning was determined to be 2.02 sec. The observed and computed data are compared at 2.00 sec.

Remark 4 (reference Part 2, Table II-1). The observed trajectories for these drops ended 0.10 sec before the carton functioned. The observed and computed data are compared at the last data observed, not at carton functioning.

Remark 5 (reference Part 3, Table II-1). Impact data was not obtained; bombs hit out of target area.

Remark 6 (reference Part 3, Table II-1). The correlation between release and impact data was uncertain.

Remark 7 (reference Part 3, Table II-1). The computed data utilized the observed functioning time as break-point between the carton part and the bomb part of the trajectory.

B. DEFINITIONS AND SYMBOLS.

MSL: Mean sea level.

MPI: Mean point of impact. The point within the impact pattern determined by averaging the X-coordinates (range) and Z-coordinates (deflection), respectively, of all of the bombs located for each carton released.

ΔX: Observed minus computed range (ft).

ΔZ: Observed minus computed deflection (ft).

ΔT: Observed minus computed time of flight (sec).

PE: Probable error = $0.6745 \sqrt{\frac{n}{n-1}}\ S$

S: Standard deviation (in feet for range and deflection; in seconds for time of flight).

CEP: $\frac{0.8727\ (PE_{\Delta X} + PE_{\Delta Z})\ X\ 1000}{\text{average arc length}}$ = Dispersion in mils.

C. PARTICLE EQUATIONS OF MOTION.

The particle equations of motion assume that the only forces acting on a bomb are: (1) the drag force which acts in a direction opposite to that of the air velocity vector of the bomb and (2) gravity.

The drag force, D, is then

$D = ma = \rho K_D d^2 v^2$, where

D = drag force ($lb\text{-}ft/sec^2$)

m = mass of bomb (lb)

a = acceleration of bomb due to drag (ft/sec^2)

ρ = air density (lb/ft^3)

K_D = drag coefficient (dimensionless)

d = bomb diameter (ft)

v = air velocity of bomb (ft/sec)

TABLE II-2. K_D VS MACH NUMBER FOR ADU-253/B CARTON CONTAINING 74 BLU-3/B BOMBS.

Mach No.	K_D	Mach No.	K_D
0.20	0.2842	0.50	0.2908
0.22	0.2841	0.52	0.2926
0.24	0.2840	0.54	0.2947
0.26	0.2839	0.56	0.2971
0.28	0.2838	0.58	0.2999
0.30	0.2838	0.60	0.3032
0.32	0.2839	0.62	0.3070
0.34	0.2841	0.64	0.3113
0.36	0.2845	0.66	0.3161
0.38	0.2852	0.68	0.3214
0.40	0.2859	0.70	0.3270
0.42	0.2869	0.72	0.3329
0.44	0.2880	0.74	0.3390
0.46	0.2893	0.76	0.3453
0.48	0.2902	0.78	0.3517

Weight = 150 lb

$$d_e^2 = \frac{S_T}{\pi} = \frac{8.125}{3.1416} = 2.586 \text{ ft}^2$$

where d_e = equivalent diameter (ft)

S_T = total area (ft^2)

C_D, used by many aerodynamicists, is related to K_D by the formula:

$$K_D = \frac{\pi}{8} C_D$$

and drag, D, may be expressed as

$$D = 1/2\rho\, C_D\, S^1 v^2$$

where $S^1 = \frac{\pi d^2}{4}$ = cross-sectional area.

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TABLE II-3. K_D VS MACH NUMBER FOR THE BLU-3/B BOMB RELEASED FROM THE ADU-253/B CARTON (FROM CARTON FUNCTIONING TO MPI OF BOMB PATTERN).

Mach No.	K_D	Mach No.	K_D
0.10	0.824	0.50	0.675
0.12	0.815	0.52	0.673
0.14	0.806	0.54	0.671
0.16	0.796	0.56	0.671
0.18	0.787	0.58	0.672
0.20	0.778	0.60	0.675
0.22	0.769	0.62	0.679
0.24	0.761	0.64	0.685
0.26	0.752	0.66	0.694
0.28	0.743	0.68	0.705
0.30	0.734	0.70	0.719
0.32	0.727	0.72	0.735
0.34	0.719	0.74	0.756
0.36	0.712	0.76	0.781
0.38	0.705	0.78	0.810
0.40	0.698		
0.42	0.692		
0.44	0.687		
0.46	0.682		
0.48	0.678		

Weight = 1.74 lb.

Diameter = 2.70 in.

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APPENDIX III

MATHEMATICAL DEVELOPMENT OF THE IBM 7094 FORTRAN IV COMPUTER PROGRAM NUMBER 707

EFFECTIVE AREA DETERMINATION FOR MULTIPLE BOMBS

The purpose of this program is to take a pattern of given impact points (X_i, Y_i), an assumed "kill radius" and information for determination of a "kill area rectangle" surrounding many of these impact points and to compute the kill area of coverage by one or more bombs, two or more bombs, three or more bombs, four or more bombs, five or more bombs, and more than five bombs. Moreover, the program will print out the same type of information when considering exactly one bomb, exactly two, etc.

In addition to printing out this area coverage information, the program will output the (x, z) (after rotation of such has been performed) and will write a binary floating point tape suitable for entry into the plotter program (Program 297). This plotter tape contains a first file of impact positions and a second file of points at 50-ft intervals along the rectangle of interest so that on the plot this rectangle can be shown.

For a given impact pattern, as many "passes over the data" as are desired can be made, changing at will any one or any combination of the kill radius, the "Grid Delta," or the Kx, Kz used in determining the lethality rectangle. Only one plotter output is given for a given pattern, regardless of the number of times the pattern is investigated, and the rectangle plotted will be that determined by the last "pass" over the data.

This program has a maximum impact pattern-handling capability of 6000 items.

EXPLANATION OF PRINTED OUTPUT

1. Two lines of header information obtained from lead cards.
2. Mean x = $\bar{x}$ = $\Sigma x/n$ = Average downrange coordinate.
3. Mean z = $\bar{z}$ = $\Sigma z/n$ = Average crossrange coordinate.

(NOTE: $(\bar{X}, \bar{Z})$ = Mean point of impact.)

4. Sx = Estimate of standard deviation in x = $\sqrt{\frac{\Sigma (x_i - \bar{x})^2}{n-1}}$

5. Sz = Estimate of standard deviation in z = $\sqrt{\frac{\Sigma (z_i - \bar{z})^2}{n-1}}$

6. N = Number items (bombs) involved in the computations.

7. NR = Number items outside the rectangle being investigated. Items outside but near the edge of the rectangle can contribute to the kill within the rectangle.

8. Percent REJ = Percent of items rejected = (NR/N) x 100.

9. KILL R = Kill radius for which following statistics were computed. It is assumed that anything within a distance R of a given bomb impact point is killed and anything beyond R is not affected by that bomb.

10. Pattern (XMAX, XMIN) = , (ZMAX, ZMIN) = Define the rectangle being investigated. These maxima, minima may be provided the program if desired, or the program can compute them, using the Kx, Kz discussed below.

11. Pattern Length = XMAX - XMIN = Length of rectangle being investigated.

12. Pattern Width = ZMAX - ZMIN = Width of rectangle being investigated.

13. Kx, Kz = Constants to multiply by Sx, Sz in determining maxima and minima of rectangle. If these are provided, the program computes the max-min as follows:

$$XMAX = \bar{x} + (Kx)(Sx) \; ; \quad XMIN = \bar{x} - (Kx)(Sx)$$

$$ZMAX = \bar{z} + (Kz)(Sz) \; ; \quad ZMIN = \bar{z} - (Kz)(Sz)$$

14. Grid Delta = Length (ft) of side of small squares examined within the rectangle. If this = 1, a grid of 1-ft squares is superimposed over the rectangle, and the distances from the midpoint of each square to the impact points in that neighborhood are determined. If this distance is less than KILL R for at least one impact point, the 1-ft square is assumed to be "killed." A count is also kept of the number of "overkills" for each square. If no impact is within KILL R of the center of the square, the entire square is assumed to be missed. Using a KILL R of 5 or more, preliminary tests yielded almost identical results for Grid Delta = .1, .5, 1, 2, but poorer results for 3. Since

computer time required is divided by four each time the Grid Delta is doubled, the maximum possible Delta is desirable.

15. Rotation Angle = The angle through which all impact coordinates are rotated before lethality computations begin. This can be provided by the program or computed by the program. If provided, the normal desire would be to rotate the pattern to align with the aircraft heading at release. Thus, the difference of the heading and the downrange axis of the impact coordinate system (aircraft heading angle minus downrange axis angle) would be provided. If the program performs the computation, the rotational angle is determined to cause the resultant impact pattern to be "uncorrelated" in x, z, that is such that the x-axis is parallel to the principle axis of the probability ellipse. The mathematics is:

$$v_x = \Sigma x^2 - n\bar{x}^2,\ v_z = \Sigma_z{}^2 - n\bar{z}^2,\ v_{xz} = \Sigma xz - nx\bar{z}$$

$$\alpha = \arctan\left[\left((v_z - v_x) + \sqrt{(v_z - v_x)^2 + 4v^2_{xz}}\right)/2v_{xz}\right]$$

16. MPI before Translation (x, z) = In the event the program is told to translate the impacts to the MPI, the new MPI = $(\bar{x}, \bar{z})$ will be zero. The $(\bar{x}, \bar{z})$ printed here are the values before translation.

17. Total Area (sq ft) = Area of rectangle investigated = (pattern length) length) x (pattern width).

18. Kill Area (sq ft) = Area within the rectangle which was killed at least once.

19. Kill Percent = Percent of total area killed = $\left(\frac{\text{Kill Area}}{\text{Total Area}}\right) \times 100$

20. Missed Area (sq ft) = Area within the rectangle which was completely missed.

21. Missed Percent = Percent of total area missed = $\left(\frac{\text{Missed Area}}{\text{Total Area}}\right) \times 100$

22. Overkill 2 Area = Area within the rectangle which was "killed" exactly twice.

23. Overkill 2 Percent = Percent of area killed exactly twice =

$$\left(\frac{\text{Overkilled Area}}{\text{Total Area}}\right) \times 100$$

24. Overkill 3 Area and Percent - Same as above for area killed exactly 3 times.

25. Overkill 4 Area and Percent - Same as above for area killed exactly 4 times.

26. Overkill 5 Area and Percent - Same as above for area killed exactly 5 times.

27. Overkill GT5 Area and Percent - Same as above for area killed more than 5 times.

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APPENDIX IV

RESULTS AND DISCUSSION OF MISSIONS 24, 25, 26, AND 27

In addition to the 23 missions required to fulfill the primary objectives of this project, four additional missions were flown at Eglin Air Force Base to test the feasibility of a spinning carton for increasing the dispersion of the BLU-3/B bomb, a bomb-bay baffle for the B-47 aircraft, the feasibility of a carton filled with napalm, and a modified retaining band for the BLU-3/B carton (ADU-253/B).

MISSIONS 24 AND 25 -- SPINNING CARTONS

Three designs were tested (Figs. IV-1 and IV-2). The first design tested consisted of four 8-in. square vanes attached at a 45-deg angle to the middle of the four sides of an otherwise normal carton configuration. The second design tested was identical to the first except that the vanes were 6 in. square. The third design tested consisted of four vanes 2 in. wide and 10 in. long attached vertically at the corners of the carton.

The object of the three designs was to cause the cartons to spin around the vertical axis which would result in the bombs dispersing laterally due to centrifugal forces. The first test consisted of pushing cartons from the cargo door of a C-54. The second test consisted of dropping the cartons from an SUU-24/A dispenser in a B-47. The summary of test results are contained in Table IV-1.

Only four of the 19 cartons released from the C-54 spun for any length of time. Two of the four broke apart in flight. The other cartons tumbled. None of the cartons released from the B-47 spun.

MISSIONS 26A -- B-47 BOMB-BAY BAFFLE

Premature carton opening due to carton collision just below the bomb bay resulted in damage to the B-47 during the course of the primary test phase.

A baffle was designed to fit from the aft end of the dispenser to the bottom edge of the rear bulkhead of the bomb bay (Fig. IV-3). The baffle was designed to: (a) sufficiently alter the airflow in and around the bomb bay so that carton components would be directed away from the aircraft and/or (b) protect the bulkhead (which contains a fuel cell) from punctures by the carton components.

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Two one-half dispenser load (2664 bombs) releases using inert-live detonator bombs were made using a loading sequence designed to produce carton collisions. The summary of test results are contained in Table IV-2. A number of cartons collided and opened early. Scrapes and gouges were found on the fuselage of the B-47 aft of the wheel well and on the radome. Nothing struck the baffle or punctured the fuel cell.

MISSION 26B — NAPALM CARTON

At the request of the Air Force Armament Laboratory, RTD, the Hayes International Corporation of Birmingham, Alabama designed and fabricated three oversize cartons 14 3/8 in. square and 21 in. tall (Fig. IV-4). These were filled with vermiculate to simulate napalm. Three cartons were dropped singly on three passes from low altitudes. Table IV-2 contains the summary of test results.

All of the cartons cleared the dispenser and aircraft. However, the trajectory of the cartons carried them close to the aircraft fuselage, causing concern about the aerodynamic characteristics of the lighter carton.

The three cartons appeared to impact in a vertical attitude. The splash patterns were eliptical and approximately 75 ft long and 30 ft wide.

MISSION 27

The problem of inflight collisions among the cartons could not be completely eliminated. However, it was desirable to reduce the early carton openings resulting from the collisions. A modified retaining band (Fig. IV-5) was designed to accomplish this.

The retaining band was attached to the carton top by four short right-angle bands of the same material which were welded to the retaining band and rivetted to the carton top. Two of these bands were attached on the two sides (as opposed to front and rear) of the carton.

The primary objective of mission 27 was to determine if the cartons would open normally. Only six cartons were released, three at a time from one cell on two passes. Mission 27 test results are contained in Table IV-2.

All six cartons opened in a satisfactory manner.

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CONCLUSIONS AND RECOMMENDATIONS

Conclusion	Recommendation
1. The designs to cause cartons to spin failed to produce a satisfactory rotation of the cartons.	1. The concept of a spinning carton should be investigated further.
2. The bomb-bay baffle failed to prevent damage to the delivery aircraft. It is not possible to conclude if it prevented damage to the aft bulkhead of the bomb bay.	2. The bomb-bay baffle should be tested with a full dispenser load of cartons.
3. A napalm carton for the SUU-24/A dispenser is feasible.	3. The concept of a napalm carton should be investigated further.
4. The modified retaining band does not interfere with the normal opening of an ADU-253/B (BLU-3/B carton).	4. The modified retaining band should be tested with additional cartons to determine if it reduces premature carton openings resulting from collisions.

TABLE IV-1. SUMMARY OF TEST RESULTS, MISSIONS 2[illegible] AND 25

Mission Number	Ai[illegible]ft Type	Altitude AGL (ft)	Airspeed ([illegible])	[illegible] No.	[illegible]	[illegible]	Remarks
2[illegible]	[illegible]	[illegible]	12[illegible]	1	1	[illegible]	[illegible]
		[illegible]	12[illegible]	[illegible]	1	[illegible]	Stabilized [illegible] impact [illegible]
		[illegible]	12[illegible]	[illegible]	1	[illegible]	Stabilized [illegible] impact [illegible]
		[illegible]	12	[illegible]	1		[illegible]
		[illegible]	[illegible]	[illegible]	1		
		[illegible]	[illegible]	[illegible]	1		[illegible]
		[illegible]	12[illegible]	[illegible]	1		[illegible]
		[illegible]	12[illegible]	[illegible]	1	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	1	[illegible]	[illegible]
		200[illegible]	12[illegible]	1[illegible]	1		Released [illegible]
		[illegible]	12[illegible]	[illegible]	1		[illegible]
		200[illegible]	[illegible]	[illegible]	1		[illegible] started [illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] initially [illegible]
		[illegible]	[illegible]	[illegible]	1	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] initially. [illegible] impact.
		[illegible]	[illegible]	[illegible]	[illegible]		[illegible] initially [illegible]
		[illegible]	[illegible]	[illegible]	[illegible]		[illegible] initially [illegible]
		[illegible]	12	1	1		[illegible] initially [illegible] apart [illegible]
		[illegible]	12[illegible]	1[illegible]	1	[illegible]	Tumbled all [illegible]
		[illegible]	[illegible]	2[illegible]	1		Tumbled all [illegible]
25	B[illegible]	[illegible]	2	1	1	1	[illegible]
		[illegible]	[illegible]	2	1	[illegible]	
		[illegible]	[illegible]	[illegible]	1	1	
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
		200[illegible]	[illegible]	[illegible]	1	[illegible]	
		2[illegible]	[illegible]	[illegible]	1	[illegible]	
		2[illegible]	[illegible]		1	[illegible]	
		[illegible]	[illegible]		[illegible]	[illegible]	
		2[illegible]	[illegible]		[illegible]	1	

Timer settings not available [illegible]

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TABLE IV-2. SUMMARY OF TEST RESULTS, MISSIONS 26 AND 27, WITH B-47 AIRCRAFT

Mission Number	Altitude AFL (ft)	Airspeed (KIAS)	Pass No.	Cartons Per Pass	Timer Setting (sec)	Carton Configuration	Remarks
26A	1000	425	1	36	3	12	To test bomb-bay baffle.
	1000	425	2	36	3	12	To test bomb-bay baffle
26B	400	250	3	1	NA	—	Napalm - filled
	400	350	4	1	NA	—	Napalm - filled
	400	350	5	1	NA	—	Napalm - filled
27	1000	425	1	3	3	12	With modified retaining band
	1000	425	2	3	3	12	With modified retaining band

NA = Not applicable.

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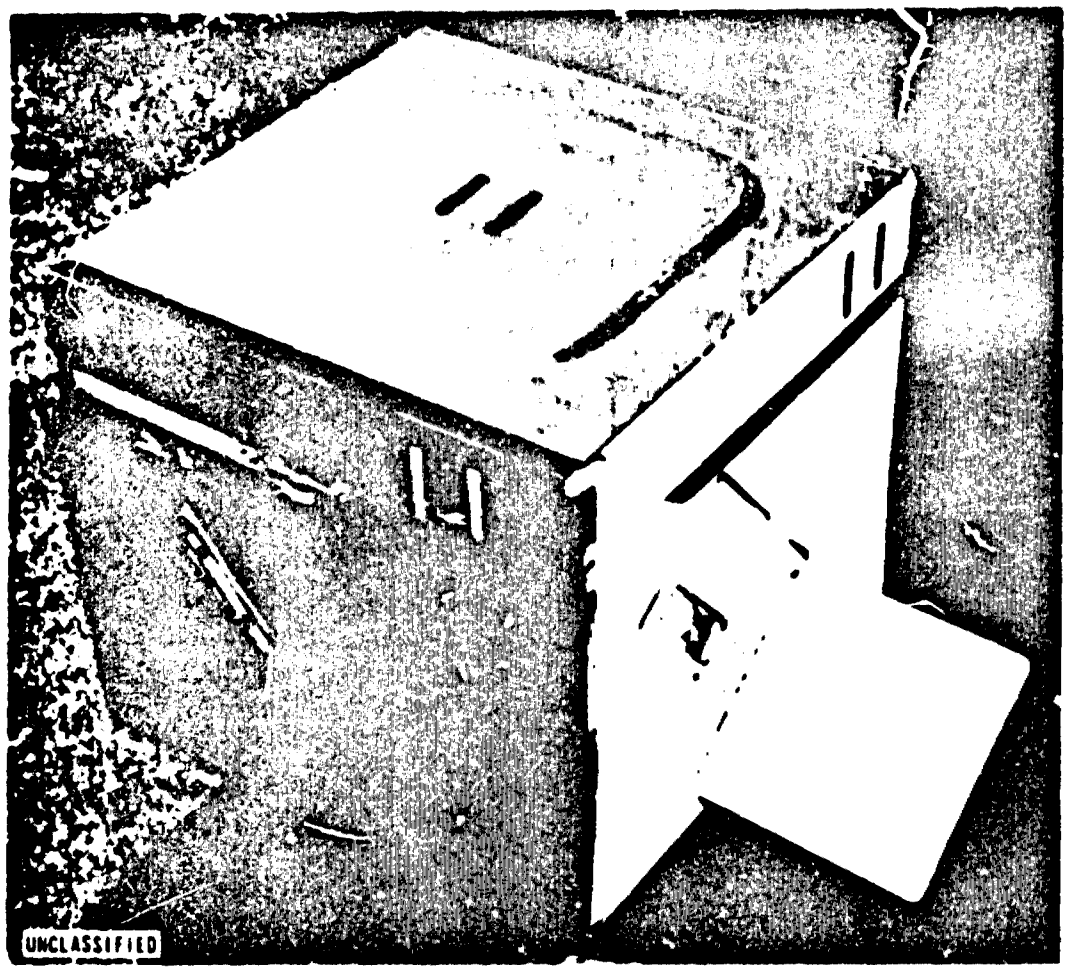


Figure IV-1. Carton Design No. 1.

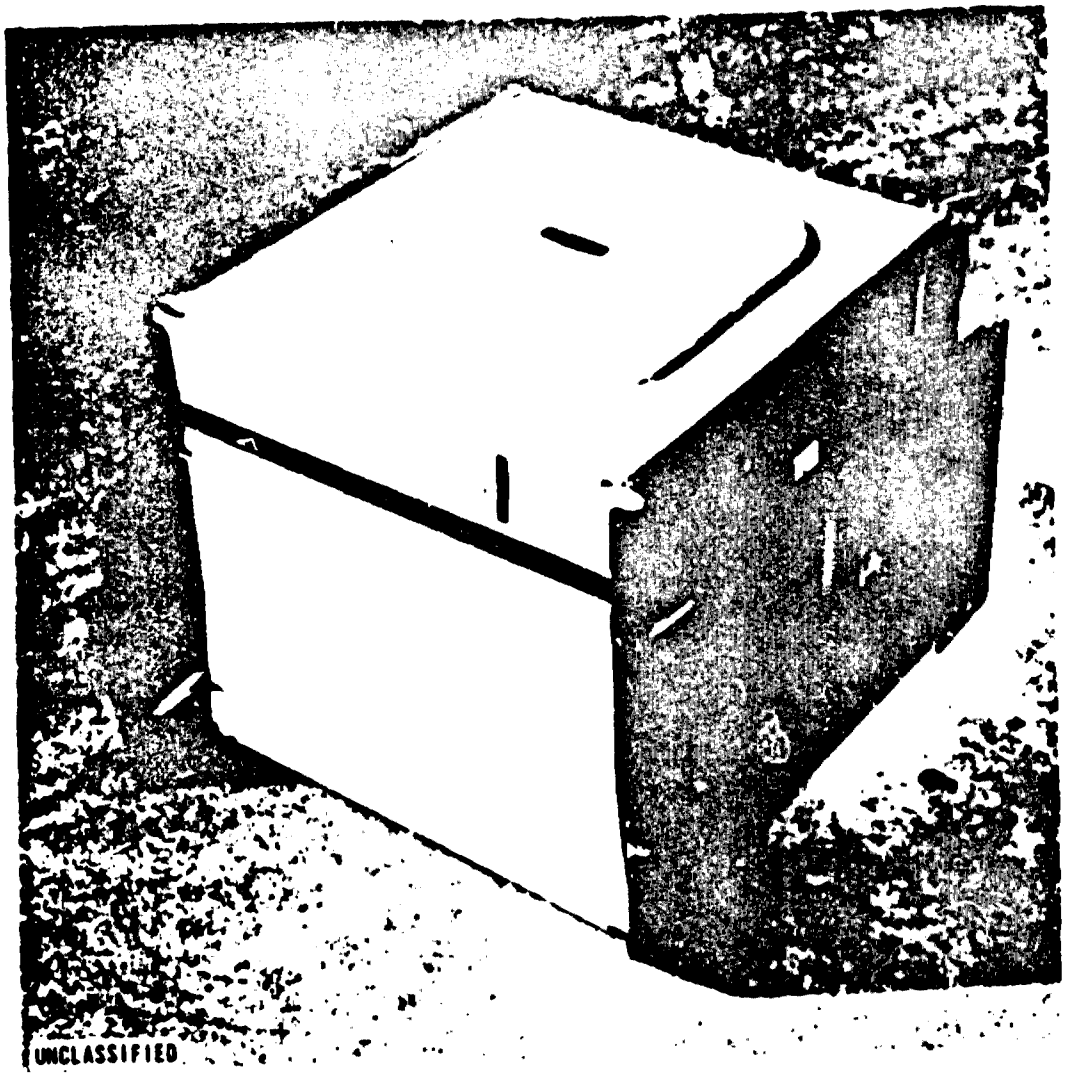


Figure IV-2. Carton Design No. 2.

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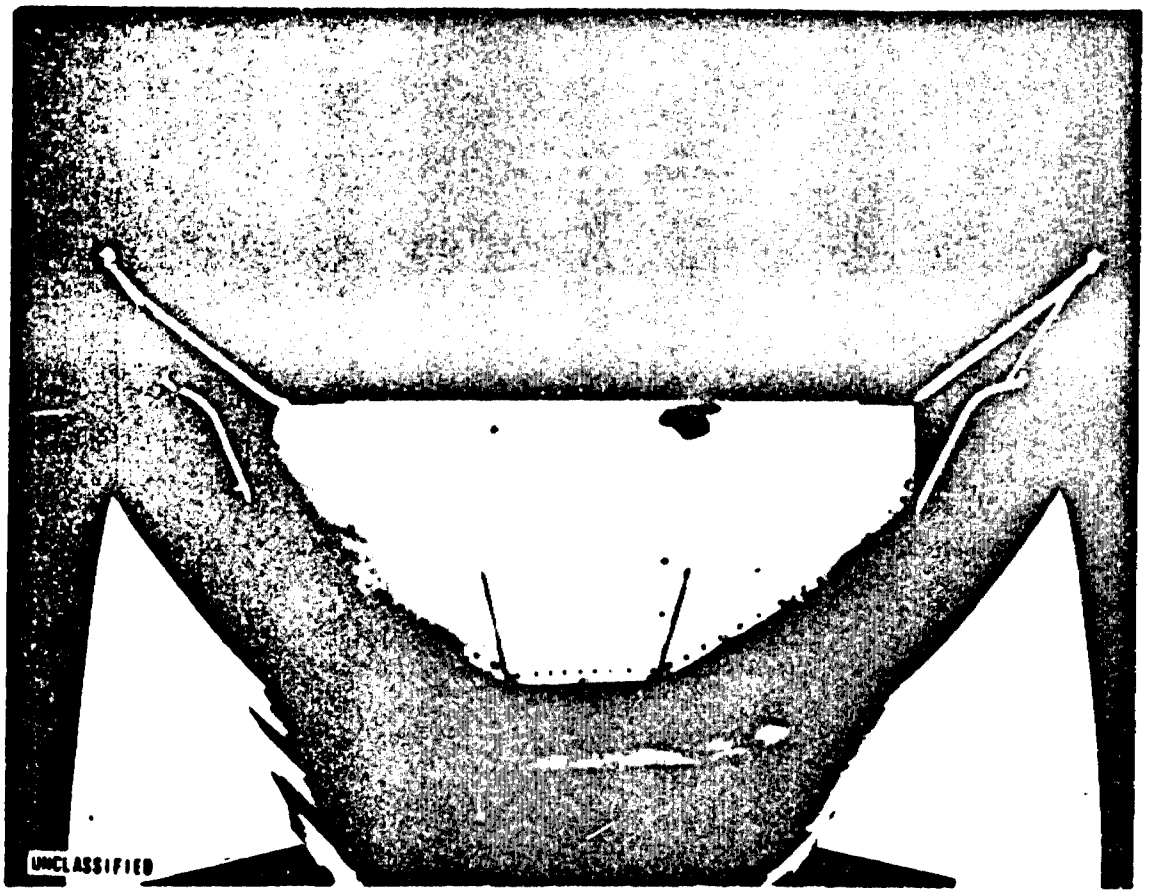


Figure IV-3. B-47 Aircraft Bomb-Bay Baffle.

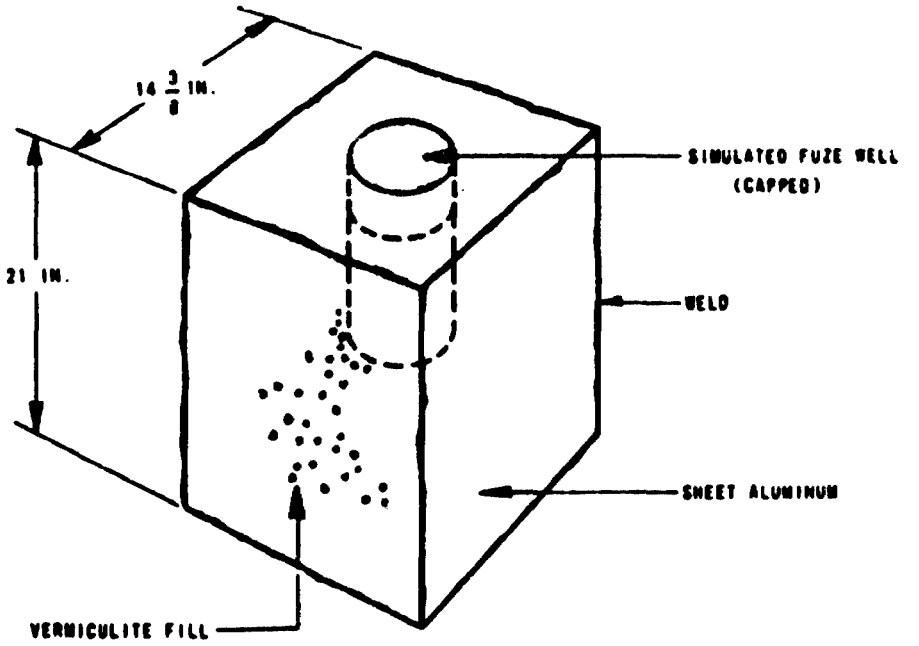


Figure IV-4. Napalm Carton Fabricated by Hayes International Corporation.

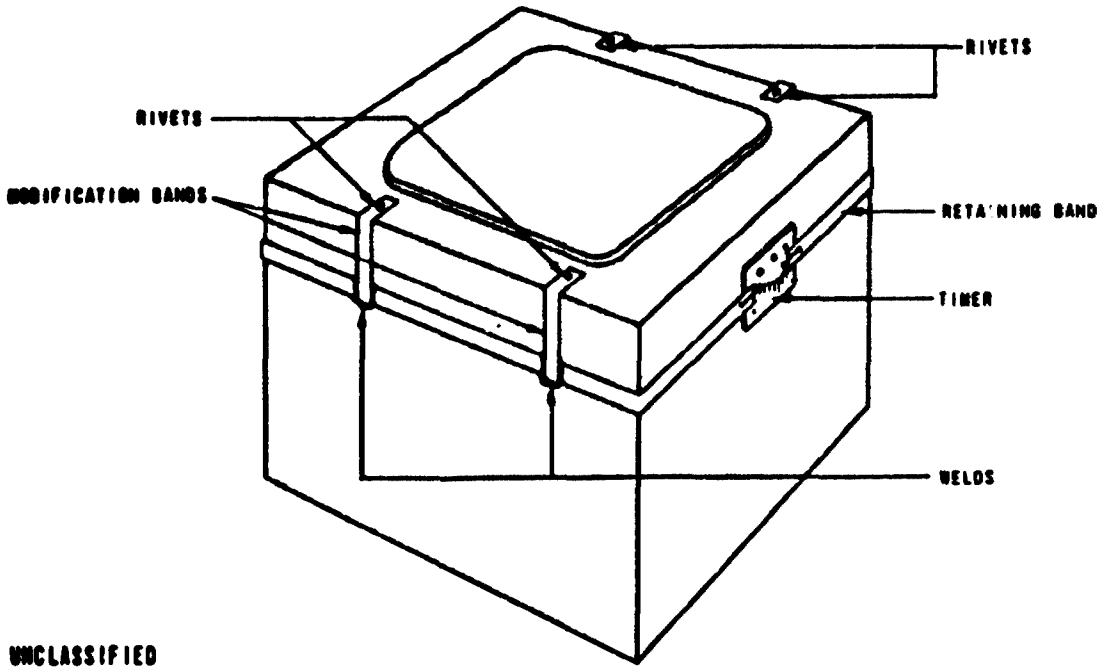


Figure IV-5. Carton Showing Modified Retaining Band Design.

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APPENDIX V

IMPACT POSITION DATA

This appendix includes the impact position data for each impact plot presented and discussed in Section V of this report. The X and Z coordinates (sorted in X and not correlated to the position of the aircraft at release) are presented to provide the reader with the information necessary to reproduce the plots on a workable scale and to allow the reader to conduct the various other pattern-density-versus-target studies necessary for optimum employment of the weapons system.

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2 MARCH 1965, MISSION 15, PASS 2

[illegible]	CROSSRANGE
142.28	698.52
145.87	723.10
[illegible]	[illegible]
146.24	753.08
176.64	719.87
178.82	735.37
181.19	750.11
183.24	733.56
186.15	769.16
186.15	769.16
190.48	734.49
193.82	711.26
204.63	702.25
206.85	711.94
219.90	690.99
221.40	819.43
227.14	770.21
231.19	715.35
233.62	699.81
249.57	682.90
254.18	735.97
261.24	733.38
261.40	786.50
271.50	748.63
271.61	710.04
274.61	710.04
276.82	754.94
280.19	764.36
282.59	747.24
284.78	724.56
314.16	742.49
316.57	705.53
319.22	738.26
323.78	774.23
324.47	757.94
326.02	722.09
330.59	735.22
331.60	684.35
341.27	721.84
342.74	518.32
344.05	719.60
345.78	724.99
361.52	730.08
370.27	663.36
374.65	739.46
374.70	657.92
378.78	726.84
379.84	729.40
381.67	697.63
383.62	794.27
392.06	745.31
401.17	726.76
403.04	719.54
407.00	708.71
422.04	728.68
427.50	743.79
428.42	745.39
444.94	654.20
445.17	736.22

[illegible]	CROSSRANGE
445.53	68.36
453.71	726.33
453.87	715.46
456.32	702.00
457.34	764.39
457.50	726.09
464.91	710.55
464.54	793.08
468.26	703.60
472.64	779.06
475.72	752.29
476.05	721.86
478.04	734.51
484.19	733.39
485.15	761.30
493.96	707.05
493.97	707.16
495.58	782.58
497.09	751.47
497.42	765.14
499.52	701.89
507.72	806.19
508.44	749.70
514.10	772.84
517.02	737.96
518.84	801.75
519.69	663.79
523.57	689.01
523.98	731.25
524.83	700.75
529.08	803.45
532.05	669.68
533.39	665.44
535.05	755.52
539.53	714.26
542.39	679.57
543.21	711.44
544.02	767.07
544.20	673.22
545.09	772.13
546.16	668.81
547.03	742.25
551.77	686.20
552.52	632.72
553.80	739.95
554.22	748.28
558.31	818.98
559.05	708.27
559.15	702.56
560.72	718.84
560.88	663.11
561.02	715.42
562.03	772.39
562.98	749.16
564.61	640.58
570.65	732.36
574.14	676.76
576.45	700.56
577.02	741.06

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X	Z
577.09	624.16
577.12	717.82
577.31	801.74
577.39	782.04
581.97	779.44
583.43	724.00
584.59	723.77
584.90	757.47
586.63	740.67
589.25	735.72
594.85	742.33
595.14	726.93
595.55	768.15
596.46	751.51
602.24	766.08
603.88	713.89
604.39	702.50
606.12	750.91
607.14	772.86
608.20	731.74
610.15	745.35
611.73	762.91
612.40	721.67
613.55	725.14
616.68	762.51
619.38	739.49
620.38	669.83
621.09	734.74
623.12	748.81
623.71	763.16
623.90	664.94
629.62	632.36
630.46	766.42
634.88	772.29
635.66	759.05
637.60	708.32
641.41	722.83
643.11	766.57
644.15	788.28
650.27	727.74
650.76	719.84
653.05	750.60
654.53	726.98
655.99	739.57
657.44	757.34
658.81	757.52
659.63	695.81
659.68	708.86
664.31	666.45
665.64	728.08
667.26	717.74
668.67	710.05
669.50	635.54
669.68	729.06
671.17	715.74
671.43	781.90
677.51	731.38
679.26	780.36
682.01	774.38

X	Z
682.57	744.42
685.62	696.57
688.14	670.06
689.93	753.15
690.72	757.16
691.38	714.00
693.16	684.95
693.32	701.88
695.72	730.07
698.11	684.25
698.61	752.77
698.75	781.69
700.53	820.29
701.69	718.15
701.84	724.89
704.53	709.11
705.81	728.80
709.46	720.06
710.65	765.38
716.23	756.45
719.42	771.25
724.07	730.40
724.28	721.18
724.46	735.70
726.02	717.49
726.13	724.74
728.70	708.87
729.29	707.99
732.31	714.04
732.43	682.36
734.17	773.71
734.53	765.06
735.00	755.09
734.29	676.11
740.83	735.10
741.09	717.33
742.02	740.51
742.78	749.71
744.10	699.90
747.70	725.21
752.27	782.27
752.72	753.73
753.86	739.41
758.71	737.03
761.21	807.67
762.35	760.12
763.51	737.46
765.42	698.52
766.45	678.93
770.60	792.45
771.90	674.14
773.81	777.85
775.15	707.73
775.87	744.33
776.04	719.00
776.45	643.05
776.92	737.46
777.63	763.73
780.25	770.95

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
780.72	760.80
780.76	659.36
781.16	690.67
781.61	757.90
782.29	774.53
783.46	764.87
783.81	721.04
784.59	697.32
785.06	773.26
786.02	760.45
786.72	727.52
787.68	659.44
788.13	801.56
788.30	726.10
789.44	745.37
790.95	704.19
792.30	729.53
792.94	708.31
793.89	767.84
795.72	729.11
796.54	784.35
797.57	806.95
798.74	770.23
800.01	741.34
801.36	718.41
802.05	757.50
803.37	822.37
805.54	795.14
806.77	741.22
807.31	854.36
808.37	777.42
810.11	807.61
813.73	742.05
814.05	732.62
814.14	737.72
814.21	741.71
814.46	675.82
815.30	760.85
816.36	816.84
818.13	760.81
820.26	749.61
820.86	833.86
821.32	814.53
822.64	750.91
823.34	775.74
824.36	732.46
825.06	747.70
825.86	715.45
826.54	784.57
826.65	715.64
827.33	778.06
828.64	778.57
829.06	776.29
829.25	747.81
829.66	751.17
829.76	774.13
830.44	742.58
831.41	733.73
831.95	715.42

X	Z
854.43	777.89
858.20	708.40
861.62	690.62
863.65	765.81
864.47	753.26
865.29	769.60
866.39	726.85
867.50	822.34
869.16	706.03
870.87	770.28
873.10	735.06
873.58	704.31
873.86	813.31
874.70	781.28
875.61	756.21
877.25	774.06
879.60	765.04
879.87	716.15
880.43	670.30
882.40	698.49
883.66	704.74
885.67	637.81
886.35	786.01
887.18	768.72
887.30	744.40
890.15	800.95
893.52	749.50
894.14	736.47
894.28	707.89
895.97	816.06
899.31	700.19
899.73	750.94
901.47	772.23
901.85	815.27
902.29	742.49
902.79	779.84
903.63	772.77
903.86	747.94
904.58	814.70
905.19	775.59
910.52	697.42
912.16	749.48
913.22	775.20
914.98	764.19
914.85	805.18
914.60	724.27
919.89	766.21
924.70	743.33
925.77	714.49
928.42	778.15
930.16	758.36
930.86	766.57
933.33	747.34
935.20	733.63
936.62	760.47
936.74	655.02
943.24	747.61
943.41	744.79
945.78	762.29

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X	Z
949.78	762.29
945.98	734.02
948.67	730.42
950.43	752.26
952.24	697.44
953.04	747.73
953.93	740.24
954.74	730.49
954.81	704.41
955.23	765.94
956.20	775.92
956.58	768.64
956.82	743.01
960.15	711.03
960.62	776.74
962.16	735.63
964.06	778.09
968.88	718.78
968.91	729.49
973.29	773.80
977.86	811.17
978.04	765.62
978.50	756.53
979.81	746.81
983.47	809.46
984.53	717.01
984.69	734.16
985.58	757.54
992.05	757.68
995.08	716.73
996.96	748.76
999.55	711.1[illegible]
1000.21	751.6[illegible]
1000.35	720.06
1001.83	678.89
1003.98	725.05
1006.51	716.59
1008.45	740.41
1008.46	712.56
1010.25	708.39
1011.14	701.66
1011.32	775.03
1012.49	697.14
1016.74	711.92
1019.60	691.67
1022.29	725.05
1025.76	773.24
1026.12	698.26
1026.8[illegible]	772.98
1028.63	689.81
1028.65	722.61
1028.79	739.67
1030.04	811.80
1030.08	713.64
1032.27	746.90
1032.32	703.88
1034.08	714.18
1036.34	757.10
1038.25	716.52

X	Z
1039.33	744.28
1041.80	711.5[illegible]
1042.78	764.68
1043.83	719. 9
1046.91	754.87
1048.84	717.24
1050.03	772.67
1050.34	768.98
1050.88	700.18
1053.06	772.16
1054.63	709.44
1056.81	739.24
1057.67	776.42
1061.43	733.98
1062.09	720.76
1063.67	739.12
1064.42	719.93
1068.15	725.83
1068.31	777.86
1068.88	752.63
1072.84	746.51
1072.52	694.29
1074.51	763.86
1075.03	747.37
1077.71	724.07
1077.77	774.32
1081.70	778.55
1082.24	716.57
1082.85	748.80
1083.24	705.13
1084.04	793.30
1084.88	752.70
1085.33	734.09
1086.06	708.14
1087.89	746.93
1093.14	740.59
1096.05	700.68
1105.42	685.69
1111.59	789.34
1113.59	763.14
1117.13	746.51
1124.96	764.23
1128.97	794.63
1129.58	751.35
1130.15	772.01
1134.43	736.92
1134.48	740.14
1138.23	749.70
1139.35	766.83
1139.67	757.91
1141.19	802.38
1142.56	713.00
1143.06	722.24
1143.54	795.7[illegible]
1151.96	768.77
1156.53	764.17
1157.24	721.70
1159.52	659.07
1160.00	747.72

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X	Z
1162.15	602.71
1162.56	749.43
[illegible]	[illegible]
1165.01	697.99
1170.00	674.98
1179.37	683.45
1179.37	850.15
1186.10	698.71
[illegible]	[illegible]
1191.25	823.96
1201.25	781.51
1205.05	792.22
1207.71	746.38
1211.08	825.22
[illegible]	[illegible]
1218.49	720.37
1218.75	757.45
1223.27	866.52
1226.93	752.36
1228.79	741.03
[illegible]	[illegible]
1236.45	742.87
1241.93	744.28
1251.10	773.59
1268.35	665.15
1269.96	779.67
[illegible]	[illegible]
1277.54	786.08
1280.98	639.60
1288.42	630.97
1289.93	751.30
1289.94	654.46
[illegible]	[illegible]
1300.58	674.41
1312.24	689.66
1313.06	699.52
1319.68	780.11
1316.37	773.00
[illegible]	[illegible]
1319.39	712.48
1321.38	707.74
1321.59	688.54
1323.38	628.38
1326.67	767.07
[illegible]	[illegible]
1333.41	739.00
1333.43	633.88
1338.05	818.60
1342.49	778.76
1342.89	656.11
[illegible]	[illegible]
1356.03	709.35
1360.42	664.58
1361.46	664.46
1362.30	714.84
1362.72	637.77
[illegible]	[illegible]
1364.29	717.63
1364.34	737.01

X	Z
1368.26	736.97
1368.42	710.73
[illegible]	[illegible]
1370.57	662.98
1371.86	657.09
1375.44	708.74
1379.[illegible]	718.07
1381.90	703.76
[illegible]	[illegible]
1392.07	642.71
1395.09	645.40
1397.83	775.93
1398.11	716.64
1400.53	784.54
[illegible]	[illegible]
1402.28	662.06
1404.96	732.22
1411.07	705.62
1417.15	731.66
1425.00	670.40
[illegible]	[illegible]
1440.90	660.65
1441.42	651.40
1446.89	638.15
1449.24	755.48
1450.57	688.62
[illegible]	[illegible]
1457.99	673.58
1467.23	839.90
1476.51	721.23
1480.45	799.44
1487.62	686.87
[illegible]	[illegible]
1521.46	760.18
1530.35	721.66
1539.19	669.17
1547.66	722.26
1554.98	677.78
[illegible]	[illegible]
1571.55	658.19
1578.10	851.50
1587.89	832.52
1589.32	666.01
1591.57	672.27
[illegible]	[illegible]
1604.51	735.81
1622.11	827.27
1655.26	793.46
1664.85	666.53
1665.05	682.00
[illegible]	[illegible]
1693.69	733.86
1723.04	664.90
1730.71	699.87
1816.39	714.47
1827.25	612.71
[illegible]	[illegible]
1857.20	715.02
1880.65	713.07
1989.93	602.75
2432.82	887.54

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2 MARCH 1965, MISSION 15, PASS 3

DOWNRANGE	CROSSRANGE
593.07	532.38
618.58	568.27
632.62	757.25
755.10	609.22
756.29	653.46
784.67	618.67
800.94	523.90
849.79	590.80
852.27	647.81
860.02	614.16
881.39	587.52
903.36	573.99
905.87	599.95
916.33	738.43
920.65	639.59
944.29	660.26
944.45	540.28
950.50	542.07
956.72	647.35
957.55	698.99
958.88	698.44
962.90	694.35
963.36	657.49
965.18	656.59
966.52	626.14
967.78	642.44
971.02	628.60
974.34	612.86
994.74	640.99
1001.50	675.19
1005.54	705.95
1010.57	644.36
1014.42	599.10
1014.82	712.06
1017.37	699.28
1020.10	650.10
1021.34	595.84
1029.38	691.01
1031.14	621.71
1033.20	703.73
1034.03	670.48
1036.64	619.32
1040.24	588.56
1040.28	613.34
1040.48	585.89
1054.18	674.68
1059.64	653.02
1059.92	668.71
1060.38	703.09
1075.63	602.59
1077.17	681.58
1080.00	638.73
1080.72	649.48
1083.71	628.69
1084.30	587.74
1084.47	750.45
1086.20	674.17
1086.81	638.70
1087.07	764.05

DOWNRANGE	CROSSRANGE
1088.34	657.54
1090.54	659.64
1093.42	609.28
1099.73	689.16
1097.93	644.16
1101.30	601.66
1102.31	635.08
1102.71	713.92
1104.71	662.38
1106.21	630.93
1108.72	678.02
1109.78	687.58
1113.23	562.38
1113.58	670.25
1116.65	698.98
1118.07	558.65
1118.87	748.94
1124.14	659.05
1130.43	609.85
1133.61	601.09
1133.96	653.35
1135.12	562.98
1143.66	685.02
1144.13	629.28
1144.81	647.95
1145.99	619.95
1147.01	721.99
1147.41	653.44
1147.89	624.58
1150.30	618.99
1154.18	746.34
1155.85	620.46
1160.02	621.37
1166.71	617.26
1173.57	707.52
1175.00	630.23
1177.90	733.15
1178.85	736.94
1179.16	760.91
1179.76	671.54
1184.91	721.70
1185.19	707.64
1189.63	720.97
1190.58	657.73
1188.66	662.90
1192.44	679.01
1195.64	762.72
1197.44	628.38
1211.85	618.52
1214.21	616.54
1215.35	616.58
1214.34	653.29
1216.74	602.67
1218.05	741.72
1219.64	664.28
1224.47	654.10
1225.49	580.47
1229.60	631.61
1241.37	597.45

DOCUMENT UNCLASSIFIED JCP-I, DPG

1232.19	582.69
1235.51	712.56
1235.53	658.72
1237.53	609.84
1237.68	739.66
1237.82	718.13
1238.61	757.75
1243.34	852.94
1244.27	647.71
1247.32	679.39
1247.62	617.92
1250.50	693.93
1251.29	595.72
1254.51	627.92
1255.48	604.77
1261.04	734.69
1264.89	623.01
1269.21	672.31
1270.92	629.77
1271.67	649.24
1271.72	667.17
1273.55	630.34
1275.83	764.19
1278.60	641.76
1279.28	621.59
1281.66	681.41
1282.01	716.35
1283.01	745.75
1283.82	621.22
1287.31	671.10
1288.54	661.36
1292.59	625.20
1302.92	633.36
1304.71	631.61
1310.61	622.71
1310.76	645.16
1311.69	617.11
1312.11	689.55
1317.62	671.56
1317.74	634.38
1318.44	651.89
1320.69	659.91
1329.80	670.27
1330.05	668.91
1331.29	652.28
1341.67	626.77
1344.14	631.01
1343.69	652.67
1345.14	616.92
1345.39	609.37
1346.92	637.18
1347.17	605.73
1348.88	671.62
1353.87	693.12
1359.26	672.41
1367.54	653.10
1369.23	638.04
1371.74	584.94
1376.24	610.64

1377.24	683.27
1378.46	654.65
1384.65	656.40
1395.93	641.52
1399.86	678.89
1399.86	691.77
1401.54	690.63
1404.33	694.65
1404.37	606.34
1407.02	623.44
1407.02	623.44
1411.41	658.10
1416.86	680.89
1424.37	643.28
1431.22	685.73
1432.56	670.10
1436.04	706.55
1438.42	673.40
1438.01	550.42
1445.23	627.39
1445.90	606.18
1446.71	563.96
1450.91	705.57
1452.78	644.36
1453.73	675.45
1454.80	649.87
1458.29	601.46
1460.42	674.85
1462.66	670.39
1462.73	708.42
1464.88	643.66
1468.75	618.75
1468.82	625.37
1469.47	620.69
1477.26	606.83
1482.37	615.89
1484.44	662.40
1487.05	633.06
1488.15	644.09
1491.72	578.64
1494.99	649.44
1499.98	641.97
1500.60	615.10
1501.87	583.27
1502.52	642.17
1504.66	622.78
1505.06	629.05
1506.03	642.15
1512.37	665.09
1513.70	643.53
1514.04	642.12
1515.29	701.90
1515.44	592.32
1517.84	662.09
1518.32	639.42
1519.49	601.35
1520.32	620.40
1520.64	625.11
1524.80	696.27

DOCUMENT UNCLASSIFIED JCP-I, DPG

x	z
1527.43	654.74
1530.13	621.91
1534.12	586.48
1535.79	627.41
1539.02	627.22
1541.20	622.00
1550.58	561.07
1559.00	606.77
1559.06	593.63
1560.33	598.56
1568.02	691.92
1569.02	630.03
1569.09	605.45
1574.21	642.58
1575.66	602.65
1575.90	601.82
1575.94	599.60
1577.59	668.17
1581.99	603.91
1583.15	623.02
1585.68	618.80
1585.68	633.52
1589.55	636.50
1587.89	655.94
1591.47	639.43
1593.88	650.32
1595.13	611.49
1597.07	607.83
1601.51	607.89
1605.53	592.07
1605.74	658.19
1605.89	622.77
1610.69	602.30
1613.40	615.35
1614.52	674.40
1614.67	614.44
1616.09	578.44
1619.62	626.59
1624.74	614.65
1629.06	590.54
1634.40	623.17
1639.78	639.44
1639.86	607.10
1643.07	603.76
1642.16	657.20
1644.00	610.24
1646.68	640.65
1655.75	659.68
1658.92	627.65
1659.46	621.47
1659.59	594.84
1660.00	597.66
1660.04	623.62
1661.60	629.27
1664.36	594.11
1670.07	632.79
1671.43	634.32
1675.85	656.69
1679.29	670.72

x	z
1682.14	671.62
1685.69	597.01
1687.62	734.34
1688.01	657.28
1688.32	646.67
1688.44	590.79
1689.06	664.13
1690.27	660.00
1692.73	639.36
1693.93	617.03
1694.36	642.24
1695.90	619.09
1701.51	629.22
1702.29	647.97
1703.62	629.15
1710.43	627.99
1712.76	654.44
1717.12	636.93
1718.90	513.52
1719.57	622.70
1720.71	655.36
1721.81	607.35
1725.96	634.61
1727.01	781.52
1728.38	643.15
1729.31	659.05
1731.59	608.50
1731.74	594.72
1733.67	656.48
1736.13	545.05
1736.42	619.17
1737.89	581.73
1740.72	667.35
1741.83	629.66
1746.87	625.30
1750.52	660.85
1751.03	625.46
1752.41	657.17
1752.83	663.91
1754.17	615.26
1755.21	659.21
1756.77	610.34
1760.79	642.60
1760.82	640.89
1767.02	632.66
1770.36	649.90
1771.71	614.82
1774.21	619.52
1776.83	618.68
1777.53	602.58
1778.15	663.72
1779.23	576.20
1780.54	605.59
1780.76	604.83
1781.60	614.66
1787.17	644.96
1787.31	641.42
1788.03	646.80
1788.11	621.58

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
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1789.16	644.96
1790.33	616.98
1794.71	627.80
1795.76	716.45
1796.24	643.75
1797.48	689.66
1798.27	658.09
1802.32	671.82
1804.47	625.58
1806.29	642.63
1808.06	62[illegible]
1813.75	65[illegible]
1814.94	615.32
1815.73	612.65
1816.24	624.23
1817.03	661.28
1817.48	606.77
1818.67	610.32
1818.84	630.82
1818.18	625.31
1819.18	675.31
1819.22	625.86
1819.49	606.46
1820.31	641.64
1820.39	616.43
1821.20	646.28
1822.87	649.87
1823.24	625.74
1825.69	677.87
1825.77	622.57
1825.79	617.55
1829.88	650.15
1832.21	618.89
1833.49	602.58
1837.00	630.96
1838.95	618.81
1839.70	635.54
1840.81	579.19
1841.05	634.23
1841.13	614.13
1846.50	642.96
1847.24	626.93
1848.63	654.78
1848.66	619.91
1850.67	655.35
1850.92	617.19
1852.41	647.52
1852.51	628.34
1852.68	596.54
1854.74	666.26
1855.57	668.36
1[illegible]	650.3[illegible]
1860.94	641.87
1861.25	649.47
1862.13	619.31
1862.46	675.55
1864.95	651.03
1866.82	669.37

X	Z
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1868.25	617.57
1870.58	628.92
1871.71	675.65
1873.24	635.45
1873.30	671.85
1874.60	653.69
1874.66	592.45
1877.00	664.08
1878.11	655.81
1879.89	615.69
1880.86	598.98
1881.22	639.05
1881.84	644.02
1884.81	553.14
1887.97	657.85
1889.14	674.86
1891.88	650.77
1893.38	613.31
1894.75	670.58
1896.39	669.40
1901.47	675.07
1902.65	694.42
1903.11	641.77
1904.50	661.96
1907.52	648.17
1912.70	683.89
1913.13	680.82
1913.24	596.91
1914.34	663.96
1915.55	630.75
1916.21	605.91
1917.33	664.45
1918.32	681.57
1919.04	686.86
1920.44	679.29
1922.83	653.87
1924.81	659.40
1925.56	680.06
1926.18	666.23
1926.31	598.50
1928.41	617.18
1933.47	623.77
1934.98	620.05
1940.05	636.42
1941.43	611.59
1941.52	645.67
1943.20	639.88
1946.19	652.76
1949.82	683.94
1950.78	601.82
1953.05	621.99
1957.71	676.31
1959.58	694.46
1960.68	666.58
1966.13	605.95
1969.76	689.87
1969.76	639.87
1971.56	617.30

DOCUMENT UNCLASSIFIED JCP-I, DPG

x	z
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1981.52	594.78
1981.96	601.30
1984.75	664.67
1984.86	578.45
1986.74	654.73
1989.97	596.46
1989.93	682.84
1990.06	629.52
1991.46	623.43
1993.34	649.73
1993.95	25.46
2000.36	650.42
2003.20	633.33
2004.41	667.39
2005.99	639.41
2009.93	618.62
2010.55	665.40
2012.22	614.62
2015.26	646.66
2016.36	623.41
2016.68	681.31
2017.18	586.67
2018.21	754.82
2019.70	752.73
2023.99	600.66
2027.30	604.74
2028.14	636.97
2033.76	593.52
2035.00	640.08
2035.66	612.53
2040.39	637.98
2043.12	649.63
2045.53	666.72
2045.82	633.85
2048.03	834.42
2049.11	646.94
2053.30	685.32
2053.72	652.56
2058.59	673.36
2058.60	597.66
2061.54	663.58
2063.14	656.54
2065.79	602.06
2068.01	619.88
2070.96	664.57
2071.30	475.68
2073.28	643.78
2074.84	635.56
2082.84	670.26
2083.90	660.54
2099.89	636.19
2099.95	624.57
2106.16	685.75
2106.63	639.19
2109.42	608.20
2120.1	612.11
2125.90	646.03
2127.59	648.07

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2129.51	693.81
2132.43	649.38
2134.37	634.80
2135.68	637.94
2142.04	627.68
2142.21	605.41
2144.22	648.33
2146.30	606.76
2148.05	627.79
2163.08	635.53
2163.40	689.77
2164.74	665.43
2168.39	686.30
2191.59	518.01
2215.45	621.66
2220.29	649.96
2222.75	634.63
2237.32	709.88
2242.37	681.96
2248.28	632.58
2249.14	710.22
2269.03	524.24
2280.92	683.91
2293.69	703.39
2311.10	666.02
2335.69	613.75
2337.18	632.17
2360.50	640.55
2375.94	712.53
2379.03	601.21
2385.43	637.53
2399.91	622.13
2410.63	627.13
2422.11	687.16
2431.00	602.89
2435.68	650.91
2444.37	615.06
2456.98	604.51
2460.42	610.10
2460.66	591.62
2466.86	673.12
2467.42	653.27
2478.75	607.59
2486.52	633.66
2486.98	662.30
2493.16	660.28
2494.49	634.82
2501.41	649.94
2501.89	647.47
2508.16	609.78
2509.42	684.02
2511.77	630.31
2515.11	589.40
2516.73	638.60
2522.51	661.56
2523.77	621.12
2526.91	648.70
2527.26	649.23
2529.87	668.23

X	Z
2533.13	670.66
2533.18	668.27
2535.14	610.41
2537.17	627.25
2544.67	656.49
2547.76	610.65
2554.77	711.03
2554.97	689.15
2553.21	686.62
2562.62	684.32
2575.81	611.14
2579.71	608.11
2586.56	661.04
2589.81	684.22
2592.16	632.06
2598.76	621.97
2599.17	627.67
2606.62	737.82
2627.02	675.68
2631.79	647.65
2634.03	646.82
2642.08	670.17
2642.60	646.17
2646.33	642.22
2652.45	661.29
2654.25	690.10
2660.14	648.78
2683.65	656.28
2698.64	665.49
2724.61	640.33
2746.61	626.19
2752.05	650.96
2774.78	685.18
2778.59	663.70
2834.63	727.81
3002.41	770.74
3013.58	707.34
3020.11	785.49

DOCUMENT UNCLASSIFIED JCP-I, DPG

3 MARCH 1965, MISSION 16, PASS 1

DOWNRANGE	CROSSRANGE
515.35	971.71
552.13	954.95
705.41	907.09
766.41	866.88
794.07	834.83
806.90	1022.66
808.09	898.78
825.48	1017.18
829.23	943.74
833.38	1034.63
842.40	1022.19
843.35	970.03
843.36	950.84
871.43	1004.97
873.84	952.75
894 43	934.87
895 33	977.52
895.84	944.84
899.96	1126.27
903.05	950.32
908.36	1023.79
908.37	1016.23
909.64	962.22
911.15	978.42
911.77	959.00
915.17	978.25
917.26	963.41
923.75	910.00
923.78	986.46
927.23	954.91
927.52	979.61
929.59	981.19
932.78	967.61
933.08	963.90
935.67	1033.43
938.54	967.53
939.09	993.72
970.28	935.57
970.73	984.64
972.33	945.98
973.67	953.48
978.58	929.82
982.85	938.34
982.85	945.50
984.66	972.19
989.64	951.47
990.71	964.47
991.23	1018.96
994.80	994.18
998.99	996.72
1005.10	944.42
1007.64	1052.96
1008.95	953.16
1013.35	945.39
1014.03	952.44
1014.55	973.14
1020.01	962.83
1020.95	1015.06
1033.41	965.55

DOWNRANGE	CROSSRANGE
1030.44	982.12
1035.96	982.70
1036.79	961.42
1044.26	961.09
1044.35	936.16
1047.05	1007.64
1047.13	990.46
1049.57	958.10
1050.90	1055.47
1054.49	959.69
1054.71	979.32
1055.84	950.62
1055.93	1005.32
1060.42	944.63
1065.12	989.57
1068.90	948.87
1073.68	963.71
1075.20	955.30
1079.11	942.52
1080.46	971.07
1080.77	955.17
1084.61	964.27
1090.06	977.23
1090.62	940.64
1092.22	935.15
1095.12	972.68
1097.84	962.85
1100.14	949.35
1102.03	986.47
1103.31	924.80
1105.39	954.14
1105.63	991.24
1106.61	937.69
1107.29	967.00
1107.77	942.10
1109.04	966.47
1110.44	978.96
1113.21	946.79
1113.83	1021.11
1115.00	940.99
1117.71	964.27
1118.49	953.04
1120.11	960.88
1122.58	953.26
1125.15	956.97
1129.16	958.76
1130.05	960.56
1130.10	978.20
1130.41	964.65
1131.11	983.10
1131.30	965.42
1132.30	1014.06
1132.66	935.77
1135.48	952.17
1135.97	986.96
1137.16	962.45
1137.25	970.46
1140.67	984.46
1141.60	995.73

DOCUMENT UNCLASSIFIED JCP-I, DPG

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1148.56	936.94
1150.92	944.07
1151.62	983.28
1153.54	974.50
1156.07	922.63
1158.49	949.86
1157.71	920.85
1159.68	935.83
1160.34	953.17
1161.09	979.43
1161.23	1007.47
1162.15	975.26
1165.13	989.80
1166.18	954.74
1166.34	961.18
1169.80	937.73
1170.73	976.70
1175.12	990.24
1176.84	951.45
1179.10	987.93
1180.97	957.01
1180.94	994.32
1182.41	969.72
1182.78	1019.79
1184.30	1030.61
1186.91	953.18
1188.29	951.43
1188.79	936.30
1190.28	958.52
1192.44	929.30
1193.91	947.01
1194.30	955.09
1194.69	940.08
1194.75	974.44
1194.84	962.43
1195.07	966.75
1195.17	945.08
1196.37	952.26
1196.64	964.94
1197.99	994.81
1198.13	942.13
1199.96	965.66
1200.40	963.53
1201.50	963.74
1201.88	1043.22
1202.67	980.63
1203.12	990.71
1203.76	960.80
1204.96	940.07
1208.04	925.52
1208.28	927.76
1208.64	947.91
1211.80	973.29
1212.78	981.44
1213.04	985.66
1213.75	967.47
1216.86	930.51

X	Z
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1217.60	918.22
1220.07	992.47
1220.51	1010.64
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1224.59	993.04
1226.89	975.97
1227.69	938.24
1229.06	969.29
1231.29	984.51
1231.86	924.86
1232.00	1014.10
1232.09	976.76
1233.55	983.62
1235.59	929.59
1236.30	970.24
1236.88	992.62
1236.95	975.30
1237.58	962.29
1241.90	979.92
1245.40	957.52
1246.94	936.08
1247.76	952.68
1250.90	1020.75
1250.99	951.77
1252.35	933.90
1253.86	974.54
1255.79	930.24
1256.24	975.52
1256.29	962.66
1258.86	932.81
1259.23	898.96
1259.72	995.31
1260.35	1002.53
1261.77	976.93
1261.86	950.96
1263.16	927.28
1264.60	959.10
1265.14	943.72
1265.18	962.46
1265.24	939.19
1265.31	1056.68
1265.88	941.47
1265.94	955.37
1266.56	939.19
1268.73	968.56
1268.94	921.70
1268.96	952.62
1270.79	1055.19
1273.37	973.83
1274.84	943.33
1274.92	1012.65
1275.40	1001.72
1275.52	911.52
1276.08	986.70
1277.58	974.32
1280.27	952.38
1280.96	967.41
1281.09	964.53

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
1281.27	996.13
1281.52	962.72
1284.92	994.53
1285.20	922.53
1287.55	956.19
1288.23	941.98
1289.12	988.14
1291.19	941.09
1291.94	974.91
1292.73	1016.41
1292.85	944.06
1292.92	950.99
1292.95	983.55
1294.47	960.39
1296.55	929.01
1297.83	981.74
1298.00	984.34
1299.49	960.27
1299.85	938.12
1300.43	939.16
1302.18	969.85
1303.75	934.86
1306.65	955.82
1307.06	960.45
1307.10	990.85
1307.64	1006.13
1308.53	958.38
1309.12	990.03
1309.36	943.65
1311.67	1006.29
1312.45	954.24
1315.01	963.07
1316.01	973.50
1316.68	1042.01
1318.72	938.96
1318.83	999.47
1319.65	963.17
1319.77	962.14
1320.74	982.21
1321.55	975.02
1321.96	961.84
1322.49	926.47
1322.56	927.51
1325.70	926.22
1327.21	951.24
1328.58	950.81
1330.41	995.24
1332.30	999.80
1334.89	1019.92
1334.94	1005.19
1337.02	963.74
1338.76	946.54
1338.88	984.27
1341.31	977.08
1342.96	966.70
1343.80	956.31
1344.37	949.24
1344.78	917.54
1348.18	922.84

X	Z
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1350.28	969.85
1351.05	971.70
1353.26	938.97
1354.15	954.74
1354.37	953.37
1355.79	929.32
1356.34	968.77
1357.41	971.63
1357.67	976.09
1358.78	960.05
1361.22	958.27
1361.73	1038.64
1361.76	976.02
1364.37	964.65
1365.13	1016.87
1368.45	934.37
1369.01	984.46
1370.22	951.87
1371.56	1004.18
1372.36	940.69
1372.40	966.01
1372.91	943.15
1375.05	967.70
1376.92	975.21
1378.35	952.10
1378.91	1003.55
1380.24	945.25
1380.45	936.50
1381.26	976.85
1381.44	964.67
1383.24	995.49
1383.91	982.43
1384.64	968.53
1385.34	957.79
1387.14	1020.49
1388.91	974.12
1391.78	937.27
1392.94	937.26
1394.26	948.20
1394.99	952.32
1395.84	938.24
1397.34	931.10
1397.52	935.18
1399.26	936.17
1404.49	957.96
1404.95	1025.79
1405.88	981.23
1407.40	960.76
1407.74	961.99
1410.49	950.78
1410.71	957.80
1411.06	1020.53
1413.20	944.04
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1416.15	967.43
1416.60	977.75
1418.68	956.55
1425.52	875.26

DOCUMENT UNCLASSIFIED JCP-I, DPG

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1442.41	945.08
1442.59	932.57
1443.37	930.70
1444.03	978.34
1444.21	902.08
1444.80	1006.27
1444.92	983.35
1448.23	978.76
1448.99	983.68
1449.02	974.01
1449.13	945.13
1451.01	961.71
1453.19	970.79
1454.42	979.17
1455.11	965.09
1457.94	982.98
1460.16	977.21
1460.89	968.56
1460.97	972.06
1465.55	913.20
1467.69	943.55
1469.48	1029.91
1470.88	961.15
1471.85	947.88
1471.95	999.24
1472.08	995.14
1473.06	984.50
1473.66	962.72
1476.36	964.34
1476.36	964.34
1476.77	957.13
1478.21	946.80
1481.11	987.42
1481.62	1025.42
1484.85	980.75
1484.85	980.75
1485.22	953.99
1485.88	981.19
1485.88	981.19
1490.10	985.49
1494.15	932.33
1497.02	926.11
1499.68	958.44
1502.07	1001.06
1509.11	986.79
1511.05	1027.10
1515.61	997.47
1515.75	978.30
1517.21	1007.51
1518.22	961.84
1524.30	961.50
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1540.55	996.23
1540.75	969.03
1541.04	1017.91
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1547.23	999.87
1548.19	956.64
1549.28	909.03
1549.59	971.71
1552.04	972.73
1552.10	997.69
1552.82	1022.78
1553.74	879.81
1556.72	1034.05
1557.96	968.31
1558.78	980.49
1560.03	933.87
1561.59	993.58
1563.10	975.70
1563.19	948.37
1563.28	995.70
1563.91	990.87
1566.08	1059.70
1566.09	993.89
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1566.47	1011.03
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1570.10	985.48
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1576.02	974.07
1576.72	999.38
1576.90	980.90
1579.76	1018.05
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1584.42	1004.49
1588.72	1021.30
1594.01	972.86
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1599.11	930.20
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1600.22	1009.33
1600.65	1007.54
1602.00	971.81
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1604.86	1001.72
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1609.43	1015.46
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1613.02	981.99
1613.52	989.34

DOCUMENT UNCLASSIFIED JCP-I, DPG

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1615.10	985.05
1616.63	988.00
1618.12	969.70
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1619.15	995.74
1620.92	963.25
1622.32	1008.25
1623.25	965.89
1623.51	992.25
1623.92	976.95
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1626.50	1003.93
1633.88	981.93
1634.23	1036.45
1634.58	926.57
1638.46	975.33
1638.86	968.83
1638.93	1008.01
1642.00	1017.44
1643.93	994.40
1646.91	989.11
1647.63	966.18
1650.19	1008.11
1650.19	1008.11
1650.38	995.42
1650.49	970.35
1650.63	1031.99
1652.07	986.89
1652.43	1006.17
1658.44	979.30
1662.01	945.62
1663.40	1038.46
1665.06	982.93
1665.15	952.36
1667.65	968.16
1668.92	980.5[illegible]
1671.76	978.71
1674.95	989.76
1677.26	1026.21
1677.94	980.47
1678.37	990.94
1680.84	1013.27
1685.21	993.04
1685.45	964.98
1685.73	956.08
1686.03	981.81
1687.01	1012.42
1692.46	974.88
1693.02	989.15
1693.87	979.02
1699.86	1023.56
1705.76	944.25
1707.55	1011.98
1710.70	976.18
1712.16	986.56
1712.50	1018.17

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1724.63	968.76
1726.17	993.79
1726.20	956.14
1726.45	966.36
1726.47	979.63
1727.95	993.62
1728.54	1031.51
1728.76	991.74
1729.00	932.02
1730.82	956.92
1733.01	991.67
1734.89	967.17
1734.99	956.55
1735.09	983.79
1736.34	995.69
1738.28	954.16
1738.97	981.61
1739.04	976.33
1739.94	958.89
1744.10	1007.56
1744.77	962.20
1746.17	1024.48
1749.05	957.76
1751.27	784.24
1755.05	960.03
1760.61	971.87
1764.25	956.04
1765.16	957.87
1766.40	958.17
1766.76	9[illegible]60
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1773.07	880.51
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1776.79	977.90
1778.10	984.35
1778.61	933.73
1781.99	980.26
1782.38	964.22
1783.06	946.83
1783.95	940.01
1784.28	973.24
1786.07	953.29
1792.31	1004.03
1793.33	941.17
1794.73	960.10
1795.09	985.66
1796.66	1007.23
1797.54	933.55
1803.28	1031.91
1804.83	977.19
1804.87	963.59
1807.74	935.68
1812.93	963.04
1814.26	971.06

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z	IDENT
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1818.98	950.44	-0
1820.81	997.12	-0
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1836.26	1021.40	-0
1842.69	1006.06	-0
1843.50	977.01	-0
1844.18	949.24	-0
1844.59	993.89	-0
1844.83	843.11	-0
1847.33	898.17	-0
1849.07	984.50	-0
1850.34	991.39	-0
1851.36	953.16	-0
1854.65	960.57	-0
1855.05	959.11	-0
1860.51	975.64	-0
1863.10	983.35	-0
1867.21	998.38	-0
1874.11	999.65	-0
1877.44	987.84	-0
1888.89	969.53	-0
1890.70	983.54	-0
1893.50	973.43	-0
1895.76	792.87	7
1907.30	1041.35	-0
1914.44	921.90	-0
1914.70	974.30	-0
1919.99	987.5[illegible]	-0
1933.67	974.05	-0
1934.52	968.59	-0
1947.03	945.52	-0
1948.38	870.39	-0
1958.14	989.21	-0
1959.65	811.78	-0
1973.89	977.42	97
1974.68	975.13	-0
1977.58	957.28	-0
1980.47	1055.40	-0
1982.14	945.28	-0
1984.07	932.75	-0
1993.27	956.88	-0
1993.66	995.10	-0
1997.32	939.88	-0
2009.97	928.35	-0
2022.85	973.45	-0
2041.79	891.35	-0
2046.38	956.43	-0
2057.37	973.25	-0
2058.93	958.35	-0
2076.50	1006.92	-0
2104.42	1004.14	-0
2112.74	872.14	-0
2116.05	855.48	-0
2131.27	993.21	0
2140.55	916.54	-0
2141.92	628.81	-0

X	Z	IDENT
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2174.51	984.09	4
2183.25	948.83	-0
2220.47	994.76	-0
2245.21	965.09	-0
2262.31	917.26	-0
2262.31	919.26	6
2287.98	909.00	-0

DOCUMENT UNCLASSIFIED JCP-4, DPG

3 MARCH 1969, MISSION 1c, PASS 2

[illegible]	[illegible]
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1120.26	1087.42
1124.21	1193.49
1131.15	1102.23
1146.77	1111.49
1147.66	1052.15
1163.70	1093.50
1150.90	1045.00
1165.94	1100.34
1178.84	1098.96
1186.76	1115.13
1190.23	1088.18
1192.28	1078.95
1201.65	1132.29
1206.44	1078.70
1207.88	1112.63
1213.09	1067.43
1213.51	1118.25
1215.25	1099.81
1216.49	1132.99
1217.90	1099.65
1233.98	1154.02
1240.83	1131.80
1241.75	1092.21
1250.41	1118.49
1251.86	1049.88
1252.84	1075.72
1252.94	1073.35
1254.42	1115.07
1255.32	1141.97
1257.22	1090.78
1266.61	1081.13
1270.67	1102.92
1275.69	1094.12
1278.11	1122.56
1278.31	1134.01
1280.84	1122.77
1285.60	1090.96
1286.54	1109.93
1287.32	1104.90
1291.69	1087.49
1293.41	1119.28
1294.90	1091.97
1295.56	1108.46
1306.59	1073.25
1307.49	1067.37
1307.75	1132.69
1313.48	1093.12
1319.81	1124.23
1320.10	1108.23
1321.41	1089.82
1321.86	1064.55
1323.89	1138.45
1325.52	1078.31
1329.98	1117.91
1334.86	1130.07
1341.19	1106.47

[illegible]	[illegible]
1352.17	1086.97
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1357.59	1136.14
1361.45	1103.02
1364.64	1042.49
1367.23	1136.53
1367.49	1042.36
1368.88	1046.72
1369.37	1094.25
1370.10	1041.66
1370.80	1041.66
1370.97	1142.76
1372.09	1114.07
1375.91	1126.76
1385.95	1090.76
1388.17	1144.24
1389.30	1087.56
1391.00	1083.93
1391.24	1103.38
1391.68	1071.94
1392.26	1073.95
1393.21	1121.84
1393.91	1098.53
1393.98	1131.06
1397.35	1078.96
1403.70	1112.57
1404.08	1064.90
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1412.29	1169.72
1416.62	1126.51
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1421.72	1085.19
1421.75	1105.42
1421.79	1162.41
1422.06	1070.46
1422.52	1054.09
1423.36	1031.02
1426.49	1082.77
1426.55	1096.99
1427.71	1067.70
1427.91	1077.98
1428.41	1110.70
1429.04	1086.97
1430.23	1082.37
1432.56	1141.12
1435.24	1111.44
1436.42	1139.51
1437.80	1079.42
1438.34	1081.54
1443.57	1113.32
1444.80	1065.81
1447.94	1119.43
1447.98	1123.79
1447.99	1040.67
1448.43	1133.81
1449.78	1095.83
1449.91	1069.74

DOCUMENT UNCLASSIFIED JCP-I, DPG

A	L
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1454.55	1053.96
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1461.45	1070.15
1463.33	1095.10
1464.11	1073.48
1464.71	1101.96
1465.30	1075.17
1465.51	1073.77
1466.35	1088.52
1468.20	1174.38
1469.51	1052.66
1473.85	1086.19
1476.13	1074.37
1478.73	1097.37
1481.77	1075.16
1483.08	1099.87
1485.76	1112.98
1489.04	1083.87
1489.56	1192.51
1489.68	1131.25
1491.50	1089.02
1493.21	1107.23
1493.55	1079.95
1495.26	1092.33
1497.98	1124.81
1498.64	1154.10
1501.36	1207.87
1501.43	1088.56
1501.74	1121.52
1503.64	1090.70
1507.05	1195.41
1508.53	1104.56
1510.13	1117.60
1512.65	1069.02
1513.12	1079.05
1517.46	1140.97
1522.88	1043.28
1525.00	1074.36
1526.21	1084.11
1529.17	1105.49
1529.37	1057.15
1529.55	1061.92
1534.50	1059.57
1535.49	1116.63
1536.89	1125.94
1539.23	1101.49
1540.17	1026.40
1543.66	1080.55
1544.44	1094.18
1547.32	1096.49
1549.33	1080.22
1551.03	1112.51
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1554.11	1113.13
1554.40	1056.83

A	L
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1559.80	1148.43
1559.89	1147.93
1560.83	1127.35
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1563.27	1108.45
1565.75	1042.39
1566.17	1091.70
1568.09	1125.36
1569.79	1125.52
1570.29	1052.05
1570.34	1127.96
1570.45	1160.97
1570.90	1121.64
1574.94	1099.14
1575.08	1100.77
1575.96	1020.46
1576.52	1119.86
1577.33	1073.79
1579.47	1030.63
1581.03	1099.33
1582.36	1127.75
1582.99	1130.20
1584.09	1134.61
1584.87	1140.75
1585.01	1094.52
1585.13	1107.47
1586.80	1100.41
1588.02	1111.55
1588.11	1132.29
1590.13	1117.97
1593.57	1142.98
1594.35	1131.81
1595.74	1140.75
1598.36	1063.52
1602.40	1064.03
1603.35	1111.52
1608.07	1097.10
1609.98	1059.30
1613.71	1168.54
1615.42	1109.54
1617.57	1056.03
1618.55	1088.90
1618.55	1141.02
1618.90	1135.43
1622.44	1068.31
1625.99	1101.86
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1642.76	1072.40
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DOCUMENT UNCLASSIFIED JCP-I, DPG

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1668.63	1138.62
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1673.22	1151.42
1674.99	1034.19
1675.78	1045.27
1675.94	1049.31
1679.90	10[illegible]3.96
1682.04	1062.32
1684.94	1032.14
1686.29	1093.32
1686.86	1105.83
1686.88	1065.21
1688.26	1103.18
1689.66	1114.50
1689.83	1100.05
1691.03	1091.67
1691.46	1098.09
1693.79	1087.47
1695.10	1103.13
1702.14	1066.14
1703.84	10[illegible]7.95
1704.46	1104.90
1710.84	1102.38
1716.10	1096.36
1716.19	1136.62
1716.39	1102.68
1718.23	1082.68
1720.10	1104.22
1720.42	1081.83
1720.44	1105.83
1723.02	1121.02
1723.84	1091.16
1725.18	1118.02
1727.48	1059.38
1728.37	1071.03
1732.39	1121.64
1734.24	1044.41
1735.32	1131.27
1736.10	1064.07
1736.30	1112.09
1737.37	1070.70
1737.82	1104.03
1738.72	1049.64
1739.00	1050.77
1740.22	1097.44
1742.33	1068.00
1742.75	1045.43
1744.69	1098.21
1745.55	1139.30
1746.51	1129.30
1748.05	1078.46
1748.32	1119.31
1752.40	1096.78
1753.76	1048.00
1756.27	1106.10

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1757.71	1101.81
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1761.50	1093.16
1763.42	1028.68
1767.97	1087.27
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1770.32	1086.20
1772.04	1085.54
1773.87	1085.46
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1778.36	1092.95
1782.52	1096.55
1784.80	1082.47
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1786.17	1095.88
1789.33	1109.74
1793.01	1082.51
1793.14	1071.65
1796.27	1075.86
1796.96	1110.44
1799.85	1083.67
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1800.28	1075.42
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1803.57	1123.10
1805.38	1084.36
1808.77	1085.28
1809.03	1080.15
1813.80	1088.05
1815.91	1095.28
1828.28	1074.04
1833.22	1071.72
1834.15	1143.11
1836.23	1112.89
1838.34	1052.74
1839.71	1130.97
1843.07	1068.86
1844.41	1104.63
1847.83	1027.71
1849.27	1076.72
1851.25	1077.65
1956.36	1061.33
1858.07	1068.31
1858.40	1083.77
1865.44	1091.58
1868.44	1127.62
1868.78	1075.86
1868.81	1097.77
1869.78	1075.77
1870.47	1109.99
1873.14	1119.72
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1876.74	1061.62
1880.21	1071.49
1880.96	1050.32

DOCUMENT UNCLASSIFIED JCP-I, DPG

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1894.81	1136.32
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1899.81	1073.31
1900.13	1053.24
1905.09	1068.69
1905.09	1068.69
1905.94	1087.81
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1910.60	1090.13
1910.44	1088.68
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1918.48	1127.73
1923.26	1120.88
1923.78	1086.67
1924.80	1173.91
1925.72	1090.80
1926.23	1128.18
1927.88	1072.36
1928.29	1099.82
1929.63	1050.00
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1947.18	1077.70
1[illegible].52	1046.97
1946.56	1089.86
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1954.89	1127.71
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1961.39	1117.57
1965.40	1087.12
1969.71	1045.73
1973.00	1057.36
1976.25	1135.07
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1978.63	1116.41
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1987.21	1099.39
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1989.76	1125.58
1990.30	1139.80
1991.27	1103.44
1992.61	1072.78

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2011.53	1078.67
2011.61	1139.56
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2018.43	1109.28
2020.14	1141.51
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2020.65	1091.07
2020.93	1105.48
2021.81	969.73
2022.20	1120.87
2023.62	1103.11
2024.10	1083.90
2029.21	1066.61
2029.60	1121.92
2030.71	1116.17
2032.78	1104.35
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2034.98	1122.38
2035.48	1116.46
2037.21	1139.25
2038.42	1125.56
2041.02	1056.70
2043.37	1116.92
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2047.15	1102.32
2048.39	1098.40
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2049.30	1095.66
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DOCUMENT UNCLASSIFIED JCP-I, DPG

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2085.01	1095.27
2087.24	1098.25
2089.68	1077.97
2089.94	1150.56
2091.22	1064.65
2092.21	1121.34
2092.89	1061.77
2094.78	1114.14
2097.51	1094.06
2098.97	1089.53
2099.77	1161.60
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2103.43	1080.05
2103.51	1178.39
2104.73	987.40
2107.86	1083.47
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2112.95	1142.35
2114.58	1094.72
2115.22	1100.05
2117.71	1106.38
2120.71	1131.14
2120.95	1123.06
2124.21	1119.96
2124.37	1096.97
2124.39	1141.35
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2126.40	1091.57
2128.81	1103.41
2129.38	1097.02
2130.89	1091.96
2132.44	1105.48
2132.72	1106.46
2134.38	1106.00
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2137.34	1092.92
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2139.94	1097.43
2141.58	1153.46
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2177.86	1167.67
2178.53	1134.12
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2182.77	1117.96
2183.61	1151.41
2184.87	1112.33
2184.93	1091.93
2191.67	1168.89
2192.63	1116.04
2192.86	1089.53
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2195.19	1115.75
2195.25	1128.78
2195.70	1097.46
2196.87	1117.38
2197.54	1069.43
2200.13	1025.10
2204.06	1107.06
2207.91	1093.16
2208.07	1154.66
2208.07	1054.66
2209.58	1085.63
2217.85	1136.70
2222.21	1046.97
2228.75	1070.02
2232.79	1020.24
2237.92	1104.65
2237.93	1092.25
2239.74	1077.61
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2250.47	1151.82
2253.20	1107.28
2257.23	1079.81
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2265.20	1124.26
2266.27	1141.54
2273.78	1152.19
2279.56	1123.07
2280.03	1073.54
2281.49	1091.70
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2285.60	1159.90
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2289.72	1060.58
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DOCUMENT UNCLASSIFIED JCP-I, DPG

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2296.13	1174.22
2296.38	1115.52
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2300.69	1099.68
2309.73	1092.87
2302.62	1163.33
2305.86	1071.76
2306.42	1080.14
2306.58	1101.18
2307.81	1154.15
2309.17	1104.50
2310.12	1133.53
2310.92	1051.19
2314.75	1092.66
2315.86	1046.17
2315.96	1121.97
2317.69	1008.67
2320.00	1059.12
2321.18	1162.86
2322.88	1064.65
2324.15	1047.54
2329.12	1086.00
2326.78	1104.92
2329.35	1139.59
2329.73	1041.17
2334.24	1170.26
2334.31	1131.18
2349.69	1051.35
2349.29	1060.39
2363.99	1059.95
2393.66	1047.62
2399.60	973.22
2431.75	1100.16
2458.69	1096.70
2490.69	1076.15
2513.45	1059.80
2521.64	1102.69
2527.51	1074.03
2549.49	1032.66
2560.67	1133.11
2573.87	1050.41
2578.90	1117.61
2584.29	1117.29
2594.60	1138.97
2569.31	1027.38
2544.22	1131.67
2594.87	1071.55
2609.61	1126.66
2629.92	1118.48
2635.05	1117.72
2636.60	1148.94
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DOCUMENT UNCLASSIFIED JCP-I, DPG

3 MARCH 1969, MISSION 16, PASS 3

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1001.42	975.38
1009.76	994.09
1010.88	1033.25
1011.20	953.27
1013.23	964.00
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1020.67	947.33
1024.73	951.32
1025.74	962.28
1034.10	939.59
1036.97	952.16
1037.60	965.27
1038.83	1009.08
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1098.18	929.25
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1102.38	998.56
1103.62	956.16
1104.27	1006.63
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DOWNRANGE	CROSSRANGE
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1149.54	980.56
1154.72	1017.76
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1156.97	979.13
1165.78	970.65
1166.22	957.62
1167.67	1031.77
1173.05	1012.69
1174.66	1006.81
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1238.85	1029.09
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1262.93	961.83
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1264.74	1026.46
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DOCUMENT UNCLASSIFIED JCP-I, DPG

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1295.18	1015.37
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1302.41	1009.93
1303.59	972.08
1304.14	980.48
1305.99	1007.93
1306.42	993.12
1307.37	1029.79
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1312.42	1016.90
1312.52	1019.17
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1313.67	1011.34
1319.45	992.06
1321.96	1058.54
1322.15	1006.05
1324.54	1007.94
1325.65	1052.57
1325.69	1042.75
1328.28	1004.44
1330.65	998.97
1330.65	975.85
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1331.37	1078.64
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1342.71	1044.67
1344.88	1032.67
1345.27	986.73
1347.60	979.82
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1352.01	1019.59
1353.83	959.50
1358.14	1022.21
1359.31	996.45
1363.22	1027.04
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1373.33	976.56
1376.96	1007.89
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1379.53	1017.04
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1419.24	965.13
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1424.36	1035.25
1426.81	964.35
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1430.72	1008.18
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1444.69	979.77
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1449.15	1011.34
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1451.26	997.73
1452.39	1016.89
1454.62	1001.82
1455.08	1051.35
1457.39	1010.31
1459.90	921.46
1460.96	1053.77
1467.01	1063.03
1467.16	1013.73
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1476.50	975.43
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1477.36	1029.68
1478.73	989.78
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1483.27	1011.34
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DOCUMENT UNCLASSIFIED JCP-I, DPG

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1513.21	1011.11
1516.94	1066.33
1517.35	1016.75
1518.69	1016.99
1521.82	1033.16
1523.84	909.80
1524.12	994.78
1527.17	865.68
1528.79	1000.16
1530.28	1095.07
1530.46	1013.27
1530.99	1036.52
1533.79	996.81
1535.07	1022.73
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1546.20	1008.69
1550.00	1003.12
1550.29	1044.03
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1552.15	1042.35
1552.97	1016.33
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1559.42	1225.07
1560.14	1018.43
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1570.21	1008.26
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1572.66	1001.35
1572.72	924.64
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1588.04	1104.35
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1589.09	1019.33
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1595.44	994.06
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1644.69	973.47
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1665.23	021.52
1667.07	930.49
1667.53	991.12
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1679.73	1026.02
1688.49	1035.45
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1705.76	996.67
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1717.26	872.31
1722.02	994.17
1725.17	976.11
1739.90	1034.59
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1752.53	949.96
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1790.19	958.83
1800.11	1003.65
1804.41	932.83
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DOCUMENT UNCLASSIFIED JCP-1, DPG

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2151.13	996.56
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2163.66	1006.49
2166.28	1014.37
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2172.71	996.60
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2185.57	960.23
2189.02	980.94
2192.82	1033.14
2193.37	963.17
2193.95	993.59
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2199.02	981.60
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2199.11	1021.71
2201.34	1018.53
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2204.91	1017.18
2205.33	1012.64
2205.35	985.30
2210.44	985.55
2212.50	985.51
2212.52	1030.40
2214.16	1020.77
2215.32	1042.10
2217.21	1032.91
2220.15	959.12
2223.87	1007.98
2226.95	1013.50
2227.24	1013.96
2232.02	941.00
2232.02	895.01
2233.34	948.52
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2236.75	1033.04
2238.18	1000.85
2240.54	997.65
2243.30	1037.75
2245.06	1005.29
2246.48	1001.61
2248.42	1019.47
2250.20	1024.36
2250.93	1014.43
2252.52	1024.36
2252.73	1012.28

X	Z
1837.34	1012.28
1838.57	1010.54
1849.82	1013.47
1851.85	959.85
1854.54	1074.13
1854.88	901.25
1877.65	1047.46
1881.10	947.52
1902.85	956.81
1908.80	964.23
1920.78	934.80
1961.74	1009.67
1968.88	936.59
1969.79	966.65
1998.74	967.80
2003.54	955.75
2004.45	986.77
2011.71	1001.54
2013.03	976.56
2018.34	934.42
2022.06	959.84
2025.13	952.76
2026.48	974.08
2027.45	962.50
2040.74	949.21
2041.68	910.45
2044.46	939.57
2049.74	968.35
2051.28	977.28
2055.69	958.62
2055.73	969.93
2055.93	980.50
2058.54	983.31
2059.35	959.97
2059.48	943.80
2067.85	951.71
2072.51	952.38
2074.04	942.21
2074.59	923.32
2075.39	959.79
2088.34	982.06
2088.73	950.58
2094.36	933.25
2094.58	969.28
2096.10	943.79
2096.74	935.00
2097.32	1018.28
2102.67	958.43
2104.66	965.69
2109.31	915.67
2111.40	976.96
2116.24	953.33
2121.52	960.69
2126.24	1041.61
2131.53	959.73
2132.09	957.50
2132.72	949.88
2134.39	1012.37
2140.68	971.02

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
2266.53	979.82
2267.69	961.69
2268.72	945.22
2269.85	1038.24
2274.17	1015.95
2274.33	1030.31
2278.93	969.06
2286.67	991.66
2290.85	1146.72
2296.93	993.91
2298.05	1046.27
2298.08	999.78
2303.55	977.69
2312.61	1022.89
2316.76	1133.60
2321.67	1007.02
2328.53	1008.96
2334.13	1155.69
2345.95	1023.01
2346.46	974.78
2349.19	1034.56
2354.09	994.92
2417.53	975.35
2431.89	973.34
2438.10	1000.89
2439.61	1009.32
2440.00	1028.56
2445.75	1052.32
2447.34	1040.85
2454.72	1008.28
2455.64	1017.77
2456.19	1024.00
2457.49	980.71
2465.04	1021.19
2467.26	1011.71
2472.67	1039.50
2481.09	1005.49
2488.02	1073.37
2500.42	1013.35
2501.01	923.19
2506.00	1023.56
2508.63	963.09
2508.80	1000.79
2510.16	1039.94
2516.57	1012.64
2527.97	1041.07
2531.17	1021.37
2535.03	892.70
2537.13	1061.60
2538.18	1018.63
2539.69	1001.79
2539.93	1000.66
2544.88	1015.64
2548.72	880.47
2550.20	902.33
2552.38	989.00
2553.12	1000.92
2555.63	1008.21
2558.24	929.14

X	Z
2558.39	1012.23
2558.42	966.44
2559.85	988.71
2560.76	1021.71
2564.80	962.91
2566.98	1030.17
2570.77	1048.71
2572.54	1011.62
2575.86	1031.36
2580.05	1033.43
2582.11	1008.16
2583.27	1030.23
2585.48	1013.14
2592.94	1019.98
2594.02	1031.52
2597.38	1165.11
2599.63	1051.33
2605.22	1052.80
2605.42	1009.27
2606.57	1013.30
2606.66	985.24
2608.01	1006.11
2608.17	1002.82
2609.63	1004.71
2613.60	997.77
2627.24	1005.37
2630.38	988.23
2630.43	1000.26
2632.60	999.39
2633.09	1002.32
2633.50	1000.09
2635.31	946.93
2650.26	1002.93
2654.47	1011.92
2654.66	1060.99
2664.39	989.35
2669.65	1032.36
2681.59	1031.09
2696.63	986.21
2703.66	1017.48
2704.45	924.05
2704.88	973.84
2711.84	955.47
2715.22	989.50
2720.79	963.29
2726.86	936.26
2730.21	988.82
2761.31	990.83
2765.63	969.45
2779.75	886.82
2814.26	965.65
2817.14	992.57
2917.70	971.76
2826.84	959.34
2923.44	935.81
2931.04	890.92
2998.30	980.79

DOCUMENT UNCLASSIFIED JCP-J, DPG

APRIL 1969, MISSION 13, PASS 2

DOWNRANGE	CROSSRANGE	DOWNRANGE	CROSSRANGE
-83.48	754.01	128.33	737.56
-74.77	761.21	128.52	784.64
-73.74	770.16	130.35	724.74
-72.23	754.90	132.20	715.39
-71.34	769.65	132.27	6CC.4[illegible]
-71.0[illegible]	780.87	134.1[illegible]	71P.[illegible]
-70.61	733.01	135.25	76[illegible].[illegible]
-68.64	782.9[illegible]	135.42	755.24
-65.88	711.50	136.17	748.CC
-64.46	755.34	137.81	759.[illegible]5
-63.78	740.78	141.[illegible]C	751.[illegible]5
-61.7C	72C.6C	141.33	767.55
-58.21	729.75	141.65	747.C7
-50.6C	732.99	142.91	764.15
-46.53	743.01	144.76	753.33
-41.8[illegible]	764.[illegible]e	144.9C	724.57
-41.77	769.58	146.35	759.2[illegible]
-37.62	752.3[illegible]	148.[illegible]3	72[illegible].17
-29.18	759.7C	149.27	772.55
-27.95	751.92	151.22	[illegible]9.2C
-26.37	769.3C	151.5[illegible]	72C.[illegible]1
-24.07	728.3C	153.52	729.C5
-19.90	787.92	154.11	727.55
-19.6C	781.16	155.6C	789.17
-13.11	773.35	156.44	724.3C
-11.17	748.67	157.5[illegible]	784.5[illegible]
-5.8C	757.71	159.84	739.3[illegible]
-3.41	735.93	165.3[illegible]	777.27
-2.68	72C.93	165.61	7[illegible]0.59
-C.8[illegible]	742.44	166.85	[illegible]87.2C
3.61	749.1C	17C.21	736.C[illegible]
4.79	755.15	171.45	754.19
7.7C	777.11	177.9[illegible]	[illegible]87.15
10.34	770.38	179.27	77[illegible].[illegible]
12.29	726.7C	1[illegible]4.37	761.44
12.67	737.34	1[illegible]4.9C	73C.[illegible]4
12.79	732.3C	18[illegible].1[illegible]	692.[illegible]8
21.8[illegible]	730.77	19C.26	7[illegible].[illegible]2
25.04	744.24	195.14	726.[illegible]9
25.47	747.22	19[illegible].05	737.17
25.9[illegible]	719.84	198.61	[illegible]C9.[illegible]4
29.85	72C.7C	199.4[illegible]	73[illegible].5[illegible]
33.06	777.84	2C2.25	761.75
3[illegible].2[illegible]	778.43	2C2.5[illegible]	737.73
40.43	766.C[illegible]	2C[illegible].22	7[illegible].4[illegible]
44.0[illegible]	737.5C	215.12	7[illegible].9[illegible]
56.97	712.79	217.03	713.95
58.17	751.16	219.41	7[illegible].[illegible]9
58.95	754.93	221.11	731.2C
65.07	761.32	221.24	75[illegible].27
73.19	75C.22	221.81	732.[illegible]8
75.99	763.59	222.61	741.77
77.92	751.85	223.84	759.94
79.25	739.05	224.5[illegible]	77[illegible].5[illegible]
123.32	746.91	224.6[illegible]	733.25
123.39	767.17	227.37	[illegible]28.27
125.8C	8C2.2[illegible]	227.65	7C3.5[illegible]
126.17	739.25	227.85	758.6[illegible]
126.26	764.7[illegible]	233.61	756.71

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
241.94	741.24
245.99	760.58
249.99	760.58
251.34	776.02
258.12	784.71
260.05	760.56
260.13	825.21
260.66	755.18
261.93	766.52
262.49	758.81
264.54	752.02
274.61	794.94
274.87	715.97
274.89	726.09
276.93	726.56
277.12	605.70
279.05	724.37
279.26	774.96
279.93	710.69
279.61	673.30
280.26	789.18
280.65	751.36
282.39	711.60
283.18	736.85
283.23	716.12
283.24	789.48
284.65	784.67
286.62	755.14
286.86	751.67
286.98	748.21
287.82	768.79
287.72	815.40
288.90	726.83
290.60	742.91
290.85	818.86
291.27	7[illegible].37
292.64	76[illegible].94
295.87	722.58
295.90	785.70
296.32	772.78
296.72	705.28
297.93	763.92
297.59	766.93
297.96	710.47
299.04	710.11
299.26	721.83
300.22	765.38
300.22	798.54
301.42	781.87
301.73	751.48
302.43	776.91
302.44	757.55
302.67	773.27
302.80	732.48
303.05	726.27
305.00	737.37
306.73	721.29
307.15	723.39
307.55	749.67

X	Z
307.76	736.11
310.28	732.67
310.39	742.30
310.58	756.21
310.67	736.44
313.29	693.27
313.25	757.54
313.69	740.01
314.48	729.96
314.97	734.19
319.20	753.46
320.42	751.24
320.47	741.99
320.53	744.61
320.53	775.15
321.02	750.10
321.64	748.62
322.84	783.53
322.98	784.92
323.47	728.74
324.17	768.84
325.25	764.83
326.48	746.08
328.68	741.42
330.28	778.78
334.20	767.46
335.10	735.87
338.48	718.11
338.56	700.82
338.71	715.06
340.19	736.61
340.41	772.46
340.45	724.99
340.64	799.52
341.63	746.04
344.27	687.76
344.98	798.52
345.84	769.02
345.99	707.88
346.27	762.65
347.41	736.65
348.64	746.69
348.83	708.86
349.33	778.72
349.57	800.72
350.07	754.00
350.42	741.48
352.80	732.79
352.87	770.60
353.13	762.60
355.07	794.46
355.28	751.91
355.49	757.74
356.20	750.04
356.50	709.51
357.07	771.43
359.23	85..92
360.63	752.99
360.66	718.54

DOCUMENT UNCLASSIFIED JCP-I, DPG

SECRET

X	Y
365.CS	[illegible]
366.G5	[illegible]
367.0E	777.62
367.4E	794.8[illegible]
367.75	H2C.C9
368.56	[illegible]
368.79	784.7E
369.24	7C8.25
369.71	779.52
371.29	719.[illegible]
372.25	[illegible]
373.25	788.52
374.5C	716.75
375.8C	788.C[illegible]
376.6E	774.72
376.7C	[illegible]
377.89	714.1E
379.73	714.9E
3BC.1E	799.8[illegible]
3BC.83	HC2.37
381.87	761.C1
382.44	755.6[illegible]
382.5C	767.25
382.79	762.9E
383.24	775.9C
383.65	764.H[illegible]
383.69	HC8.72
383.97	771.34
384.31	772.3E
384.HC	783.61
384.93	774.49
385.11	741.73
385.5C	761.62
387.4C	750.98
387.91	756.32
388.51	755.34
388.6E	756.7C
385.1E	751.3[illegible]
389.74	736.29
390.1E	771.0E
391.C7	764.4E
391.7B	769.49
392.CC	734.1C
392.72	7C8.91
393.67	713.E4
393.72	728.52
393.85	685.35
394.29	724.[illegible]
394.41	76C.C2
395.05	816.55
395.21	[illegible]
395.JL	7H7.9[illegible]
396.53	74C.53
396.75	756.E7
398.3[illegible]	779.8[illegible]
399.2E	751.12
399.64	771.42
399.85	776.74
4CC.12	755.12

X	Y
4CC.5C	7E7.4C
402.94	755.9[illegible]
402.94	747.14
4C4.23	756.51
4C4.H5	724.H1
4C5.13	772.4C
4C5.37	754.61
4C6.22	774.07
4C6.44	743.32
4CE.87	73C.85
4C9.21	756.64
41C.24	7E1.41
41C.H4	77C.74
411.11	734.63
411.54	783.14
413.95	7E1.3C
414.44	H13.23
415.4[illegible]	H17.67
415.48	779.15
416.83	715.73
417.01	719.27
417.17	744.4C
41[illegible].81	746.49
418.99	759.39
415.82	730.57
42C.01	723.48
42C.1[illegible]	7E3.1C
42C.45	739.HC
42C.5C	744.42
42C.7C	720.97
421.C2	756.09
421.41	778.3C
422.0E	738.58
422.43	735.03
423.11	75C.34
424.14	762.4[illegible]
424.24	771.25
424.33	714.C2
424.73	7HC.[illegible]
425.1E	7E6.37
425.25	736.05
425.41	74[illegible].C5
425.62	754.1C
426.19	733.57
424.5E	745.6E
426.51	743.24
428.11	H49.25
428.5C	HC3.46
429.62	71[illegible].07
43C.04	729.3C
43C.2[illegible]	6H5.52
43C.45	852.4E
431.39	HCC.77
433.44	75C.4C
434.03	7H7.24
434.2C	HC3.71
435.65	7E2.81
43E.2E	769.14
436.59	71E.28

SECRET

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Y
437.09	787.CO
438.81	768.56
438.82	763.31
44C.4C	73F.M5
44C.49	712.33
44C.63	BCC.4C
44C.99	748.C3
440.9E	782.91
441.31	751.7[illegible]
442.2C	711.8C
442.41	752.60
442.77	764.C4
442.77	764.C4
442.94	81C.31
443.16	863.CB
443.67	747.2P
443.85	728.36
444.75	812.94
445.44	725.78
44E.0H	755.02
44E.0B	755.02
446.31	752.67
446.31	752.67
446.84	723.11
450.4C	739.69
450.85	739.98
451.00	718.4C
451.29	745.16
451.29	745.16
452.C9	747.C3
452.09	747.C3
452.14	888.CC
455.41	747.17
455.41	747.17
455.6H	779.23
455.96	780.2C
456.19	764.41
456.23	820.99
457.91	742.73
458.15	822.60
46C.CC	828.97
460.8E	793.H9
461.63	738.02
463.80	737.24
463.87	745.52
464.12	8C4.24
464.31	773.5E
464.82	772.11
464.89	769.71
46[illegible].29	746.97
46E.07	742.C7
466.59	781.53
466.59	781.53
467.36	828.66
468.66	834.24
47C.15	737.6E
474.3C	761.62
474.7C	735.14
474.79	736.68

X	Y
475.28	749.83
475.32	713.1H
475.97	H24.65
477.15	77C.[illegible]
477.9E	783.26
478.89	H24.95
479.44	743.E8
479.67	763.5E
4EC.02	73F.C3
4EC.8E	759.E2
482.5C	6E0.E7
482.85	[illegible]C7.7H
483.13	729.45
483.32	722.97
483.57	755.63
485.C9	777.34
485.19	773.3E
486.81	831.87
486.0C	772.24
491.21	777.4[illegible]
492.CC	719.95
492.84	812.35
492.97	764.61
493.69	766.76
495.44	752.66
495.4E	757.27
495.82	755.7C
495.9E	743.C6
496.19	732.[illegible]7
496.41	794.44
496.5E	742.12
498.32	741.16
498.94	HCC.2E
499.45	725.49
499.54	818.33
499.76	76E.0H
5CC.57	753.97
5C1.CE	724.2E
5C1.79	739.17
5C2.39	742.14
5C2.44	792.73
5C2.84	747.15
5C3.0E	782.82
5C3.31	776.94
5C3.84	8C1.34
5C3.8H	765.91
5L4.9C	75E.[illegible]3
5C5.62	77E.H7
5C5.8C	761.97
5C5.8C	761.97
511.07	769.77
511.53	7[illegible].1E
511.6C	7[illegible].2E
513.1E	8C5.59
513.7[illegible]	772.61
514.01	H12.95
515.0E	759.79
515.8E	739.51
517.24	752.39

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Y
517.98	813.63
519.04	760.24
519.16	807.35
519.37	758.42
520.23	777.17
521.65	814.07
524.97	773.11
524.04	774.18
526.42	747.81
528.35	795.58
528.98	784.68
528.99	773.79
529.72	770.59
531.77	794.44
532.26	767.17
532.37	760.07
532.38	741.12
532.64	769.59
533.62	666.75
533.66	791.64
533.88	737.40
534.45	758.29
535.76	804.34
537.99	769.42
539.32	664.33
539.35	825.83
540.74	769.95
541.99	765.42
543.08	753.05
543.11	769.10
543.29	717.37
544.30	763.40
544.75	739.95
545.02	721.29
546.16	729.62
546.98	772.01
547.26	768.65
547.27	798.70
548.24	785.97
548.36	767.09
551.93	800.39
552.96	768.17
554.00	798.21
554.26	758.21
554.78	771.91
555.48	798.62
555.85	803.16
557.10	736.89
557.71	773.83
559.29	775.28
560.29	794.13
560.61	712.16
560.78	745.92
562.33	744.84
562.45	709.20
563.15	739.93
563.67	701.30
563.92	781.89
564.62	727.55

X	Y
567.12	810.20
568.72	772.29
568.91	810.47
569.03	744.92
569.18	703.82
569.30	773.12
569.58	711.83
570.78	748.04
571.46	778.70
572.61	744.61
573.03	769.21
573.64	723.74
574.02	703.46
574.85	756.29
575.51	742.98
576.[illegible]	755.55
576.21	739.05
577.52	778.32
578.38	870.83
578.43	731.08
580.70	758.53
580.86	781.76
581.22	802.32
581.51	777.31
582.53	719.65
582.76	729.82
582.87	748.28
583.21	821.63
583.94	758.74
584.10	782.21
585.17	750.17
585.66	703.83
587.77	748.67
588.51	804.48
588.17	712.15
589.22	775.59
589.25	734.59
589.88	727.39
590.93	757.24
592.66	769.47
594.92	751.03
595.28	753.74
595.44	755.67
595.58	784.00
595.93	703.43
596.27	753.85
597.67	707.61
598.25	758.97
598.62	812.28
600.21	784.58
600.33	701.16
601.50	771.45
601.93	825.23
604.05	742.49
604.11	671.98
604.05	804.75
604.12	723.12
604.22	782.58
604.36	752.44

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
610.19	751.22
611.17	800.79
611.32	760.75
613.10	809.13
613.32	729.05
613.56	725.71
614.17	801.04
614.18	678.31
614.25	837.80
615.61	776.12
615.76	794.74
617.75	800.52
618.02	748.83
618.78	741.16
619.90	733.71
620.06	762.32
625.41	786.79
628.58	733.81
628.64	735.87
628.69	738.96
629.77	790.66
629.99	772.40
630.63	741.14
632.35	741.03
632.85	765.73
633.93	773.68
634.56	763.26
635.19	777.49
635.26	745.34
637.02	746.54
640.56	780.30
640.70	772.98
645.56	722.55
646.70	737.74
647.43	745.41
647.55	733.61
648.88	840.06
649.38	788.02
650.26	805.73
650.54	750.55
651.68	840.10
653.70	715.35
656.10	797.04
658.32	799.87
658.36	709.85
662.70	765.48
662.94	755.79
663.34	800.66
663.40	760.30
663.57	762.60
666.70	773.56
667.92	744.14
668.11	739.84
668.73	711.90
670.10	733.27
670.47	718.96
671.51	734.70
672.48	746.75
673.48	776.41

X	Z
675.45	801.86
680.18	801.47
682.80	752.00
684.23	765.80
686.43	718.49
688.69	821.45
687.52	738.63
689.11	711.39
690.83	723.25
691.56	769.94
693.17	764.27
694.83	759.64
697.45	730.10
697.45	730.10
697.67	827.17
700.16	705.91
701.59	637.28
702.59	715.47
703.02	828.86
704.93	704.12
705.11	708.21
709.13	732.66
708.76	804.08
711.65	732.19
712.61	833.61
714.91	760.37
715.76	744.51
716.16	727.74
716.65	683.04
716.67	693.75
717.30	791.25
718.92	752.81
719.24	740.12
719.32	794.03
719.41	710.69
719.58	749.85
720.74	698.69
720.95	749.91
723.20	738.67
723.44	706.35
723.78	775.06
724.01	729.51
724.67	762.23
724.75	733.08
725.01	752.35
727.04	769.23
727.41	786.68
728.52	744.03
729.24	726.73
729.53	800.73
731.86	725.19
733.04	758.51
735.25	792.67
735.56	694.34
737.35	723.64
738.23	793.19
738.53	769.32
739.17	740.56
740.28	742.26

DOCUMENT UNCLASSIFIED JCP-1, DPG

x	y
740.53	778.10
740.75	722.72
742.05	715.72
742.57	740.10
743.28	782.54
744.90	702.47
745.58	777.64
746.22	726.20
746.55	754.93
748.87	753.71
750.24	719.37
750.74	752.77
750.83	786.28
752.13	754.30
753.80	715.51
754.57	760.91
755.89	773.62
758.47	775.73
761.10	726.05
767.50	709.43
768.[illegible]	747.10
769.90	742.84
774.88	710.26
776.00	778.47
776.82	715.97
779.37	795.61
779.85	722.47
780.17	745.29
782.36	772.84
782.90	664.84
785.63	737.21
785.64	807.36
786.41	700.00
787.92	765.66
789.88	738.19
789.90	732.84
791.46	708.62
792.60	773.94
793.83	711.02
793.95	752.40
794.26	760.00
796.43	723.20
796.17	807.46
803.36	722.45
807.40	672.41
809.47	720.70
812.23	744.29
814.86	751.26
816.04	760.09
819.83	747.21
823.11	749.20
824.53	737.49
826.12	752.08
827.41	719.31
829.21	733.27
831.19	751.81
831.65	727.64
833.78	729.76
838.05	760.26

x	y
839.54	748.98
840.87	807.66
842.80	793.76
846.34	658.12
847.11	786.10
847.73	819.72
848.62	747.16
849.87	670.93
850.13	740.60
852.75	759.63
852.86	782.12
853.64	728.32
853.78	749.47
855.96	759.12
856.41	749.03
861.41	740.05
862.94	727.82
863.67	740.26
864.52	712.74
865.62	791.92
868.04	763.60
868.78	793.32
869.46	651.09
870.14	731.62
872.45	751.69
874.81	730.38
878.55	767.24
879.60	757.44
880.95	709.00
883.03	761.09
886.43	763.64
887.72	801.71
890.58	735.11
891.51	709.33
892.83	716.99
897.87	773.33
898.77	712.81
899.21	726.56
900.86	773.26
901.19	787.57
903.62	764.84
904.09	774.61
911.38	729.15
913.59	737.80
916.67	748.35
916.72	797.37
917.24	702.20
919.52	713.76
920.24	711.26
925.21	711.51
926.75	706.66
927.69	769.20
930.83	711.37
932.78	759.14
933.44	768.20
933.79	728.63
935.26	729.12
936.56	738.27
939.13	736.17

DOCUMENT UNCLASSIFIED JCP-I, DPG

x	y
542.42	732.24
949.69	762.11
951.44	769.71
951.81	747.47
953.70	734.98
956.37	752.12
957.56	745.54
958.28	738.58
961.09	719.48
965.62	758.20
965.75	764.01
966.24	790.48
969.46	675.64
972.40	703.87
974.18	699.01
975.26	717.85
976.09	727.20
978.52	761.28
979.02	786.32
979.68	658.07
979.89	735.16
980.59	732.74
980.60	729.47
980.99	723.73
981.54	752.16
981.91	741.91
990.46	732.92
991.32	752.35
993.71	721.89
994.97	748.63
995.00	717.06
996.27	736.82
996.40	705.03
998.49	738.88
998.82	741.84
999.37	730.19
1001.87	755.60
1003.32	781.95
1004.00	730.17
1004.49	735.24
1004.56	750.80
1006.60	744.73
1008.31	782.35
1008.86	700.91
1010.18	7[illegible].47
1010.58	738.70
1012.54	767.69
1015.32	782.09
1017.95	705.89
1021.00	719.62
1026.28	728.68
1026.70	666.85
1027.93	869.62
1028.04	833.67
1028.29	743.58
1028.60	732.24
1033.67	738.10
1037.38	718.15
1040.68	791.40

x	y
1044.47	735.88
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1045.53	724.91
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1052.32	718.40
1053.[illegible]9	762.71
1053.[illegible]	749.29
1054.84	753.04
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1058.98	688.05
1061.00	707.30
1062.61	750.39
1063.91	745.04
1068.91	793.79
1071.36	724.43
1074.11	730.43
1076.18	766.51
1074.45	746.88
1075.26	590.00
1076.11	679.03
1076.52	715.49
1077.03	720.22
1080.48	745.45
1081.62	818.36
1081.67	702.64
1082.78	759.48
1083.90	750.48
1085.43	711.65
1090.01	755.71
1091.69	717.12
1091.95	755.21
1095.71	733.65
1096.90	769.76
1097.05	696.40
1097.17	709.69
1100.57	756.13
1105.69	686.66
1107.07	771.20
1111.81	699.13
1114.31	777.56
1128.30	756.63
1130.10	717.06
1130.36	696.75
1130.55	752.15
1132.14	789.07
1132.63	747.59
1136.52	723.08
1138.11	778.42
1139.13	728.48
1139.13	793.98
1141.29	721.77
1143.73	741.76
1144.06	697.10
1144.23	756.61
1151.56	792.09
1159.90	721.40
1162.35	698.65

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
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1170.43	766.10
1172.73	729.79
1178.10	737.13
1180.54	726.72
1184.00	718.28
1185.01	749.51
1189.08	716.47
1187.21	779.02
1189.17	779.80
1191.94	758.28
1193.98	768.76
1198.96	768.38
1200.65	736.64
1203.56	793.79
1203.90	729.82
1205.16	742.28
1205.30	788.93
1206.22	723.71
1212.90	681.79
1213.23	789.97
1214.95	799.17
1216.35	699.43
1216.82	701.71
1217.00	690.70
1218.92	717.70
1219.29	700.01
1222.07	759.67
1222.85	758.48
1225.09	782.22
1227.12	650.48
1227.66	763.89
1228.18	759.92
1230.85	818.88
1233.23	779.40
1233.59	718.87
1235.11	720.40
1238.12	709.80
1241.31	720.70
1243.31	733.18
1243.95	740.72
1246.41	807.77
1246.44	730.43
1246.67	830.32
1247.00	701.62
1249.47	737.89
1249.64	821.60
1251.38	858.77
1253.73	761.05
1254.30	749.54
1256.83	742.91
1257.68	690.83
1259.98	742.11
1262.07	736.24
1262.24	722.48
1265.97	789.82
1265.75	679.33
1265.78	746.59

X	Z
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1271.74	756.95
1272.71	701.32
1276.62	755.22
1279.11	703.23
1276.06	768.63
1276.36	702.96
1277.13	777.44
1277.26	787.00
1277.89	780.25
1282.93	677.85
1284.23	771.29
1286.67	782.61
1291.01	779.62
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1293.65	709.33
1294.46	750.27
1295.24	771.54
1296.62	830.12
1302.17	726.58
1305.05	758.82
1305.53	741.44
1306.88	801.85
1307.26	825.60
1308.73	844.01
1311.98	813.95
1313.55	683.58
1312.94	741.11
1315.88	747.41
1317.18	758.72
1321.24	737.57
1322.47	704.48
1322.98	713.57
1323.41	832.54
1324.58	785.60
1324.98	750.69
1326.92	750.42
1330.18	697.27
1332.56	780.34
1333.22	832.24
1333.46	703.49
1333.81	707.46
1337.85	795.05
1341.68	822.10
1343.20	732.10
1343.65	813.28
1344.00	704.44
1344.56	738.08
1345.06	712.54
1345.43	704.48
1346.11	813.78
1348.06	762.18
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1351.78	835.47
1357.59	787.54
1360.81	701.82

X	Z
1363.06	751.48
1368.44	723.77
1368.99	784.71
1369.46	797.45
1371. 9	829.95
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1374.09	690.23
1375.02	748.81
1377.04	671.89
1377.30	786.66
1381.73	772.22
1383.10	758.99
1385.72	712.89
1389.86	782.33
1390.83	763.70
1390.42	741.51
1391.03	776.83
1391.56	794.95
1393.14	758.41
1393.58	784.66
1394.85	788.47
1399.56	760.67
1401.30	748.87
1401.92	763.94
1403.96	788.93
1404.96	791.42
1406.31	784.19
1407.34	758.54
1411.11	728.89
1412.01	777.87
1412.05	825.06
1413.91	800.55
1414.74	793.50
1418.04	821.81
1418.31	725.82
1425.18	753.50
1432.10	792.89
1433.96	776.64
1439.97	735.59
1442.86	757.85
1443.82	784.00
1444.03	804.41
1444.21	748.41
1444.84	859.98
1446.02	785.19
1447.10	766.46
1454.52	817.36
1454.69	699.54
1454.85	718.57
1454.91	869.23
1454.95	807.02
1457.25	687.37
1458.97	758.38
1459.11	784.08
1459.90	762.61
1461.02	821.76
1463.67	790.13
1464.03	734.85

X	Z
1466.80	781.01
1467.12	758.55
1467.56	842.48
1468.40	739.90
1468.88	753.37
1470.54	773.37
1472.64	810.15
1472.21	807.74
1473.54	784.61
1473.98	723.19
1474.50	700.97
1475.72	795.05
1478.35	639.3.
1481.43	756.18
1487.85	774.95
1489.91	748.93
1490.33	643.64
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1493.96	757.59
1494.09	784.64
1495.90	757.76
1499.02	845.59
1501.21	788.03
1502.53	764.51
1504.05	818.68
1504.78	737.78
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1507.78	752.50
1509.37	844.80
1509.87	756.95
1510.71	748.27
1510.75	701.32
1511.13	783.41
1511.34	750.39
1511.84	827.12
1516.15	780.78
1516.21	746.68
1517.70	770.78
1520.04	742.79
1520.65	807.75
1520.99	733.29
1529.99	783.54
1530.64	825.37
1530.35	780.98
1530.45	754.32
1530.60	749.41
1539.82	781.78
1546.41	722.60
1547.11	754.20
1548.03	770.62
1549.91	790.78
1550.93	778.20
1551.24	745.91
1563.01	810.98
1564.69	752.59
1568.09	754.01
1568.92	823.25
1570.96	741.98
1571.04	759.71

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Y
1571.14	756.44
1578.40	772.80
1577.76	746.00
1578.65	759.04
1580.80	752.00
1582.93	824.75
1583.03	748.65
1594.24	738.82
1595.80	815.04
1599.14	757.42
1604.04	783.81
1611.30	727.78
1611.52	758.16
1617.37	750.30
1617.92	741.24
1622.32	714.72
1623.85	766.76
1630.40	729.63
1630.56	700.66
1639.00	704.04
1640.31	791.62
1644.29	749.04
1647.49	707.21
1647.87	706.20
1649.45	950.40
1649.77	707.32
1650.92	747.24
1659.32	717.20
1661.17	892.11
1662.17	718.42
1665.16	759.09
1668.52	720.11
1669.21	718.81
1671.59	821.59
1671.80	707.00
1676.01	814.54
1683.29	749.30
1684.44	795.82
1688.61	760.62
1692.52	708.14
1695.21	708.35
1696.55	854.37
1698.65	853.82
1699.94	851.[illegible]
1709.36	751.[illegible]
1709.43	803.[illegible]
1717.68	829.[illegible]
1723.66	731.91
1734.77	748.62
17.6.40	[illegible]
1740.30	[illegible]
1740.44	755.73
1740.98	719.93
1746.09	760.26
1750.41	753.35
1751.10	749.78
1758.23	748.22
1770.62	708.91
1772.96	749.37

X	Y
1776.79	731.59
1781.81	761.89
1786.85	764.00
1787.76	731.81
1787.80	742.20
1788.30	740.43
1790.05	742.90
1795.05	742.24
1796.84	781.66
1797.69	[illegible]
1799.21	770.53
1802.00	735.20
1823.12	764.83
1824.24	749.14
1874.84	[illegible]
1910.98	[illegible]
1923.28	750.28
2023.85	[illegible]
2037.91	754.65
2050.17	[illegible]
2050.43	745.76
2133.94	662.94

DOCUMENT UNCLASSIFIED JCP-I, DPG

1 APRIL 1965 MISSION 19

DOWNRANGE	CROSSRANGE
1994.47	-213.66
2052.34	-178.03
2174.26	-308.46
2205.16	-144.67
2246.12	-147.65
2254.23	-184.86
2255.33	-138.07
2283.56	-129.54
2287.13	-147.63
2298.86	-200.92
2332.44	-168.72
2363.70	-145.44
2364.13	-148.47
2368.20	-187.58
2373.22	-185.70
2373.63	-169.70
2374.53	-173.72
2411.02	-153.59
2417.42	-178.75
2419.61	-171.18
2439.27	-185.27
2448.08	-151.47
2454.79	-163.64
2455.67	-168.66
2458.41	-179.73
2462.55	-173.82
2463.89	-199.85
2467.58	-172.94
2475.38	-139.12
2476.64	-170.16
2480.99	-283.29
2482.21	-188.10
2488.55	-132.43
2489.45	-136.46
2490.33	-141.48
2496.16	-232.64
2497.28	-143.64
2498.57	-173.68
2509.21	-104.92
2513.16	-149.02
2519.51	-176.18
2521.44	-179.23
2522.32	-184.25
2522.71	-126.25
2523.42	-180.28
2526.90	-118.34
2529.36	-350.47
2529.61	-172.42
2534.15	-149.53
2535.03	-154.55
2535.04	-112.54
2538.13	-108.61
2541.89	-160.71
2543.62	-213.77
2543.77	-207.77
2545.14	-317.84
2554.17	-191.02
2555.55	-217.06
2556.00	-15 05

DOWNRANGE	CROSSRANGE
2556.55	-175.07
2558.10	-110.09
2558.16	-233.12
2562.38	-140.20
2563.40	-181.23
2566.93	-159.31
2572.38	-140.44
2581.31	-59.63
2593.94	-200.97
2597.35	-184.04
2601.54	-134.13
2605.28	-145.22
2605.40	-140.22
2608.18	-149.29
2609.85	-163.34
2613.63	-214.44
2624.48	-178.69
2625.17	-149.70
2630.52	-260.86
2631.15	-150.84
2632.03	-155.86
2632.36	-225.89
2635.57	-216.97
2646.74	-176.21
2646.81	-165.22
2647.57	-217.25
2649.96	-158.29
2652.40	-182.36
2653.11	-362.43
2654.40	-182.41
2654.69	-212.42
2654.92	-202.42
2660.38	-183.55
2660.95	-159.56
2662.80	-207.61
2662.92	-202.61
2663.04	-197.62
2666.57	-175.69
2668.61	-257.72
2668.71	-211.76
2669.23	-231.77
2670.03	-281.81
2670.90	-119.78
2672.87	-246.86
2678.58	-216.99
2681.54	-175.05
2684.44	-139.11
2685.24	-231.16
2685.41	-266.17
2686.65	-173.17
2696.67	-255.44
2698.51	-178.46
2698.99	-158.46
2700.19	-275.52
2701.54	-135.52
2704.20	-149.58
2709.90	-329.72
2713.41	-182.81
2713.59	-176.82

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
2713.91	-202.83
2714.43	-181.84
2715.36	-142.85
2735.52	-178.34
2739.78	-167.44
2750.52	-220.71
2752.64	-131.74
2761.80	-124.95
2764.83	-124.02
2765.75	-253.08
2766.59	-176.08
2766.68	-172.08
2767.01	-242.11
2769.65	-257.18
2770.77	-210.19
2771.03	-241.21
2771.03	-241.21
2772.68	-214.24
2780.75	-211.43
2781.13	-237.45
2783.49	-138.47
2785.56	-139.52
2786.17	-193.55
2790.07	-239.66
2798.67	-172.85
2799.02	-241.87
2800.64	-257.92
2804.54	-304.02
2804.72	-128.98
2810.79	-210.15
2811.38	-227.16
2814.75	-137.28
2819.62	-175.15
2821.98	-160.40
2824.07	-156.45
2829.04	-283.60
2831.83	-166.64
2839.59	-218.44
2839.87	-290.[illegible]
2839.87	-290.86
2841.75	-211.89
2844.66	-215.96
2847.56	-178.01
2849.45	-141.05
2857.32	-272.27
2858.56	-178.28
2859.17	-320.33
2860.72	-213.34
2871.89	-206.60
2873.62	-217.65
2874.24	-274.68
2877.55	-220.74
2877.69	-214.74
2881.49	-97.80
2884.69	-256.92
2887.50	-107.00
2887.86	-207.98
2888.88	-207.01
2893.43	-184.11

X	Z
2894.98	-203.15
2895.45	-183.16
2895.88	-165.16
2897.16	-237.22
2906.59	-261.45
2908.26	-191.47
2912.25	-233.57
2921.25	-233.79
2921.73	-171.78
2922.44	-225.82
2925.18	-152.86
2926.21	-151.88
2926.92	-247.93
2927.53	-305.96
2932.46	-225.05
2937.56	-221.17
2943.08	-197.29
2946.72	-298.42
2946.72	-214.39
2947.06	-116.37
2950.65	-175.47
2951.53	-222.51
2955.77	-170.59
2956.93	-205.63
2956.93	-205.63
2958.67	-216.68
2959.53	-222.70
2959.69	-299.73
2960.53	-222.72
2960.53	-222.72
2966.90	-248.88
2967.42	-310.91
2969.74	-213.94
2969.91	-206.94
2971.86	-251.00
2972.15	-154.98
2973.34	-189.02
2975.97	-288.11
2977.93	-164.12
2979.21	-278.19
2982.21	-236.24
2984.67	-91.26
2987.56	-305.39
2988.12	-114.35
2989.40	-186.40
2992.97	-245.50
2997.28	-275.62
2998.40	-228.63
2998.59	-220.63
3001.30	-232.70
3001.30	-232.70
3003.07	-116.71
3003.16	-238.75
3003.37	-187.74
3003.54	-222.75
3003.61	-261.76
3004.73	-214.78
3004.73	-214.78
3004.87	-250.79

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
3006.39	-270.83
3006.61	-219.82
3007.01	-244.84
3007.54	-263.86
3008.18	-237.86
3009.23	-151.87
3010.07	-116.88
3010.68	-216.92
3013.61	-219.99
3014.83	-169.00
3015.15	-239.03
3019.58	-263.14
3019.63	-219.13
3021.96	-222.18
3022.12	-324.22
3022.91	-224.20
3023.92	-207.23
3024.25	-235.25
3027.31	-274.33
3028.01	-203.33
3031.11	-157.39
3033.20	-111.43
3033.58	-179.45
3035.08	-242.51
3035.29	-233.51
3037.55	-306.59
3037.79	-296.59
3038.27	-108.55
3040.01	-119.59
3040.69	-298.65
3041.48	-275.66
3042.70	-216.68
3043.37	-107.67
3044.02	-286.78
3044.74	-214.78
3047.62	-177.79
3047.74	-214.80
3048.07	-284.83
3048.19	97.28
3050.07	-286.88
3050.84	-209.88
3051.84	-210.90
3051.93	-248.91
3053.41	-228.94
3053.46	-142.92
3054.64	-218.97
3054.79	-212.97
3055.05	-159.96
3056.21	-279.02
3058.20	-112.02
3058.74	-173.05
3059.42	-220.09
3060.85	-252.13
3061.16	-239.13
3061.45	-269.15
3064.21	-195.19
3066.26	-235.25
3068.50	-183.29
3069.56	-306.35

X	Z
3070.35	-231.35
3070.43	-186.34
3070.57	-222.35
3073.85	-210.42
3074.71	-258.46
3075.56	-264.48
3078.10	-208.54
3080.20	-193.57
3080.42	-228.59
3081.32	-274.62
3082.28	-192.62
3082.49	-309.66
3083.59	-179.65
3083.73	-215.66
3085.73	-173.70
3087.59	-221.76
3088.87	-293.81
3089.09	-158.77
3089.47	-226.80
3090.28	-150.80
3090.68	-217.83
3091.30	-233.85
3092.13	-198.86
3092.85	-210.88
3093.80	-212.90
3095.44	-227.94
3096.32	-232.97
3097.87	-210.00
3107.44	-144.21
3108.25	-152.23
3110.34	-274.31
3115.34	-190.41
3117.13	-157.44
3117.22	-237.47
3118.52	-308.52
3118.69	-259.51
3124.05	-244.63
3124.93	-207.64
3130.51	-183.77
3130.74	-257.80
3131.14	-324.82
3131.98	-247.82
3132.19	-238.83
3132.76	-214.83
3132.86	-210.83
3133.95	-332.89
3134.79	-171.87
3136.07	-327.94
3136.29	-234.92
3136.43	-186.91
3137.04	-328.97
3138.07	-329.99
3138.26	-235.97
3140.55	-266.03
3140.69	-176.01
3142.55	-187.06
3142.84	-210.07
3142.84	-168.06
3143.02	-204.07

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
3144.55	-224.12
3144.60	-180.10
3144.98	-206.12
3145.12	-158.11
3145.40	-230.14
3146.00	-209.15
3146.24	-153.14
3147.21	-238.18
3147.50	-184.17
3147.55	-224.19
3148.05	-161.18
3148.40	-272.22
3148.50	-226.21
3150.07	-244.25
3151.29	-151.26
3151.90	-226.28
3151.85	-295.31
3155.93	-208.38
3156.31	-192.39
3156.88	-260.42
3159.85	-295.50
3161.88	-210.53
3162.49	-226.54
3162.54	-224.55
3162.90	-209.55
3163.31	-150.54
3163.40	-146.54
3164.45	-228.59
3164.49	-226.59
3164.49	-226.59
3166.76	-215.64
3168.49	-184.68
3168.49	-184.68
3170.28	-235.73
3170.40	-230.73
3173.06	-244.80
3173.23	-195.79
3173.94	-207.81
3174.28	-193.82
3174.37	-231.83
3175.04	-161.83
3175.99	-247.87
3176.11	-242.87
3176.1.	-200.86
3176.39	-230.88
3176.40	-188.87
3176.87	-252.90
3178.13	-241.92
3178.35	-190.91
3178.61	-221.93
3179.90	-167.94
3181.27	-278.01
3181.77	-215.00
3183.85	-170.04
3184.40	-147.04
3187.32	-234.14
3187.56	-266.15
3190.94	-181.20
3192.15	-199.24

X	Z
3194.44	-187.30
3197.48	-227.38
3199.63	-221.43
3200.53	-183.44
3201.65	-220.47
3201.91	-209.46
3202.94	-208.50
3203.25	-195.51
3203.72	-175.51
3207.01	-205.60
3207.15	-199.60
3210.10	-201.67
3212.10	-159.71
3212.67	199.38
3212.96	-165.73
3216.24	-199.82
3216.34	-191.82
3219.05	-161.88
3219.89	-168.90
3219.98	-206.91
3223.97	-249.02
3226.09	-244.07
3226.46	-145.05
3226.50	-185.06
3227.31	-235.09
3228.34	-108.08
3228.66	-262.13
3228.79	-173.11
3229.43	-230.14
3229.85	-296.17
3230.72	-176.16
3231.22	-155.16
3231.28	-278.20
3233.49	-229.24
3234.86	-212.27
3236.90	-210.32
3236.95	-250.33
3237.79	-173.33
3237.90	-168.33
3238.02	213.78
3239.09	-202.37
3239.85	-294.40
3239.85	-212.39
3240.09	-202.39
3240.52	108.69
3240.87	-253.42
3241.98	-81.40
3246.09	-244.55
3247.30	-235.57
3247.31	-192.56
3249.33	-234.62
3252.59	-223.69
3256.09	-160.76
3258.01	-247.83
3258.59	-181.63
3258.70	-260.85
3259.75	-216.86
3261.16	-241.90
3261.49	-185.90

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
3261.82	-213.91
3263.25	-237.95
3263.92	-209.96
3263.92	-209.96
3263.95	-186.95
3266.85	-213.03
3267.84	-213.06
3270.13	-243.12
3270.75	-217.13
3271.25	-196.13
3271.82	-214.15
3271.87	-212.15
3272.46	-271.14
3272.65	-221.17
3272.92	-210.14
3273.94	-209.20
3274.80	-131.20
3274.96	-208.22
3276.03	-205.25
3276.63	-222.27
3280.34	-234.36
3281.82	-214.39
3285.06	-204.46
3285.58	-142.47
3286.01	-206.49
3286.96	-250.52
3288.94	-209.56
3290.77	-216.60
3290.81	-256.62
3292.02	-209.65
3292.39	-232.65
3294.84	-255.71
3295.10	-244.71
3295.22	-230.72
3295.24	-238.72
3295.39	-190.71
3296.91	-252.76
3297.24	-194.75
3297.86	-170.76
3298.44	-187.78
3299.67	-262.83
3302.02	-289.89
3302.86	-212.89
3303.22	-197.90
3304.07	-245.93
3304.57	-224.94
3305.12	-193.95
3306.24	-199.02
3309.07	-204.06
3310.10	-203.06
3311.72	-177.09
3313.52	-227.15
3314.95	-251.21
3317.05	-205.23
3317.21	-198.23
3317.42	-319.27
3320.26	-196.30
3323.26	-196.37
3324.98	-166.41

X	Z
3326.55	-142.44
3326.91	-168.45
3330.85	-213.56
3334.23	-197.64
3335.21	-198.66
3335.49	-186.66
3335.49	-186.66
3335.80	-215.68
3337.01	-248.72
3337.25	-238.72
3337.54	-266.74
3338.61	-222.75
3338.94	-251.76
3339.54	-184.76
3342.46	-355.88
3343.80	-215.87
3344.28	-195.87
3344.40	-190.88
3346.47	-187.92
3347.09	-203.94
3347.26	-154.93
3347.46	-229.76
3348.01	-206.97
3348.44	-271.00
3348.44	-188.97
3349.63	-223.01
3350.44	-189.02
3351.97	167.05
3352.68	-211.08
3353.32	-194.09
3353.53	-227.10
3354.65	-264.14
3354.90	-170.12
3355.54	-185.14
3356.35	-193.16
3356.77	-217.18
3357.03	-248.19
3360.60	-266.28
3360.96	-209.28
3361.24	-281.30
3361.60	-266.31
3361.65	-180.29
3363.92	-169.34
3365.29	-237.39
3365.79	-258.41
3366.[illegible]	-154.39
3366.30	-153.39
3368.18	-200.45
3368.22	-240.46
3369.34	-235.48
3370.08	-204.49
3370.27	-196.50
3373.13	-160.55
3373.77	-175.57
3374.58	-225.61
3374.70	-178.60
3375.13	-202.61
3376.10	-203.64
3376.30	-153.63

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
3376.39	-233.65
3377.58	-225.68
3377.91	-211.68
3378.53	-227.70
3379.08	-162.70
3381.53	-227.77
3382.60	-224.80
3382.65	-180.79
3383.20	-157.79
3383.55	-184.81
3384.93	-252.86
3387.12	-244.91
3387.40	-274.93
3387.74	-176.91
3389.96	-167.96
3390.50	-228.99
3391.05	-209.99
3391.38	-192.00
3393.41	-148.03
3395.12	-161.08
3395.31	-195.09
3395.45	-231.11
3396.26	-239.13
3396.72	-178.12
3398.00	-166.15
3400.28	-238.22
3401.02	-207.25
3401.76	-176.24
3403.02	-207.28
3403.64	-223.30
3404.23	-240.32
3405.64	-139.32
3405.87	-381.40
3406.00	-166.34
3406.47	-230.37
3406.78	-217.37
3407.07	-165.36
3409.17	-203.42
3409.38	-236.44
3410.35	-193.45
3410.49	-359.50
3410.71	-220.47
3410.88	-171.46
3411.40	-233.49
3412.57	-276.51
3412.66	-222.51
3413.43	-106.50
3414.13	-194.55
3414.97	-167.55
3418.13	-236.65
3419.59	-183.67
3424.23	-198.78
3424.91	-166.79
3426.20	-238.84
3426.73	-139.83
3427.82	-219.87
3428.54	-185.88
3429.80	-174.91
3430.92	-211.95

X	Z
3432.68	-264.00
3434.04	-169.01
3435.68	-180.05
3436.39	-234.08
3438.01	-290.13
3438.87	-214.14
3438.97	-168.13
3439.49	-188.15
3440.72	-262.20
3441.22	-241.20
3441.65	-173.20
3443.84	-257.27
3446.13	-203.31
3446.92	-128.31
3447.06	-206.33
3447.17	-243.34
3447.96	-210.35
3448.32	-237.37
3448.79	-217.38
3450.77	-176.41
3451.02	-375.47
3453.68	-180.48
3454.05	-248.51
3455.08	-209.52
3455.69	-263.55
3456.25	-198.55
3457.12	-245.58
3457.46	-147.5
3458.06	-184.58
3458.32	-153.58
3459.72	-178.63
3459.93	-211.64
3460.13	-203.64
3461.93	-211.69
3462.74	-261.72
3463.46	-189.72
3464.39	-150.73
3466.22	-157.77
3467.05	-204.81
3467.98	-251.84
3468.05	-248.84
3468.36	-277.86
3470.64	-265.91
3472.05	-206.93
3474.07	-247.94
3474.29	-196.98
3474.63	-258.01
3475.60	-226.02
3476.07	-242.04
3477.55	-228.06
3477.74	-220.07
3477.78	-177.06
3478.33	-237.09
3479.22	-200.10
3480.47	-275.15
3482.17	-160.16
3482.47	-231.18
3482.81	76.90
3483.38	-193.19

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
3485.64	-249.25
3486.16	-244.27
3487.00	-167.27
3487.30	-280.31
3488.52	-229.33
3488.90	-255.34
3488.90	-171.32
3489.41	-190.33
3490.00	-209.36
3490.24	-199.36
3492.08	-331.44
3493.26	-240.44
3493.36	-235.44
3495.26	-114.46
3495.80	-259.51
3496.09	-209.90
3496.30	-322.54
3496.71	-179.51
3497.73	-220.54
3499.27	-323.61
3499.42	-191.58
3502.14	-203.64
3504.11	-246.70
3506.63	-266.77
3507.71	-221.78
3507.87	-256.80
3508.42	-191.79
3508.92	-212.81
3509.35	-236.83
3509.59	-184.82
3509.92	-254.84
3510.20	-242.85
3511.85	-257.99
3512.94	-211.90
3513.01	-250.92
3514.58	-228.99
3515.06	-206.95
3515.18	-201.96
3516.14	-161.97
3516.21	-230.00
3516.68	-180.99
3517.33	-153.99
3518.41	-276.05
3520.08	-260.09
3521.13	-246.11
3522.36	-270.15
3523.20	-243.16
3523.36	-270.17
3523.61	-226.16
3524.41	-276.20
3524.47	-148.16
3524.75	-178.16
3525.01	-251.20
3525.46	-232.21
3525.87	-215.21
3526.70	-180.22
3528.24	-283.29
3530.13	-246.32
3530.39	-193.32

X	Z
3530.94	-170.32
3530.98	-252.35
3532.89	-172.37
3533.98	-252.42
3536.46	-232.42
3536.61	-142.45
3538.46	-232.52
3539.29	-281.55
3539.72	-221.55
3544.39	-235.66
3546.81	-217.72
3549.48	-231.78
3549.67	-181.77
3550.05	-207.79
3550.14	-371.84
3550.19	-243.80
3551.27	-198.82
3552.24	-241.85
3552.67	-181.84
3553.12	-246.87
3554.31	-238.90
3555.67	-306.95
3557.36	-236.97
3557.36	-194.96
3557.45	-232.97
3557.92	-297.00
3558.83	-259.01
3559.40	-361.06
3560.48	-232.05
3561.64	-225.07
3562.43	-150.07
3562.76	-220.10
3563.33	-196.15
3565.64	-183.15
3565.84	-179.16
3565.92	-297.19
3565.93	-171.16
3566.71	-306.22
3570.52	-314.31
3571.21	-201.29
3573.36	-195.34
3574.24	-241.38
3575.26	-199.39
3576.35	-237.43
3576.69	-223.43
3576.97	-295.46
3577.19	-202.44
3578.38	-194.46
3578.52	-188.46
3578.54	-229.48
3578.85	-216.48
3579.09	-290.51
3579.09	-206.48
3579.43	-192.49
3579.46	-358.53
3579.78	-303.53
3579.92	-213.50
3580.26	-199.51
3580.37	-278.53

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
3580.52	-230.52
3581.40	-193.53
3581.80	-344.59
3582.82	-343.61
3582.92	-213.58
3583.02	-167.56
3584.04	-166.59
3584.61	-226.62
3584.71	-264.63
3585.04	-166.61
3585.21	-201.63
3585.92	-255.66
3586.59	-227.67
3587.26	-199.68
3587.73	-263.70
3588.58	-311.74
3588.71	-222.72
3589.07	-169.71
3589.11	-209.72
3589.32	-238.74
3590.71	-222.76
3591.37	-236.78
3591.73	-179.78
3592.45	-191.80
3593.35	-237.83
3593.59	-185.82
3593.63	-267.85
3593.73	-221.84
3593.73	-137.81
3594.27	-282.87
3594.38	-152.83
3594.74	-178.85
3595.09	-206.86
3595.37	-278.89
3595.73	-221.88
3596.61	-184.89
3597.09	-206.91
3597.25	-199.91
3597.61	-226.93
3598.50	-356.99
3599.23	-200.96
3599.49	-189.96
3599.66	-162.97
3599.87	-257.99
3599.87	-173.97
3602.89	-215.05
3603.92	-172.04
3604.27	-241.07
3604.65	-267.09
3605.66	-183.06
3605.84	-301.15
3606.20	-202.13
3606.34	-238.14
3606.44	-190.12
3606.54	-188.13
3606.93	-339.18
3607.14	-372.20
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3608.01	-168.16

X	Z
3608.53	-230.19
3608.54	-271.20
3609.27	-241.21
3609.44	-192.20
3610.48	-316.26
3610.66	-183.23
3611.11	-164.23
3611.18	-203.25
3611.22	-243.26
3611.43	-360.30
3611.77	-262.28
3612.05	-292.29
3612.22	-285.30
3612.51	-273.30
3613.70	-265.32
3614.10	-248.33
3614.55	-271.35
3614.72	-222.34
3615.01	-252.35
3615.36	-279.37
3615.58	-186.35
3615.84	-175.35
3616.03	-293.39
3616.94	-213.39
3617.74	-263.42
3617.76	-304.43
3618.03	-251.42
3618.60	-227.43
3618.61	-59.38
3618.89	-257.45
3618.98	-211.44
3619.86	-216.46
3619.99	-169.45
3620.08	-207.46
3621.20	-244.50
3621.72	-180.49
3621.82	-176.49
3622.20	-244.52
3622.79	-261.54
3623.15	-204.53
3623.65	-225.55
3623.75	-179.54
3623.77	-220.55
3624.17	-203.56
3624.46	-233.57
3624.60	-277.57
3624.96	-212.58
3626.53	-230.62
3626.89	-215.63
3627.03	-209.63
3627.86	-216.65
3627.95	-296.67
3628.38	-236.67
3628.81	-260.68
3629.03	-209.67
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3630.98	-293.73
3631.29	-198.73
3632.50	-315.79

SECRET

X	Z
3633.05	-208.77
3633.17	-203.77
3633.84	-175.78
3634.15	-162.78
3634.35	-321.83
3634.73	-347.85
3635.25	-158.81
3635.39	-152.81
3635.40	-361.87
3637.88	-257.90
3638.24	-156.88
3638.36	-237.91
3638.38	-194.89
3638.60	-227.91
3638.64	-267.92
3638.64	-225.91
3639.79	-177.92
3640.29	-198.94
3640.83	-217.96
3641.05	-166.95
3641.12	-247.97
3641.78	-261.99
3643.31	-240.02
3643.57	-187.02
3644.38	-195.04
3644.57	-187.04
3646.33	-239.10
3646.91	-173.09
3647.15	-163.09
3647.43	-235.12
3648.09	-249.14
3648.86	-217.15
3649.45	-192.16
3650.12	-206.18
3650.52	-315.22
3650.81	-219.20
3651.50	-232.22
3651.79	-178.21
3652.12	-248.24
3652.79	-178.23
3653.45	-192.25
3653.76	-221.27
3654.35	-238.29
3654.90	-299.32
3655.09	-249.31
3655.57	-187.30
3655.90	-257.33
3656.28	-283.35
3656.52	-273.35
3657.97	-254.38
3658.07	-250.38
3658.12	-206.37
3658.21	-160.36
3658.50	-148.36
3658.86	-175.38
3659.32	-72.36
3659.47	-191.40
3659.52	-189.40
3659.67	-183.40

X	Z
3660.05	-167.40
3660.18	-245.43
3660.56	-271.45
3661.07	-166.43
3661.21	-244.45
3661.88	-218.46
3662.24	-159.45
3662.29	-157.45
3662.38	-195.47
3663.09	-291.51
3663.09	-249.50
3663.32	-281.51
3663.62	-185.49
3663.71	-181.49
3664.57	-187.52
3664.82	-302.56
3664.85	-175.52
3664.90	-257.54
3665.14	-205.54
3666.01	-333.59
3666.11	-248.57
3666.23	-285.58
3666.88	-216.58
3667.21	-160.57
3667.28	-199.59
3667.71	-265.61
3668.61	-185.61
3668.82	-344.66
3669.19	-203.63
3669.51	-315.67
3669.54	-230.65
3669.63	-310.67
3669.66	-225.65
3671.73	180.69
3671.74	-138.67
3673.09	-207.73
3674.16	-204.75
3674.52	-189.75
3676.18	-245.81
3676.20	-244.81
3676.47	-233.81
3676.57	-61.77
3676.97	-254.83
3676.99	-169.81
3677.13	-205.82
3677.81	-176.83
3677.95	-171.83
3678.58	-312.89
3679.30	-149.87
3679.90	-89.86
3680.38	-151.88
3682.75	-179.95
3683.02	-168.95
3683.15	-246.98
3683.47	-235.98
3683.61	-227.98
3683.71	-55.94
3684.03	-252.00
3684.04	-123.96

SECRET

DOCUMENT UNCLASSIFIED JCP-I, DPG

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3684.65	-268.02
3684.85	-218.01
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3685.77	-221.03
3685.80	-196.01
3685.85	-344.07
3686.80	-178.04
3686.82	-219.06
3687.81	-228.08
3688.09	-166.07
3688.11	-164.07
3688.42	-196.09
3688.46	-277.11
3688.46	-234.10
3688.68	-229.10
3688.75	-222.10
3689.11	-249.12
3689.18	-246.12
3689.91	-299.15
3691.04	-210.16
3691.34	-239.17
3691.92	-173.17
3692.04	-210.18
3693.07	-83.17
3693.07	-334.24
3694.34	-239.24
3695.56	-230.27
3696.65	-268.31
3696.94	-172.29
3697.05	-339.33
3697.11	-207.30
3698.14	-331.36
3698.25	175.78
3698.53	-189.33
3698.67	-267.35
3699.03	-294.37
3701.44	-193.40
3702.74	-348.47
3703.32	-196.43
3704.18	-162.46
3704.20	-203.47
3704.77	-179.47
3705.24	-243.50
3705.26	-326.53
3705.89	-216.51
3706.51	-190.52
3706.98	-296.56
3707.91	-257.57
3708.17	-246.57
3709.54	-188.59
3710.29	-283.64
3712.43	-277.68
3712.57	-313.70
3712.89	-174.67
3713.10	-207.68
3713.27	-242.69
3713.50	-358.73

X	Z
3713.91	-257.71
3714.21	-328.74
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3714.94	-172.71
3715.48	-275.76
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3716.00	-211.75
3716.15	-247.77
3716.77	-221.77
3717.15	-205.78
3718.24	-285.83
3718.77	-173.81
3718.89	-174.81
3720.07	-250.86
3721.21	-328.91
3722.65	-142.89
3723.05	-209.92
3724.57	-229.96
3725.07	-250.98
3726.07	-208.99
3726.19	-209.99
3726.40	-321.03
3726.59	-271.02
3727.62	-270.05
3727.96	-172.03
3731.49	-317.15
3732.00	-254.15
3732.24	-202.14
3735.30	-283.23
3735.66	-310.25
3735.90	-216.23
3736.54	273.26
3738.91	-174.29
3739.02	-169.29
3739.14	-164.29
3739.29	-158.29
3739.49	-277.33
3740.05	-210.32
3740.63	-353.38
3743.97	-255.43
3745.33	-198.41
3746.01	-167.46
3746.31	-157.46
3747.73	-223.51
3748.80	-262.55
3748.80	-262.55
3749.35	-197.54
3750.69	-141.56
3750.94	-212.59
3751.02	-253.60
3751.51	-274.62
3751.13	-268.65
3751.78	-283.67
3756.32	-324.75
3757.04	-252.74
3757.56	-314.77
3757.80	-267.76
3758.04	-168.74
3758.20	-329.79

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
3759.58	-313.82
3760.84	-302.85
3760.94	-256.84
3761.32	-240.84
3762.82	-219.87
3763.04	-168.86
3763.04	-168.86
3763.34	-323.91
3764.47	-234.91
3764.79	-346.95
3766.87	-259.98
3767.11	-249.98
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3768.11	-250.01
3768.63	-270.02
3769.18	-165.01
3770.71	-57.01
3772.33	-157.08
3772.35	-198.09
3772.35	-198.09
3773.77	-264.15
3774.27	-243.15
3774.43	-323.18
3775.79	-263.19
3775.91	-258.19
3775.91	-258.19
3778.13	-207.23
3779.08	-293.28
3779.25	-207.26
3780.89	-217.30
3781.39	-196.31
3784.34	-287.40
3784.46	-277.40
3785.25	-140.39
3785.32	-241.41
3785.89	-179.41
3786.32	-241.44
3788.50	-317.91
3789.17	-209.50
3789.17	-209.50
3789.17	-209.50
3789.51	-149.49
3791.76	-306.59
3793.08	-209.59
3793.96	-216.61
3794.14	-290.64
3796.46	-193.67
3797.00	-294.70
3797.96	-213.71
3798.24	-244.72
3798.57	-314.75
3798.81	-304.75
3799.17	-289.76
3803.14	-248.84
3806.63	-437.98
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3808.29	-242.96
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3811.05	-293.03

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3811.09	-293.04
3811.18	-331.06
3811.21	-330.06
3812.07	-252.06
3813.09	-293.09
3813.43	-237.08
3814.19	-247.10
3815.24	-161.11
3815.90	-343.17
3816.07	-252.15
3817.64	-312.21
3817.64	-186.17
3818.57	-231.20
3818.97	-256.22
3820.90	-301.28
3821.52	-191.26
3822.28	-201.29
3824.46	-361.38
3825.55	-190.36
3828.68	-310.47
3829.55	-190.44
3831.04	-337.53
3831.07	-210.50
3831.87	-260.53
3834.42	-321.61
3835.20	-310.63
3835.37	-239.61
3835.37	-239.61
3836.94	-299.66
3839.61	-229.71
3839.89	-299.72
3840.13	-249.72
3840.13	-249.72
3840.49	-234.73
3840.76	-139.71
3840.76	-139.71
841.06	-336.77
3841.13	-249.75
3842.57	-189.77
3845.30	-284.86
3845.41	-363.88
3846.16	-248.87
3846.16	-248.87
3846.51	-359.91
3846.53	-316.90
3847.35	-198.88
3848.16	-248.92
3849.51	-233.92
3849.15	-248.94
3849.39	-248.94
3849.96	-248.97
3850.10	-158.94
3850.39	-238.97
3850.92	-258.98
3851.04	-253.99
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3852.78	-139.00

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
3853.72	-309.07
3853.72	-309.07
3854.35	-199.05
3855.35	-199.07
3856.15	-249.11
3856.32	-284.12
3856.96	-299.14
3857.03	-294.13
3857.03	-294.13
3857.58	-189.17
3862.08	-253.25
3862.43	-321.28
3863.2[illegible]	-288.29
3863.17	-198.26
3863.4[illegible]	-298.31
3864.46	-278.31
3868.10	-293.30
3868.49	-191.39
3868.9[illegible]	-298.41
3869.05	-299.42
3869.22	-288.43
3869.77	-18[illegible].41
3869.84	-178.41
3870.04	-170.42
3871.45	-320.49
3872.31	-329.52
3872.41	-321.52
3872.77	-223.50
3872.93	-298.51
3872.93	-298.51
3873.14	-281.53
3873.9[illegible]	[illegible]
3874	[illegible]
3875	-246 [illegible]
3875.25	-203 [illegible]
3875.46	-278.58
3876.41	-238.59
3877.22	-288.62
3878.69	-352 [illegible]
3880.41	-19[illegible].67
3880.71	-393.73
3880.89	-218.69
3880.89	-218.69
3880.96	-219.69
3882.60	-188.72
3882.89	-218.74
3883.48	-193.74
3883.69	-268.77
3883.91	-298.77
3886.71	-309.85
3886.91	-398.86
3887.91	-433.85
3888.41	-238.87
3889.14	-333.92
3889.26	-286.91
3889.38	-323.92
3889.57	-273.91
3889.64	-228.90
3889.86	-177.89

X	Z
3890.12	-208.91
3890.41	-238.92
3890.55	-148.90
3891.97	-298.98
3892.26	-328.99
3892.32	-158.94
3892.41	-238.97
3892.76	-223.97
3893.12	-208.98
3893.24	-203.98
3893.45	-279.01
3893.60	-188.98
3893.85	-309.02
3893.88	-219.00
3894.45	-237.0[illegible]
3894.90	-260.04
3895.96	-302.07
3896.40	-239.06
3896.50	-277.08
3896.52	-276.08
3897.45	-279.10
3897.69	-269.10
3897.58	-219.09
3898.05	-259.11
3898.67	-144.09
3898.88	-219.12
3899.66	-312.16
3899.79	-139.12
3900.69	-269.18
3900.76	-274.16
3902.43	-218.21
3903.33	-326.25
3903.47	-362.27
3903.78	-223.24
3903.81	-264.25
3904.28	-286.27
3904.37	-324.28
3904.80	-264.27
3904.95	-218.26
3905.21	-246.28
3905.52	-192.27
3906.73	-309.33
3906.75	-308.33
3906.85	-304.33
3906.90	-302.33
3907.09	-210.31
3907.32	-243.33
3909.37	-324.40
3909.92	-259.39
3909.97	-299.41
3910.54	-231.40
3910.59	-273.41
3910.91	-217.4[illegible]
3911.07	-211.4[illegible]
3911.91	-134.41
3912.59	-189.44
3912.71	-194.44
3913.11	-251.47
3913.21	-247.52

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
3915.35	-199.51
3915.59	-189.51
3916.26	-245.54
3916.47	-194.53
3916.88	-219.55
3917.42	-280.58
3918.56	-232.59
3919.61	-230.62
3919.78	-265.63
3919.94	-300.64
3920.14	-124.60
3920.33	-247.64
3920.80	-264.65
3921.42	-238.66
3921.73	-225.67
3921.82	-263.68
3922.21	-204.67
3922.37	-240.69
3922.42	-280.70
3922.90	-134.67
3922.96	-249.72
3922.97	-257.70
3923.01	-255.70
3923.14	-208.69
3923.47	-235.71
3923.56	-232.71
3923.80	-264.73
3924.31	-200.72
3924.43	-70.69
3926.00	-130.74
3926.61	-277.80
3926.85	-282.90
3927.60	-314.83
3927.80	-306.83
3929.39	-281.86
3929.49	-193.84
3929.89	-302.88
3929.96	-257.87
3932.58	-231.93
3932.99	-298.96
3933.49	-277.96
3933.56	-233.95
3934.32	-200.96
3934.61	-229.97
3935.56	-274.00
3936.18	-207.01
3936.23	-205.01
3936.51	-318.05
3937.12	-201.03
3937.65	-271.06
3938.58	-232.07
3939.01	-214.07
3939.32	-241.09
3937.70	-269.11
3934.72	-810.12
3937.98	-299.12
3940.11	-252.11
3940.34	-284.13
3940.63	-230.12

X	Z
3941.53	-234.14
3941.82	-306.17
3941.93	-301.17
3942.77	-266.18
3943.13	-167.16
3943.87	-262.20
3944.08	-211.19
3944.65	-313.24
3945.39	-198.22
3945.77	-142.23
3945.77	-142.23
3945.81	-306.26
3946.34	-324.28
3947.56	-233.28
3947.56	-233.28
3947.75	-183.27
3948.10	-336.33
3948.10	-294.31
3948.25	-204.29
3948.70	-183.30
3948.72	-310.33
3948.75	-183.30
3949.08	-253.33
3950.01	-296.35
3950.12	-293.36
3950.51	-277.37
3950.91	-301.38
3951.34	-200.37
3951.79	-265.39
3952.05	-296.41
3952.29	-286.41
3952.53	-234.40
3953.72	-228.43
3954.01	-214.43
3954.19	-290.46
3954.48	-236.45
3955.20	-206.46
3955.22	-205.46
3955.29	-244.47
3955.53	-318.50
3955.60	-231.48
3955.78	-215.48
3956.05	-212.48
3956.18	-282.51
3956.65	-229.50
3956.65	-229.50
3956.89	-261.51
3957.24	-246.52
3957.41	-323.54
3957.77	-224.53
3958.10	-252.54
3958.34	-200.53
3958.72	-184.54
3959.31	-285.58
3959.84	-179.56
3960.48	-194.58
3960.54	-275.61
3960.67	-186.58
3960.96	-174.59

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
3962.72	-297.65
3962.29	-202.63
3962.36	-283.65
3962.41	-281.65
3962.65	-279.64
3963.10	-210.65
3963.55	89.42
3963.79	-265.68
3964.24	-288.70
3964.50	-239.69
3964.62	-272.70
3964.64	-271.70
3965.00	-256.71
3965.08	-271.70
3965.17	-249.71
3965.52	-318.74
3966.05	-254.73
3966.26	-287.75
3967.33	-2 .77
3967.41	-155.74
3969.20	-206.79
3970.02	-255.83
3970.60	-231.83
3970.74	-267.85
3971.17	-249.85
3971.29	-244.85
3972.07	-337.90
3972.29	-244.88
3972.93	-217.89
3973.00	-248.91
3974.15	-208.91
3974.33	-284.94
3974.60	-189.92
3974.65	-187.92
3975.24	-288.96
3975.42	-322.97
3975.69	-227.95
3975.91	-176.94
3976.78	-265.99
3977.26	-203.98
3977.49	-324.02
3977.84	-178.99
3977.91	-301.01
3979.27	-182.02
3979.33	-285.06
3979.76	-267.06
3980.69	-270.09
3980.79	-224.07
3980.84	-241.08
3981.15	43.99
3981.33	-243.09
3982.14	-209.10
3982.64	-188.11
3982.64	-188.11
3982.67	-187.11
3982.69	-312.14
3983.13	-291.15
3983.24	-245.14
3983.57	-279.16

X	Z
3983.71	-269.16
3983.72	-185.13
3983.76	-309.17
3984.16	-292.17
3984.21	-290.18
3984.23	-289.18
3984.74	-267.18
3984.93	-260.18
3985.02	-298.20
3985.14	-293.20
3986.92	-344.26
3986.95	-217.22
3987.09	-337.26
3987.16	-250.23
3987.23	-247.24
3987.51	-403.29
3987.60	-170.23
3987.61	-273.25
3989.00	-257.28
3989.02	-256.28
3989.25	-330.31
3989.45	-238.29
3989.45	-238.29
3989.83	-222.29
3990.61	-273.32
3991.55	-192.32
3991.73	-226.34
3992.50	-236.36
3992.73	-310.38
3993.16	-292.39
3993.66	-313.41
3993.76	-225.38
3993.78	-266.40
3994.73	-226.41
3994.88	-178.40
3996.31	-160.43
3996.33	-201.44
3996.85	-263.47
3996.94	-301.48
3996.97	-258.47
3996.97	-258.47
3996.97	-258.47
3997.21	-248.47
3997.92	-260.49
3998.06	-254.50
3998.20	-332.52
3998.32	-285.51
3998.63	-272.51
3998.92	-260.52
3999.16	-250.52
3999.18	-291.53
3999.23	-289.53
3999.59	-274.54
4000.16	-208.53
4000.20	-230.54
4001.07	-212.56
4001.16	-250.57
4002.08	-295.60
4002.31	-160.57

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
4002.33	-243.59
4002.33	-243.59
4002.61	-231.60
4002.66	-229.60
4002.73	-260.61
4002.82	-264.61
4002.94	-259.61
4003.00	-173.59
4004.37	-283.65
4004.40	-198.63
4004.81	-181.64
4005.02	-172.64
4005.13	-293.68
4006.25	-246.69
4006.32	-243.69
4006.73	-184.68
4007.38	-157.69
4007.44	-238.72
4007.63	-230.72
4007.84	-347.76
4008.28	-245.74
4008.51	-277.75
4008.87	-262.76
4009.02	-172.73
4009.61	-189.75
4009.89	-261.78
4010.04	-171.76
4010.20	-332.81
4010.23	-247.78
4010.27	-329.81
4010.32	-243.79
4010.73	-226.79
4011.01	-250.81
4011.25	-246.81
4011.63	-230.81
4011.84	-309.84
4011.89	-219.82
4012.01	-298.84
4012.08	-293.83
401..11	-252.81
4012.99	-257.85
4015.30	-202.89
4016.30	-286.94
4016.77	-308.96
4017.11	-252.95
4017.96	-258.97
4018.33	-159.95
4018.72	-268.99
4018.80	-223.98
4019.28	-203.99
4019.37	-242.00
4019.61	-232.00
4019.87	-269.02
4019.82	-223.01
4020.37	-200.01
4020.89	-220.03
4020.94	-218.03
4021.06	-297.06
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4021.99	-216.06
4022.41	-282.08
4023.08	-254.09
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4023.75	-268.11
4023.94	-302.13
4024.46	-322.14
4024.56	-276.13
4024.77	-267.14
4025.05	-297.15
4025.25	-289.15
4025.34	-285.16
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4025.96	-217.15
4026.18	-250.17
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4026.41	-3[illegible]4.19
4026.61	-190.16
4027.16	-167.17
4027.63	-147.17
4028.11	-210.20
4028.36	-326.24
4028.44	-197.20
4029.61	-190.23
4029.91	-261.26
4030.01	-257.26
4030.15	-251.26
4031.39	-199.28
4031.63	-189.28
4032.46	-238.31
4033.05	-259.33
4033.4[illegible]	-155.31
4034.11	-169.33
4034.70	-228.36
4035.10	-295.39
4035.11	-169.36
4035.15	-251.38
4035.17	-292.39
4036.25	-205.39
4036.31	-286.42
4036.38	-325.43
4037.32	-244.43
4037.46	-238.43
4037.62	-273.45
4038.39	-157.43
4038.44	-197.44
4039.03	-214.46
4039.41	-324.50
4040.12	-294.51
4040.15	-209.49
4040.30	-119.47
4041.67	-313.55
4042.17	-250.55
4042.31	-244.55
4042.41	-240.55
4042.43	-239.55

SECRET

X	Z
4043.17	-208.56
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4043.62	-319.60
4044.17	-208.58
4044.30	-161.57
4044.43	-323.62
4044.48	-199.59
4045.00	-257.62
4046.53	-193.64
4046.81	-223.65
4047.75	-184.66
4048.26	-288.70
4048.34	-243.69
4048.36	-242.69
4048.50	-278.71
4049.22	-164.69
4049.33	-327.74
4049.34	-201.70
4049.58	-258.74
4051.34	-201.75
4051.82	-181.76
4052.12	-294.80
4052.95	-301.82
4053.00	-215.80
4053.21	-290.82
4054.00	-215.82
4054.10	-293.83
4054.38	-325.86
4054.55	-276.85
4055.31	-244.86
4055.33	-243.86
4055.53	-193.85
4055.53	-151.84
4055.93	-176.85
4056.52	-277.90
4056.64	-230.89
4056.85	-305.91
4057.41	-198.90
4057.43	-239.91
4057.44	-155.88
4058.00	-215.92
4059.53	-193.95
4059.65	-146.93
4060.41	-198.97
4060.61	-316.01
4061.74	-269.02
4061.76	-268.02
4062.03	-215.01
4062.09	-296.04
4062.12	-295.04
4062.71	-228.03
4063.19	-166.02
4063.28	-372.09
4063.36	-201.04
4063.62	-190.04
4063.70	-396.10
4063.73	-311.08
4064.24	-164.05
4064.27	-163.05

X	Z
4064.43	-198.06
4064.43	-156.05
4065.10	-170.07
4065.12	-211.08
4065.31	-249.10
4065.66	-314.13
4066.62	-232.13
4066.86	-180.12
4067.24	-248.14
4067.24	-184.12
4067.36	-243.15
4068.02	-215.15
4068.43	-198.16
4068.93	-219.18
4069.00	-256.19
4069.64	-273.21
4070.35	-243.22
4071.19	-250.24
4071.26	-247.24
4071.38	-200.23
4073.09	-212.27
4073.19	-238.28
4073.50	-237.27
4073.64	-231.29
4073.64	-189.28
4073.69	-271.31
4073.71	-270.31
4073.80	-266.31
4074.10	-170.29
4074.10	-128.27
4074.26	-289.32
4074.31	-203.30
4074.54	-235.32
4074.64	-189.30
4075.21	-249.34
4075.74	-185.33
4077.04	-214.37
4077.06	-297.39
4077.89	-346.43
4078.21	-291.42
4078.50	-195.40
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4078.52	-194.40
4079.35	-285.44
4079.64	-273.45
4080.66	-272.47
4080.66	-272.47
4081.04	-214.46
4081.76	-226.49
4081.87	-305.51
4082.23	-332.53
4082.95	-260.52
4082.99	-258.52
4084.25	-289.56
4084.33	-244.55
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4085.04	-298.58
4085.92	-261.59

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
4086.34	-263.61
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4087.85	-180.62
4088.28	-246.65
4088.42	-240.65
4088.56	-276.66
4088.69	-145.63
4089.25	-247.67
4089.47	-238.67
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4089.47	-238.67
4089.56	-234.67
4089.64	-231.67
4089.66	-230.67
4089.92	-261.69
4090.00	-132.66
4090.21	-164.67
4090.51	-320.72
4091.18	-208.71
4091.28	-204.71
4091.32	-244.72
4091.73	-227.72
4092.15	-293.75
4094.97	-257.81
4095.03	-298.82
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4098.01	-257.88
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4100.01	-298.94
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4100.77	-267.95
4100.95	-176.93
4101.40	-157.93
4103.02	-173.98
4103.37	-200.99
4103.79	-309.03
4103.94	-349.05
4103.87	-222.01
4103.91	-304.04
4104.27	-247.03
4104.34	-244.03
4104.42	-197.01
4104.77	-226.03
4104.99	-259.05
4105.13	-211.04
4105.25	-164.03

X	Z
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4105.56	-193.04
4106.16	-160.05
4106.61	-233.08
4106.61	-191.07
4106.65	-231.08
4106.65	-231.08
4107.67	-314.13
4107.68	-272.12
4107.73	-228.11
4107.77	-310.13
4108.04	-173.10
4108.09	-171.10
4108.89	-305.16
4109.00	-342.17
4109.18	-209.13
4109.44	-262.16
4109.53	-320.17
4109.91	-262.17
4110.04	-131.13
4110.17	-293.18
4110.30	-204.16
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4110.70	-271.19
4110.78	-184.17
4110.93	-349.22
4111.05	-340.22
4111.06	-214.18
4111.47	-155.17
4112.16	-168.19
4113.05	-298.25
4113.23	-165.22
4113.66	-189.24
4114.23	-165.24
4114.54	-194.26
4114.77	-226.27
4115.25	-164.27
4115.48	-240.31
4115.96	-260.31
4116.70	-229.32
4116.77	-310.34
4117.51	-145.33
4118.91	-220.37
4119.70	-271.40
4119.99	-133.37
4120.20	-166.39
4120.61	-190.40
4120.72	-270.43
4122.10	-296.47
4122.22	-207.45
4122.32	-249.46
4122.91	-262.48
4122.98	-301.49
4123.91	-220.49
4124.02	-341.53
4124.55	-235.51
4124.98	-259.53
4124.98	-217.51

DOCUMENT UNCLASSIFIED JCP-J, DPG

X	Z
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4125.27	-209.92
4125.90	-946.97
4126.39	-242.95
4126.39	-200.54
4127.10	-212.96
4127.91	-237.58
4127.95	-277.59
4128.20	-208.59
4128.29	-204.59
4129.36	-265.64
4129.81	-266.64
4130.37	-117.61
4130.93	-261.67
4131.24	-206.66
4131.32	-161.65
4131.41	-241.67
4132.38	-242.70
4133.03	-173.69
4133.86	-264.74
4134.93	-261.76
4135.88	-263.79
4135.93	-261.79
4136.02	-341.81
4136.48	-196.78
4137.09	-296.83
4137.14	-294.83
4137.21	-291.83
4137.41	-241.82
4137.74	-227.82
4138.20	-166.82
4138.29	-246.84
4138.79	-267.86
4139.14	-252.86
4139.40	-283.88
4140.16	-299.90
4140.29	-246.89
4140.33	-286.90
4140.45	-281.90
4141.12	-253.91
4142.24	-206.92
4142.33	-286.95
4142.76	-226.94
4143.81	-266.98
4143.92	-303.99
4144.53	-194.97
4145.12	-211.99
4145.79	-226.01
4146.54	-278.05
4146.71	-271.05
4146.74	-228.04
4147.55	-194.05
4147.83	-266.07
4147.88	-306.09
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4148.40	-284.09
4149.[illegible]	-256.10
4149.[illegible]	-281.12

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4149.57	-193.09
4149.59	-276.12
4150.12	-254.12
4150.67	-231.13
4150.73	-270.14
4150.74	-186.12
4151.19	-167.13
4151.57	-277.17
4152.74	-186.17
4152.81	-266.19
4153.26	-206.19
4153.38	-201.19
4153.46	-156.18
4154.18	-293.23
4154.74	-228.23
4154.81	-267.24
4155.23	-249.25
4156.14	-211.26
4156.83	-224.28
4157.11	-296.30
4157.57	-277.31
4157.86	-181.29
4158.54	-236.32
4158.95	-261.34
4159.71	-271.36
4159.73	-228.35
4160.57	-235.37
4161.09	-255.39
4161.62	-325.41
4161.56	-361.43
4162.07	-256.41
4163.69	-230.44
4164.42	-325.49
4164.42	-241.46
4164.97	-260.48
4165.37	-285.50
4165.83	-266.50
4165.89	-305.52
4167.85	-265.55
4168.63	-274.57
4169.00	-[illegible].54
4169.04	-213.57
4169.05	-173.55
4170.64	-148.58
4170.87	-264.62
4171.11	-212.61
4171.35	-244.63
4171.47	-281.64
4172.04	-173.63
4172.47	-239.65
4172.63	-274.67
4174.04	-173.67
4175.11	-254.72
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4178.11	-212.78
4178.25	-248.79
4179.04	-257.82
4181.16	-252.87

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
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4185.01	-216.95
4185.27	-331.99
4186.27	-290.00
4187.72	-271.03
4187.92	-221.02
4188.29	-415.08
4188.39	-283.05
4192.27	-332.15
4192.46	-282.14
4192.72	-271.15
4193.22	-290.15
4193.49	-115.12
4194.39	-285.19
4194.58	-277.19
4194.66	-148.16
4195.01	-301.21
4195.91	-238.20
4195.63	-233.20
4195.77	-311.23
4196.20	-251.22
4197.94	-220.26
4198.86	-265.29
4198.98	-260.29
4199.11	-213.28
4199.27	-290.31
4199.77	-269.31
4200.14	-337.34
4201.34	-287.36
4202.03	-258.36
4202.65	-190.36
4203.01	-175.36
4203.18	-168.37
4203.41	-284.41
4203.53	-237.39
4203.91	-263.41
4204.10	-255.41
4204.17	-294.43
4205.17	-252.44
4205.89	-264.46
4205.96	-219.45
4206.15	-295.47
4206.46	-282.48
4206.91	-305.49
4207.34	-203.48
4207.55	-278.50
4208.06	-215.50
4209.31	-288.55
4210.72	-187.55
4211.72	-271.60
4212.60	-276.62
4213.08	-214.62
4213.15	-169.61
4213.60	-234.63
4214.24	-207.64
4215.46	-239.68
4215.89	-180.67
4217.08	-214.71

X	Z
4217.29	-163.70
4217.65	-232.73
4219.02	-342.79
4219.38	-243.77
4219.64	-316.80
4220.00	-259.79
4220.41	-242.80
4220.41	-200.79
4221.17	-252.82
4221.93	-237.82
4221.58	-193.81
4222.12	-296.86
4222.77	-185.84
4223.39	-201.86
4223.41	-242.87
4223.81	-267.89
4224.45	-240.90
4224.52	-279.91
4224.88	-264.91
4224.88	-222.90
4225.07	-298.93
4225.19	-251.92
4226.02	-258.94
4227.09	-255.96
4227.26	-248.96
4228.08	-172.96
4228.19	-251.99
4228.53	-195.98
4228.69	-315.02
4229.09	-256.01
4230.47	-282.05
4230.78	-269.05
4230.93	-221.04
4231.05	-258.06
4231.09	-256.06
4231.60	-193.05
4233.14	-254.11
4234.74	-229.14
4234.85	-308.16
4234.93	-263.15
4235.45	-190.15
4236.04	-258.18
4236.31	-247.18
4237.80	-310.23
4238.00	-260.22
4238.81	-184.22
4239.98	-177.25
4242.05	-216.31
4242.88	-265.34
4244.71	-230.38
4245.30	-289.41
4245.93	-221.40
4246.81	-184.41
4246.87	-307.45
4247.07	-215.43
4247.42	-284.46
4247.78	-269.46
4249.78	-269.51
4250.57	-236.52

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
4250.92	-209.55
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4251.14	-170.51
4251.18	-252.94
4251.66	-274.55
4252.04	-300.57
4252.40	-285.57
4252.73	-229.57
4253.23	-290.58
4253.50	-197.58
4254.76	-186.60
4255.24	-166.61
4256.44	-283.67
4257.00	-176.65
4257.01	-259.68
4257.18	-336.70
4257.85	-182.68
4258.13	-254.70
4258.26	-207.69
4258.30	-247.70
4258.34	-329.73
4258.96	-303.74
4259.26	-207.72
4259.57	-194.72
4259.92	-263.75
4260.92	-263.77
4261.01	-301.78
4261.04	-258.77
4261.16	-211.76
4262.23	-208.79
4262.23	-208.79
4263.01	-301.83
4263.99	-302.86
4264.60	-318.88
4265.22	-292.88
4266.80	-268.91
4267.20	-293.93
4267.25	-249.92
4267.51	-238.92
4267.73	-187.91
4269.22	-292.98
4269.58	-235.97
4269.73	-229.97
4270.01	-217.98
4270.44	-241.99
4271.75	-229.02
4272.48	-324.07
4275.49	-198.10
4275.70	-273.11
4275.77	-312.14
4276.72	-272.15
4276.94	-177.13
4277.73	-188.15
4277.79	-269.18
4278.20	-252.18
4278.30	-248.18
4278.78	-186.18
4279.46	-283.22
4280.13	-213.22

X	Z
4280.49	-198.22
4280.80	-185.22
4280.92	-222.24
4281.44	-242.26
4281.48	-282.27
4281.63	-234.26
4282.01	-218.26
4282.44	-242.28
4283.23	-167.28
4284.41	-243.33
4284.68	-232.33
4284.94	-263.34
4285.23	-167.32
4285.23	-167.32
4285.84	-267.37
4286.77	-228.38
4287.86	-350.44
4288.34	-288.43
4289.32	-205.42
4289.41	-243.45
4290.72	-230.47
4292.17	-337.54
4292.38	-286.53
4292.80	-185.51
4293.37	-203.53
4293.60	-235.54
4293.77	-196.53
4293.79	-227.55
4294.41	-285.58
4295.98	-219.60
4296.08	-173.59
4296.96	-262.63
4297.56	-195.63
4298.48	-240.66
4298.93	-221.67
4300.15	-212.69
4300.48	-282.72
4300.53	-196.70
4300.67	-232.71
4301.10	-256.73
4301.15	-254.73
4301.95	-262.75
4301.96	-220.74
4302.13	-171.73
4302.43	-200.74
4303.17	-211.77
4303.51	-197.77
4304.21	-293.81
4305.41	-243.83
4307.00	-344.89
4307.77	-186.87
4310.35	-286.96
4310.57	-236.95
4310.60	-193.94
4311.69	-189.96
4312.07	-257.99
4312.35	-330.02
4312.90	-265.01
4314.14	-297.05

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
4314.31	-164.02
4314.43	-192.03
4314.66	-317.07
4315.19	-253.06
4315.69	-190.06
4315.76	-271.08
4316.47	-283.10
4317.31	-164.09
4317.38	-245.11
4318.09	-257.13
4318.22	-168.11
4319.05	-217.15
4319.18	-337.18
4319.64	-234.17
4319.64	-234.17
4319.66	-275.18
4320.10	-173.16
4320.19	-253.18
4320.79	-166.18
4320.93	-222.19
4321.00	-261.21
4321.78	-228.21
4321.96	-388.26
4324.38	-203.27
4324.45	-284.29
4324.78	-270.30
4325.07	-258.30
4325.38	-245.31
4325.62	-235.31
4325.69	-190.30
4326.88	-224.33
4328.31	-206.36
4328.40	-286.39
4329.33	-205.39
4329.62	-193.39
4329.78	-228.41
4330.81	-227.43
4331.38	-203.44
4331.54	-280.46
4331.87	-350.49
4332.33	-205.46
4332.35	-330.50
4333.81	-143.48
4334.63	-318.55
4335.26	-250.54
4335.42	-327.57
4335.71	-273.56
4336.06	-258.56
4336.73	-230.57
4339.25	-272.65
4339.47	-241.64
4340.13	-339.68
4340.44	-368.70
4340.64	-192.65
4340.92	-264.68
4340.92	-264.68
4341.13	-297.70
4341.25	-292.70
4342.64	-192.70

X	Z
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4344.59	-152.74
4344.85	-267.78
4345.15	-380.82
4345.33	-209.77
4345.66	-233.79
4345.97	-262.80
4345.99	-219.79
4346.35	-246.81
4346.35	-246.81
4346.85	-229.81
4346.97	-262.83
4347.16	-254.83
4347.37	-287.84
4347.68	-274.85
4347.87	-224.84
4347.95	-179.83
4348.16	-170.83
4348.23	-167.83
4349.16	-170.85
4349.72	-396.92
4350.04	-217.89
4350.28	-207.89
4350.29	-432.92
4350.85	-183.90
4351.09	-215.91
4351.25	-290.92
4351.44	-284.94
4351.49	-240.93
4351.51	-261.94
4351.61	-239.93
4352.35	-294.94
4353.37	-201.96
4353.39	-286.99
4354.18	-189.97
4354.87	-279.00
4354.[illegible]	-266.02
4354.[illegible]	-177.99
4355.60	-228.03
4356.[illegible]	-252.04
4356.89	-266.06
4357.29	-253.07
4357.56	-236.07
4358.16	-213.08
4358.28	-166.07
4358.32	-206.08
4358.99	-220.10
4359.53	-239.12
4359.58	-237.12
4359.80	-144.10
4359.96	-263.14
4360.21	-169.11
4360.61	-236.14
4361.51	-239.17
4361.93	-306.19
4362.36	-288.20
4362.56	-238.19
4362.97	-179.18
4363.46	-200.20

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
4363.49	-157.19
4365.49	-157.24
4366.46	-242.28
4366.77	-187.28
4367.72	-357.35
4367.91	-349.35
4368.52	-114.30
4368.93	-281.35
4370.84	-226.38
4371.12	-298.41
4373.12	-256.45
4374.84	-186.47
4375.20	-253.50
4375.27	-208.49
4375.27	-208.49
4376.14	-339.54
4376.67	-233.53
4376.70	-190.51
4377.09	-259.54
4377.08	-216.53
4377.15	-255.54
4377.34	-163.52
4377.75	-188.54
4378.96	-179.57
4381.91	-265.66
4382.19	-295.68
4382.27	-208.65
4382.79	-270.68
4383.94	-180.68
4383.95	-347.73
4384.57	-363.75
4386.45	-243.76
4386.78	-312.79
4387.03	-218.77
4387.12	-256.78
4387.66	-317.8[illegible]
4389.17	-296.8[illegible]
4391.17	-212.8[illegible]
4391.36	-246.88
4392.12	-298.91
4392.44	-159.88
4393.86	-229.91
4395.45	-284.99
4395.53	-197.97
4396.02	-261.00
4396.55	-281.01
4397.81	-228.03
4397.89	-183.02
4398.26	-251.05
4399.02	-219.06
4399.14	-340.09
4399.67	-234.07
4399.81	-186.06
4400.33	-206.08
4400.93	-181.09
4401.78	-355.16
4401.95	-222.13
4402.22	-169.12
4403.02	-261.16

X	Z
4404.23	-336.21
4404.60	-195.18
4404.78	-229.20
4405.07	-259.21
4405.34	-164.19
4405.40	-203.20
4405.81	-270.23
4407.07	-217.25
4407.45	-159.24
4407.85	-352.30
4407.93	-181.26
4408.38	-162.26
4408.73	-273.30
4408.83	-269.30
4413.26	-209.39
4413.48	-158.38
4413.50	-199.40
4413.95	-264.42
4414.33	-248.43
4415.07	-259.45
4417.00	-220.48
4417.45	-201.49
4420.66	-234.58
4421.51	-282.61
4421.80	-270.61
4421.82	-269.61
4422.11	-592.7
4422.59	-237.62
4423.11	-257.6[illegible]
4423.40	-245.64
4423.42	-244.64
4423.99	-304.68
4424.51	-324.69
4425.20	-167.67
4425.28	-250.69
4425.30	-249.69
4426.25	-251.71
4426.33	-206.70
4426.78	-271.73
4427.04	-260.74
4427.75	-230.74
4427.93	-139.72
4428.06	-259.76
4428.37	-246.76
4429.80	-228.79
4430.32	-290.82
4430.66	-234.81
4430.97	-263.83
4431.65	-276.85
4431.87	-309.87
4431.92	-269.85
4432.16	-255.86
4432.30	-249.86
4434.64	-193.90
4434.89	-266.93
4435.16	-213.92
4436.25	-209.94
4436.87	-267.97
4437.30	-249.98

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
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4437.89	-267.00
4437.94	-222.99
4440.18	-213.04
4440.38	-372.09
4440.91	-266.07
4441.51	-241.08
4442.51	-199.09
4443.06	-260.12
4444.09	-175.12
4444.96	-264.16
4445.13	-173.14
4445.19	-214.16
4445.18	-259.17
4445.39	-204.16
4447.13	-215.20
4447.70	-275.23
4447.82	-228.22
4447.87	-226.22
4448.23	-169.22
4448.27	-209.23
4448.32	-165.22
4448.87	-226.25
4449.06	-218.25
4449.17	-255.26
4450.48	-242.29
4450.53	-282.30
4451.63	-152.29
4452.70	-212.32
4452.44	-244.34
4452.99	-221.34
4453.72	-232.36
4454.79	-229.37
4455.03	-261.40
4455.60	-279.42
4455.67	-276.42
4457.27	-167.43
4457.36	-247.46
4457.44	-160.4
4457.67	-234.46
4457.74	-273.47
4457.93	-265.47
4458.32	-249.48
4458.36	-331.50
4458.63	-236.48
4458.86	-310.51
4458.96	-264.50
4460.24	-294.54
4460.51	-241.53
4460.53	-240.53
4461.31	-249.55
4461.67	-276.57
4461.74	-315.58
4462.41	-245.58
4462.44	-160.55
4462.57	-280.59
4462.62	-278.59
4462.70	-233.58
4462.84	-227.58

X	Z
4463.41	-244.60
4465.57	-322.67
4465.76	-272.66
4465.77	-188.64
4466.29	-250.67
4467.59	-363.73
4468.86	-268.74
4468.91	-224.72
4469.03	-261.74
4469.46	-201.73
4471.03	-219.77
447'.14	-256.79
4471.34	-164.77
4472.00	-262.81
4472.15	-214.80
4472.86	-226.82
4472.94	-139.80
4473.27	-167.81
4473.36	-247.84
4473.90	-308.87
4474.96	-222.87
4475.00	-262.88
4475.22	-253.88
4475.50	-283.90
4476.00	-220.89
4476.21	-337.93
4476.74	-273.93
4476.97	-305.94
4477.57	-238.94
4478.41	-203.95
4478.81	-312.99
4478.96	-180.95
4479.20	-170.96
4479.26	-209.97
4479.67	-192.97
4479.91	-224.99
4480.33	-249.00
4480.35	-332.03
4481.31	-250.03
4481.40	-246.03
4482.23	-295.06
4482.26	-210.04
4483.62	-237.08
4484.60	-154.08
4485.05	-177.10
4485.38	-205.11
4485.40	-246.12
4485.74	-232.13
4486.27	-168.12
4487.38	-247.17
4487.52	-241.17
4487.78	-272.19
4487.90	-225.18
4488.07	-176.17
4489.76	-273.24
4490.64	-236.25
4490.78	-272.26
4491.28	-251.27
4491.28	-251.27

SECRET

X	Z
4491.28	-209.25
4492.16	-256.29
4492.33	-249.29
4492.45	-244.29
4492.62	-237.29
4493.04	-261.31
4493.16	-256.31
4494.16	-256.34
4494.16	-214.32
4494.30	-242.35
4494.57	-239.34
4495.40	-330.39
4495.93	-224.37
4496.24	-169.36
4496.45	-244.37
4498.35	-248.43
4498.61	-279.45
4498.73	-232.44
4499.35	-248.46
4501.11	-258.50
4501.50	-200.50
4501.52	-283.52
4502.47	-243.53
4502.47	-243.53
4502.92	-224.54
4504.01	-304.59
4509.87	-268.62
4507.09	-217.63
4507.54	-282.66
4507.71	-191.64
4509.23	-253.70
4509.47	-243.70
4510.06	-260.72
4510.20	-296.73
4510.87	-268.74
4511.49	-326.77
4511.71	-233.75
4511.75	-231.75
4511.87	-310.77
4511.87	-268.76
4512.28	-251.77
4513.06	-260.79
4513.16	-256.79
4513.18	-255.79
4513.45	-202.78
4513.80	-271.81
4513.83	-186.79
4514.02	-178.79
4514.11	-258.81
4514.47	-201.81
4514.51	-241.82
4514.80	-229.82
4514.90	-183.81
4514.97	-222.82
4515.71	-233.84
4516.06	-260.86
4516.78	-230.87
4517.03	-303.90
4517.75	-189.88

X	Z
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4517.89	-267.91
4517.92	-266.91
4518.44	-202.90
4518.56	-323.94
4518.87	-184.91
4518.92	-182.91
4518.96	-264.93
4519.01	-262.93
4520.06	-260.96
4520.21	-212.95
4520.27	-251.96
4520.73	-232.96
4521.49	-285.00
4521.51	-241.99
4521.85	-185.98
4521.92	-182.98
4522.04	-219.99
4522.08	-302.02
4522.37	-248.01
4522.59	-197.00
4522.60	-280.02
4522.71	-192.00
4523.23	-170.01
4523.35	-207.02
4523.35	-207.02
4523.46	-244.03
4523.77	-273.05
4523.94	-224.04
4524.06	-261.05
4524.13	-258.05
4524.27	-252.05
4524.58	-239.06
4524.63	-237.06
4524.63	-237.06
4525.11	-217.06
4525.17	-298.09
4525.61	-154.06
4526.11	-259.10
4526.32	-208.09
4526.87	-227.11
4526.91	-267.12
4526.99	-222.11
4527.39	-289.14
4527.77	-231.13
4527.87	-185.12
4528.44	-249.15
4528.75	-190.14
4528.79	-272.17
4529.84	-312.20
4530.27	-252.20
4530.39	-205.19
4530.42	-204.19
4532.18	-214.23
4532.82	-187.24
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4533.34	-207.26
4533.93	-350.31

DOCUMENT UNCLASSIFIED JCP-I, DPG

x	z
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4535.87	-227.32
4536.14	-215.33
4536.68	-235.35
4536.73	-191.33
4537.06	-177.34
4537.18	-172.34
4538.05	-261.39
4538.53	-199.38
4538.63	-237.39
4539.72	-233.42
4539.96	-181.41
4540.13	-216.42
4540.13	-216.42
4540.82	-187.43
4542.01	-221.47
4542.17	-214.47
4543.67	-277.52
4543.81	-355.55
4543.89	-276.52
4544.15	-257.53
4545.48	-243.56
4546.34	-249.58
4546.86	-227.59
4547.62	-237.61
4547.67	-193.60
4548.20	-171.60
4548.72	-275.64
4548.93	-224.63
4549.03	-178.62
4549.22	-212.64
4549.29	-293.66
4549.55	-198.64
4550.00	-263.67
4550.00	-263.67
4551.03	-262.70
4551.05	-261.70
4551.17	-214.69
4551.31	-250.70
4551.67	-235.70
4552.62	-279.74
4553.33	-291.76
4553.88	-268.77
4554.57	-239.77
4554.59	-364.81
4554.96	-181.77
4555.29	-209.78
4556.05	-261.82
4556.55	-240.82
4556.71	-317.85
4556.74	-316.85
4557.72	-233.85
4557.81	-229.85
4558.05	-177.84
4558.17	-214.85
4558.46	-202.86
4558.81	-229.87
4559.05	-219.88

x	z
4559.26	-294.90
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4560.24	-169.89
4560.62	-195.91
4560.66	-361.95
4560.85	-311.94
4560.91	-183.91
4560.91	-183.91
4560.98	-222.92
4562.26	-252.96
4562.79	-230.97
4562.99	-390.02
4563.12	-258.98
4563.12	-216.97
4563.40	-289.00
4563.46	-289.00
4564.50	-285.02
4564.69	-193.00
4564.95	-224.02
4565.07	-219.02
4565.26	-211.02
4565.36	-165.01
4566.74	-233.06
4566.76	-274.07
4567.64	-279.10
4568.15	-174.08
4568.34	-290.12
4568.63	-155.08
4568.90	-268.12
4569.73	-317.16
4570.39	-373.19
4570.40	-247.15
4570.46	-161.13
4570.71	-234.16
4572.24	-254.20
4573.07	-261.22
4573.26	-211.21
4573.78	-315.25
4573.95	-224.23
4574.14	-216.23
4574.31	-209.24
4574.71	-318.28
4575.17	-173.25
4576.14	-258.29
4576.42	-284.31
4576.57	-198.29
4576.57	-198.29
4576.59	-323.32
4576.97	-223.30
4577.47	-286.33
4577.83	-187.31
4578.06	-303.35
4578.45	-267.36
4579.02	-263.36
4579.02	-263.36
4579.11	-259.37
4579.35	-241.38
4579.55	-199.36

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
4580.09	-260.39
4580.09	-260.39
4580.47	-202.38
4580.47	-202.38
4581.92	-267.43
4582.26	-211.43
4582.42	-246.44
4582.71	-234.44
4583.01	-305.47
4583.49	-243.47
4583.52	-242.47
4583.86	-227.47
4584.40	-289.50
4584.52	-242.49
4584.66	-236.49
4585.88	-227.52
4586.26	-253.53
4586.61	-280.55
4586.62	-154.51
4587.16	-257.56
4587.30	-251.56
4587.75	-274.58
4588.31	-209.57
4588.97	-161.58
4589.02	-221.59
4589.19	-172.58
4589.35	-291.62
4589.83	-145.59
4590.08	-302.64
4590.14	-216.62
4590.14	-216.62
4590.56	-240.63
4591.23	-296.66
4591.50	-201.64
4592.66	-236.68
4593.02	-137.66
4594.54	-199.72
4594.80	-314.76
4594.80	-314.76
4594.97	-265.75
4595.14	-216.74
4595.68	-235.75
4595.95	-140.73
4596.14	-216.76
4596.83	-187.77
4596.90	-226.78
4597.08	-260.79
4597.37	-248.80
4597.44	-245.80
4597.61	-198.79
4597.61	-196.79
4597.73	-275.81
4597.89	-310.83
4598.33	-166.80
4598.42	-246.82
4598.90	-184.82
4599.46	-286.86
4599.51	-368.88
4599.66	-194.84

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4600.09	-218.85
4600.23	-254.87
4600.49	-243.87
4600.94	-224.88
4600.99	-264.89
4600.99	-264.89
4601.06	-303.90
4601.11	-217.88
4601.11	-216.88
4601.23	-212.88
4601.56	-240.90
4602.07	-177.89
4602.16	-215.90
4602.92	-225.92
4603.10	-301.95
4603.21	-213.93
4603.21	-213.93
4603.23	-212.93
4603.37	-290.95
4603.56	-198.93
4604.35	-165.94
4604.42	-246.97
4604.68	-235.97
4605.77	-231.99
4605.80	-230.99
4606.23	-255.01
4606.25	-254.01
4606.25	-254.01
4606.99	-223.02
4607.04	-137.00
4607.29	-294.05
4607.30	-252.04
4608.91	-310.09
4608.96	-224.07
4609.20	-256.08
4609.79	-273.10
4609.99	-223.09
4610.15	-258.11
4610.94	-225.11
4613.06	-242.18
4613.32	-293.19
4613.54	-200.17
4614.60	-281.22
4614.70	-235.21
4614.99	-181.20
4615.15	-258.22
4615.30	-210.21
4615.70	-235.23
4617.22	-255.27
4617.56	-241.28
4618.17	-257.30
4618.77	-274.32
4619.31	-293.33
4619.35	-166.30
4619.84	-271.34
4620.12	-301.36
4620.68	-311.38
4621.10	-218.36
4621.15	-258.37

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
4622.31	-335.42
4622.61	-197.39
4623.27	-253.42
4623.27	-253.42
4623.27	-253.42
4623.51	-201.41
4623.55	-241.42
4624.03	-305.45
4624.29	-252.44
4625.08	-261.46
4625.84	-271.48
4627.20	-256.51
4627.39	-206.50
4627.41	-289.53
4627.46	-245.52
4627.80	-189.51
4628.55	-241.54
4628.72	-276.55
4628.84	-229.54
4629.29	-252.56
4630.26	-295.60
4630.81	-272.60
4630.83	-313.61
4630.98	-265.60
4631.01	-180.58
4631.06	-178.58
4631.46	-245.61
4631.88	-311.64
4631.96	-266.63
4632.17	-215.62
4632.27	-211.62
4632.36	-207.62
4632.88	-269.65
4633.10	-218.64
4633.58	-198.65
4633.98	-265.68
4633.98	-223.66
4634.24	-254.68
4634.51	-201.67
4634.84	-271.70
4635.03	-263.70
4635.34	-250.70
4636.41	-289.74
4636.67	-236.73
4637.74	-233.76
4637.77	-190.75
4638.21	-339.80
4638.22	-213.76
4638.67	-278.79
4639.14	-258.80
4639.48	-202.79
4639.53	-200.79
4640.58	-198.81
4640.91	-226.83
4641.44	-162.83
4642.10	-260.87
4642.41	-247.87
4643.67	-236.90
4644.19	-256.92

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4644.50	-243.92
4644.81	-188.91
4645.17	-215.93
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4645.57	-240.95
4645.88	-269.96
4645.90	-268.96
4645.93	-267.96
4646.00	-306.97
4646.02	-265.96
4646.26	-211.95
4646.13	-260.01
4648.93	-226.02
4649.86	-229.04
4649.95	-267.06
4650.19	-215.05
4651.28	-253.09
4652.05	-263.11
4652.31	-210.10
4652.36	-250.11
4652.80	-315.14
4653.00	-223.12
4653.71	-235.14
4653.76	-275.15
4654.76	-191.13
4653.85	-313.16
4654.10	-219.14
4654.45	-204.15
4654.48	-119.12
4654.55	-116.12
4654.90	-269.18
4655.11	-91.12
4655.21	-340.20
4655.55	-242.18
4655.79	-148.16
4655.97	-266.20
4656.00	-245.20
4656.21	-214.19
4657.23	-255.23
4657.52	-327.26
4657.64	-238.23
4657.64	-238.23
4657.69	-194.22
4658.07	-262.25
4658.07	-178.23
4658.38	-249.25
4658.71	-235.26
4658.71	-235.26
4659.40	-206.27
4660.29	-169.28
4660.37	-291.31
4660.50	-202.29
4661.57	-241.33
4661.90	-227.33
4661.90	-227.33
4661.90	-227.33
4661.95	-183.32
4663.83	-272.39
4664.15	-133.36

DOCUMENT UNCLASSIFIED JCP-I, DPG

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4664.38	-207.39
4664.38	-207.39
4664.67	-153.38
4665.35	-292.43
4665.90	-269.44
4666.16	-216.43
4666.99	-265.46
4667.24	-171.44
4667.59	-240.47
4668.28	-211.48
4668.49	-286.51
4668.57	-157.47
4669.17	-174.49
4669.57	-241.52
4670.42	-205.53
4670.47	-245.54
4670.92	-268.56
4671.16	-216.55
4672.73	-276.60
4673.85	-313.64
4673.99	-223.62
4673.99	-223.62
4674.23	-297.65
4674.35	-208.62
4674.68	-362.68
4674.73	-192.63
4674.80	-273.65
4675.81	-189.65
4675.97	-224.67
4676.00	-97.63
4676.37	-249.68
4676.97	-182.68
4677.21	-214.69
4677.42	-205.70
4677.56	-241.71
4677.87	-312.74
4678.59	-240.73
4678.61	-239.73
4678.61	-239.73
4678.63	-238.73
4678.63	-238.73
4678.73	-276.75
4678.73	-276.75
4679.33	-209.74
4679.54	-200.75
4680.54	-200.77
4680.56	-283.79
4681.32	-335.83
4681.42	-205.79
4681.82	-230.81
4681.82	-230.81
4682.20	-256.82
4682.97	-266.85
4682.[illegible]	-181.82
4683.[illegible]	-288.86
4683.66	-195.84
4684.42	-205.86
4685.25	-296.91
4685.75	-233.90

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4685.94	-181.89
4686.87	-270.94
4687.40	-206.93
4687.54	-242.95
4687.73	-150.93
4688.47	-161.95
4688.58	-240.97
4689.28	-211.98
4690.15	-259.02
4690.35	-166.99
4690.92	-227.02
4690.99	-182.01
4691.11	-261.04
4691.87	-187.04
4692.04	-222.05
4692.34	-293.08
4692.39	-207.05
4693.20	-257.09
4694.25	-255.11
4694.70	-278.13
4694.94	-226.12
4695.18	-216.12
4695.46	-246.14
4695.96	-309.17
4697.70	-236.19
4698.94	-268.23
4698.94	-226.22
4699.98	-266.25
4700.22	-256.25
4700.82	-231.26
4700.94	-226.26
4701.06	-221.26
4701.54	-159.26
4701.85	-146.26
4703.29	-337.35
4703.34	-251.33
4703.48	-245.33
4703.84	-230.33
4703.94	-142.31
4704.10	-261.35
4704.20	-215.34
4704.20	-215.34
4704.20	-215.34
4704.62	-281.37
4705.01	-139.34
4706.13	-260.40
4706.49	-161.38
4706.55	-326.43
4706.72	-235.40
4707.05	-305.43
4707.13	-260.42
4707.35	-167.40
4707.58	-199.41
4707.72	-235.43
4708.01	-265.44
4708.24	-255.45
4708.46	-204.44
4708.60	-240.45
4708.72	-193.44

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
4709.39	-249.47
4709.60	-198.46
4710.12	-240.49
4710.13	-176.47
4710.65	-280.51
4710.86	-229.50
4711.36	-290.52
4711.37	-208.51
4711.51	-244.52
4711.91	-269.54
4711.93	-352.56
4712.01	-181.51
4712.01	-181.51
4712.89	-224.55
4713.05	-180.54
4713.25	-213.55
4713.49	-228.57
4713.91	-269.59
4714.27	-212.58
4714.39	-207.58
4714.64	-238.59
4714.91	-185.59
4715.03	-264.61
4715.15	-259.61
4715.33	-335.64
4715.91	-185.61
4716.17	-258.64
4716.67	-279.65
4717.56	-156.64
4718.17	-218.67
4718.29	-293.69
4718.41	-206.67
4718.55	-262.69
4719.43	-247.71
4719.84	-188.70
4720.57	-283.75
4720.62	-321.76
4720.72	-193.73
4721.69	-238.76
4724.48	-203.79
4725.56	-158.78
4725.57	-241.81
4725.57	-241.81
.84	-148.79
4726.79	-190.81
4726.84	-229.88
4726.96	-183.87
4727.48	-245.90
4728.69	-194.92
4730.04	-347.99
4731.76	-278.01
4731.91	-228.00
4732.40	-249.02
4732.52	-244.02
4733.40	-249.04
4733.44	-122.01
4733.67	-238.05
4733.81	-232.05
4734.05	-264.06

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4734.05	-264.06
4734.17	-259.07
4734.17	-259.07
4734.36	-209.06
4735.24	-130.05
4736.19	-258.11
4736.31	-253.12
4736.31	-253.12
4736.31	-253.12
4736.53	-202.11
4737.19	-174.11
4737.64	-281.15
4737.69	-279.16
4737.69	-153.12
4738.59	-241.17
4738.95	-310.19
4738.95	-310.19
4740.35	-251.21
4740.59	-283.23
4740.71	-278.23
4740.95	-184.21
4740.97	-309.24
4741.09	-262.23
4742.78	-233.26
4743.11	-261.28
4744.38	-208.30
4745.25	-297.34
4746.26	-213.34
4746.97	-225.36
4748.39	-333.43
4748.71	-235.41
4748.77	-359.44
4748.92	-269.42
4749.02	-223.41
4749.31	-211.41
4749.33	-252.43
4749.66	-322.45
4750.07	-263.45
4750.50	-203.44
4750.86	-188.44
4751.21	-257.47
4751.29	-170.45
4752.09	-262.49
4752.30	-295.51
4752.34	-250.50
4752.78	-233.50
4752.80	-232.50
4753.95	-226.53
4754.08	-346.57
4754.09	-270.53
4754.11	-261.54
4754.26	-255.54
4754.40	-249.55
4754.45	-163.52
4754.87	-271.56
4755.25	-255.57
4755.54	-243.57
4756.55	-159.57
4757.44	-157.60

DOCUMENT UNCLASSIFIED JCP-I, DPG

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4757.90	-270.64
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4760.17	-133.65
4760.35	-251.69
4761.09	-220.70
4762.09	-262.73
4762.37	-250.74
4762.52	-244.74
4762.66	-238.74
4763.07	-179.73
4764.25	-255.78
4764.40	-249.78
4764.56	-242.79
4764.73	-277.80
4764.90	-144.77
4765.32	-294.82
4765.35	-209.90
4766.01	-265.83
4766.50	-161.81
4767.06	-221.84
4767.40	-207.84
4767.49	-247.87
4768.66	-154.86
4768.76	-150.86
4768.92	-227.89
4769.06	-263.90
4769.44	-205.89
4770.10	-303.94
4770.68	-195.92
4770.71	-110.90
4772.01	-223.96
4772.11	-261.97
4772.57	-158.95
4772.73	-193.97
4772.89	-313.01
4773.04	-222.98
4773.11	-262.00
4773.13	-261.00
4773.66	-154.98
4773.71	-152.98
4773.71	-110.97
4773.80	-190.99
4774.81	-106.99
4777.49	-204.08
4777.56	-159.07
4777.70	-195.09
4779.37	-251.14
4780.04	-139.13
4780.08	-263.16
4780.39	-208.15
4781.13	-177.16
4781.89	-229.20
4782.34	-336.24
4782.41	-291.23
4782.56	-242.22
4782.68	-196.21
4783.20	-174.21
4783.27	-213.22

X	Z
4783.30	-212.23
4783.73	-194.23
4784.13	-219.25
4784.30	-170.24
4784.87	-271.28
4784.96	-226.27
4785.32	-253.28
4785.39	-166.26
4786.82	-190.30
4786.85	-189.30
4786.87	-188.30
4787.01	-223.32
4787.22	-215.32
4787.53	-244.34
4788.06	-222.34
4788.36	-293.37
4788.41	-249.36
4788.73	-152.34
4789.25	-172.36
4789.49	-204.37
4789.58	-242.38
4790.31	-168.38
4790.37	-167.38
4790.53	-202.39
4790.53	-202.39
4790.67	-280.42
4790.98	-309.44
4791.29	-254.43
4791.80	-191.42
4791.82	-190.42
4792.37	-209.44
4792.39	-208.44
4792.60	-199.44
4792.72	-278.47
4792.87	-188.45
4793.41	-207.47
4793.89	-187.47
4793.91	-186.47
4794.20	-258.50
4794.25	-172.48
4794.74	-277.52
4794.89	-229.51
4794.99	-141.48
4796.19	-300.56
4796.39	-166.52
4796.44	-164.53
4796.44	-164.53
4796.44	-164.53
4796.50	-329.57
4796.94	-227.55
4797.53	-160.55
4797.63	-114.54
4798.29	-254.59
4798.98	-225.60
4799.44	-122.58
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4799.84	-231.63
4800.31	-253.64
4800.43	-290.66

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
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4802.05	-284.69
4807.49	-162.67
4807.49	-162.67
4802.55	-201.68
4803.02	-307.72
4803.58	-242.72
4803.77	-234.72
4804.10	-262.74
4804.43	-248.74
4804.99	-141.72
4804.99	-141.72
4805.67	-196.75
4806.41	-165.76
4807.69	-237.81
4807.82	-190.80
4807.83	-273.83
4807.88	-229.82
4808.58	-158.81
4809.24	-296.87
4809.51	-119.82
4809.74	-235.86
4809.90	-270.88
4810.27	-171.86
4810.67	-196.87
4810.76	-276.90
4810.79	-233.89
4810.79	-233.89
4811.80	-107.88
4812.41	-164.91
4812.98	-267.95
4813.14	-260.95
4811.33	-294.97
4813.88	-229.96
4813.98	-267.97
4814.10	-220.96
4814.15	-176.95
4814.31	-211.97
4814.31	-211.97
4814.35	-293.99
4814.39	-124.94
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4815.05	-138.96
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4817.24	-257.05
4817.43	-249.05
4817.60	-242.05
4817.74	-236.05
4817.90	-271.07
4817.90	-271.07
4818.24	-171.05
4818.45	-248.07
4818.53	-203.06
4818.59	-242.08
4818.64	-156.05
4818.91	-270.09
4819.71	-237.10
4813.95	-269.12
4820.31	-254.12

X	Z
4820.33	-295.13
4820.36	-126.09
4820.81	-191.11
4820.83	-232.13
4821.14	-219.13
4821.17	-176.12
4821.19	-301.15
4821.29	-129.11
4821.52	-245.15
4821.83	-274.16
4822.63	-366.21
4822.70	-112.14
4822.95	-227.18
4823.31	-170.17
4823.49	-372.23
4823.81	-233.20
4823.93	-228.20
4824.69	-154.20
4824.74	-152.20
4824.91	-145.20
4824.94	-353.26
4825.11	-304.25
4825.12	-136.20
4825.69	-196.23
4825.76	-277.26
4825.78	-276.26
4826.61	-283.28
4827.02	-266.28
4827.19	-217.27
4827.30	-296.30
4828.66	-281.33
4828.67	-155.29
4828.79	-192.31
4829.31	-212.32
4829.91	-145.32
4829.93	-144.32
4830.00	-141.32
4830.48	-163.34
4830.54	-244.36
4830.97	-226.37
4831.90	-187.38
4831.97	-268.40
4832.07	-180.36
4833.21	-174.41
4833.24	-215.42
4833.62	-115.40
4833.78	-234.44
4834.36	-168.43
4834.86	-147.44
4834.95	-143.
4836.50	-162.4
4836.52	-270.52
4837.31	-212.51
4838.75	-277.57
4838.97	-226.56
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4840.02	-266.59
4840.05	-181.57
4840.21	-174.57

DOCUMENT UNCLASSIFIED JCP-I, DPG

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4840.73	-278.61
4841.20	-300.63
4841.74	-152.60
4841.85	-273.64
4842.25	-256.64
4842.52	-245.65
4843.07	-222.65
4843.58	-284.68
4844.12	-178.67
4844.56	-285.71
4844.83	-148.68
4845.61	-199.71
4846.02	-224.73
4846.59	-200.73
4846.76	-151.72
4846.89	-188.74
4846.99	-225.75
4847.21	-174.74
4848.52	-161.77
4848.56	-243.79
4848.57	-201.78
4848.71	-195.78
4848.71	-153.77
4849.16	-260.81
4849.51	-287.83
4849.83	-190.81
4849.97	-226.82
4850.11	-220.82
4850.37	-209.83
4850.39	-334.86
4851.07	-138.82
4851.11	-178.83
4851.66	-197.85
4852.01	-266.88
4852.09	-179.86
4852.75	-277.90
4852.80	-233.89
4853.10	-304.92
4854.16	-134.89
4854.46	-331.96
4854.86	-105.90
4854.92	-144.92
4855.14	-135.92
4857.42	-207.99
4857.64	-156.98
4857.83	-148.99
4858.01	-225.01
4859.95	-144.03
4859.95	-102.02
4860.11	-221.06
4861.35	-127.06
4861.41	-292.11
4861.69	-113.07
4861.71	-154.08
4861.79	-276.12
4861.91	-313.13
4862.06	-181.10

X	Z
4863.80	-234.15
4865.01	-267.19
4865.44	-207.18
4865.78	-151.18
4866.89	-230.23
4867.12	-304.25
4868.01	-309.27
4868.80	-192.26
4868.89	-230.27
4869.06	-139.25
4869.37	-252.29
4869.38	-335.31
4869.54	-161.27
4869.54	-161.27
4869.68	-155.27
4869.99	-226.30
4870.82	-149.30
4870.98	-310.35
4871.18	-134.30
4871.22	-258.34
4871.63	-157.32
4871.72	-237.34
4872.32	-170.34
4872.46	-290.38
4872.49	-205.35
4872.58	-243.36
4873.70	-238.39
4874.70	-238.41
4875.28	-130.40
4875.34	-211.42
4875.49	-121.40
4877.07	-306.49
4877.11	-179.45
4877.17	-218.47
4877.32	-212.47
4877.43	-291.49
4877.44	-207.47
4877.93	-270.50
4878.06	-273.49
4878.51	-162.48
4879.17	-260.53
4879.17	-260.53
4880.03	-266.55
4880.22	-174.53
4882.18	-176.57
4883.27	-256.62
4883.61	-116.59
4884.01	-141.61
4885.01	-141.63
4885.58	-117.64
4885.84	-148.65
4886.13	-178.67
4886.24	-257.69
4886.96	-143.68
4887.48	-205.71
4887.68	-113.69
4887.73	-111.69
4887.74	-278.74
4889.08	-138.73

DOCUMENT UNCLASSIFIED JCP-I, DPG

x	y
4889.62	-283.79
4889.72	-195.76
4890.63	-157.77
4891.37	-126.78
4891.48	-163.79
4891.72	-237.82
4891.77	-109.78
4892.62	-283.85
4892.84	-232.85
4892.87	-147.82
4893.15	-135.83
4893.55	-202.85
4893.81	-191.86
4894.07	-222.87
4894.29	-129.85
4894.72	-193.87
4894.93	-188.88
4895.36	-294.92
4895.70	-154.89
4896.05	-223.92
4896.17	-218.92
4896.41	-166.91
4897.39	-125.92
4897.43	-249.96
4899.95	-270.03
4900.03	-225.01
4900.95	-270.05
4901.67	-240.06
4901.84	-189.05
4902.01	-142.04
4902.24	-174.05
4903.02	-225.09
4903.62	-200.09
4904.45	-241.14
4905.14	-220.14
4905.21	-301.16
4905.33	-296.16
4905.50	-205.14
4906.86	-106.14
4906.96	-144.16
4907.10	-138.16
4907.51	-121.16
4908.33	-296.23
4908.52	-246.22
4909.57	-160.20
4910.19	-134.23
4910.34	-170.25
4910.34	-178.23
4910.60	-117.24
4910.69	-281.29
4910.73	-321.30
4911.52	-246.30
4912.07	-181.29
4912.17	-135.28
4912.21	-301.33
4912.24	-218.30
4912.36	-211.31
4912.76	-236.32
4913.31	-171.32

x	y
4913.45	-241.35
4914.16	-211.35
4915.12	-99.34
4916.71	-196.40
4917.24	-216.42
4917.65	-211.42
4917.34	-126.40
4917.91	-146.42
4918.04	-266.46
4918.56	-286.47
4918.61	-326.49
4918.76	-246.46
4919.59	-201.47
4920.19	-176.48
4920.32	-296.52
4920.60	-117.48
4921.61	-326.56
4921.64	-241.54
4922.11	-221.54
4922.44	-241.57
4922.52	-246.56
4922.55	-181.53
4923.08	-306.59
4923.23	-216.57
4923.55	-141.56
4923.73	-321.61
4923.79	-151.56
4923.91	-146.56
4924.40	-251.60
4924.52	-246.61
4924.59	-201.59
4924.69	-226.61
4925.20	-301.64
4925.23	-216.61
4925.47	-290.64
4925.60	-117.59
4925.91	-226.63
4926.07	-181.62
4926.64	-241.65
4927.11	-221.66
4927.51	-286.69
4927.64	-241.68
4928.04	-266.70
4928.47	-296.69
4929.15	-276.73
4929.37	-246.71
4929.81	-191.72
4929.87	-231.73
4930.39	-291.76
4930.54	-287.76
4930.81	-191.74
4930.91	-186.74
4931.24	-256.77
4931.71	-196.76
4932.04	-266.81
4932.44	-270.80
4932.81	-150.92
4933.49	-226.85
4933.61	-241.87

DOCUMENT UNCLASSIFIED JCP-I, DPG

x	z
4936.04	-266.89
4936.31	-129.85
4936.31	-129.85
4936.31	-129.85
4936.92	-271.91
4937.51	-246.92
4937.78	-235.92
4938.04	-266.93
4938.07	-139.90
4938.07	-139.90
4938.26	-131.90
4939.47	-164.94
4939.49	-289.97
4940.13	-220.97
4940.73	-195.98
4941.70	-281.03
4941.87	-274.03
4941.94	-271.03
4942.47	-165.01
4943.41	-293.07
4944.25	-174.06
4944.44	-250.08
4944.49	-164.06
4944.68	-282.10
4944.87	-232.09
4944.99	-185.08
4945.11	-180.08
4945.13	-179.08
4945.49	-184.08
4945.87	-190.10
4946.46	-249.13
4946.75	-153.11
4946.82	-276.15
4947.30	-256.15
4947.40	-168.13
4947.42	-209.14
4947.42	-209.14
4947.44	-208.14
4947.82	-276.17
4948.30	-256.18
4948.78	-152.16
4948.87	-232.18
4949.77	-320.23
4949.84	-233.21
4950.03	-225.21
4950.03	-97.17
4950.53	-246.23
4951.60	-285.26
4951.67	-282.26
4952.05	-308.28
4952.21	-134.23
4952.27	-257.27
4952.51	-247.27
4952.68	-156.25
4952.84	-275.29
4953.49	-206.29
4953.65	-283.31
4953.77	-236.30
4954.56	-245.32

x	z
4955.30	-214.33
4955.73	-196.34
4955.73	-196.34
4955.75	-237.35
4955.75	-195.34
4956.03	-309.38
4957.08	-223.38
4957.18	-135.35
4957.99	-185.39
4958.20	-260.41
4958.86	-274.43
4959.08	-223.42
4959.10	-264.44
4959.20	-260.44
4959.50	-289.45
4959.86	-274.46
4959.86	-232.44
4959.98	-311.47
4960.62	-284.48
4961.82	-234.49
4962.15	-220.50
4962.80	-151.49
4963.96	-228.54
4964.06	-182.53
4964.06	-182.53
4964.74	-279.57
4965.27	-301.59
4965.58	-244.58
4965.61	-159.56
4965.77	-278.60
4965.84	-275.60
4966.05	-224.59
4966.0	-265.60
4966.18	-177.58
4966.71	-239.61
4966.79	-193.60
4966.89	-147.59
4967.24	-256.63
4967.81	-234.64
4967.93	-229.64
4968.14	-137.62
4968.64	-323.68
4969.17	-219.66
4970.03	-225.69
4970.03	-225.69
4970.13	-137.66
4971.41	-251.73
4971.77	-236.73
4972.20	-176.72
4972.43	-25 .76
4972.43	-292.76
4972.53	-246.75
4972.66	-324.78
4972.91	-230.76
4973.15	-136.73
4973.20	-218.76
4974.24	-258.80
4974.29	-256.80
4974.34	-210.79

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
4974.64	-2[illegible]3.81
4974.67	-282.81
4974.86	-1[illegible]0.79
4974.88	-231.80
4975.80	-231.82
4976.93	-229.85
4976.96	-144.83
4977.29	-256.87
4977.81	-234.87
4978.14	-304.90
4978.96	-144.88
4978.99	-352.94
4979.26	-257.92
4979.36	-211.90
4979.36	-211.90
4979.86	-232.92
4979.8[illegible]	-273.93
4979.9[illegible]	-227.92
4980.39	-168.92
4981.29	-214.95
4981.34	-170.94
4981.34	-128.93
4981.81	-234.97
4982.65	-115.96
4983.83	-234.02
4984.33	-255.04
4984.81	-133.03
4985.09	-269.06
4985.02	-268.08
4986.07	-268.08
4986.69	-198.08
4986.9[illegible]	-102.06
4987.57	-207.12
4987.50	-248.13
4988.91	-147.11
4989.44	-145.13
4989.5[illegible]	-249.16
4990.71	-239.19
4990.74	-218.1[illegible]
4991.57	-161.10
4992.04	-267.22
4992.2[illegible]	-299.24
4992.29	-215.21
4993.02	-268.25
4993.02	-228.23
4993.24	-299.26
4993.28	-257.25
4993.31	-256.25
4993.62	-243.25
4993.64	-242.25
4993.86	-233.26
4994.64	-242.28
4995.76	-279.31
4995.9[illegible]	-144.28
4996.26	-216.31
4996.70	-114.29
4998.4[illegible]	-165.35
4998.6[illegible]	-282.39
4999.78	-236.40

X	Z
5000.73	-280.43
5001.00	-143.40
5001.28	-215.43
5002.00	-143.43
5002.12	-222.45
5002.21	-260.46
5002.78	-194.46
5002.97	-270.48
5003.40	-168.47
5003.47	-291.50
5004.21	-260.51
5004.3[illegible]	-169.49
5004.50	-206.50
5005.00	-227.52
5005.42	-209.53
5005.61	-243.54
5005.68	-240.54
5007.16	-178.56
5007.47	-207.57
5007.68	-240.59
5008.1[illegible]	-262.61
5008.16	-262.61
5008.2[illegible]	-299.62
5008.30	-298.62
5009.92	-230.64
5010.04	-225.64
5010.30	-298.67
5010.66	-241.66
5010.7[illegible]	-236.66
5010.83	-234.66
5010.85	-275.67
5011.1[illegible]	-262.68
5011.90	-189.67
5011.91	-105.65
5012.13	-263.70
5012.64	-242.71
5012.64	-242.71
5013.8[illegible]	-190.72
5014.13	-263.75
5014.37	-253.75
5014.85	-149.73
5014.92	-188.75
5015.16	-136.74
5015.35	-254.78
5015.85	-275.79
5015.85	-233.78
5016.08	-307.81
5016.8[illegible]	-149.78
5017.94	-271.84
5017.94	-311.85
5018.20	-260.85
5019.07	-223.86
5019.21	-134.83
5019.2[illegible]	-257.87
5019.32	-297.88
5019.83	-190.85
5020.9[illegible]	-147.89
5022.06	-224.93
5022.80	-277.96

SECRET

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5024.77	-279.01
5025.04	-226.00
5025.22	-302.02
5025.27	-258.01
5025.54	-247.02
5026.77	-279.06
5027.72	-241.08
5028.28	-174.06
5028.77	-237.09
5029.17	-304.12
5029.61	-202.10
5030.80	-194.13
5031.39	-128.12
5032.34	-255.18
5032.49	-165.16
5032.61	-202.17
5032.99	-228.19
5032.99	-228.19
5033.37	-126.17
5034.78	-153.21
5034.84	-234.24
5034.97	-187.22
5035.11	-181.23
5035.47	-124.22
5035.82	-235.26
5036.15	-305.29
5036.47	-124.24
5036.55	-288.29
5 36.75	-154.26
5036.82	-235.28
5037.08	-182.27
5037.74	-122.33
5038.13	-222.31
5038.44	-167.30
5039.25	-133.31
5040.62	-285.39
5041.53	-247.40
5042.92	-147.40
5043.50	-374.48
5044.89	-232.47
5045.48	-333.52
5046.13	-180.49
5046.20	-261.51
5046.84	-276.53
5046.86	-233.52
5047.01	-185.51
5047.41	-210.53
5047.77	-237.54
5048.34	-255.56
5049.24	-301.60
5049.24	-301.60
5050.25	-133.57
5050.31	-256.61
5050.49	-165.59
5050.67	-283.63
5051.13	-222.62

X	Z
50 00	-311.67
5052.03	-268.65
5052.36	-254.66
5053.29	-257.68
5053.38	-253.68
5053.55	-246.69
5053.74	-238.69
5054.15	-263.70
5054.29	-299.72
5054.55	-204.70
5054.72	-239.71
5055.19	-261.73
5055.35	-253.73
5055.67	-199.72
5056.00	-269.75
5056.53	-205.74
5057.04	-141.74
5057.07	-266.77
5057.77	-237.78
5058.00	-227.79
5058.04	-100.75
5058.39	-127.77
5058.45	-292.82
5058.56	-120.77
5059.30	-131.79
5060.30	-131.81
5060.70	-198.84
5060.77	-111.82
5060.81	-277.87
5061.39	-85.83
5061.98	-228.88
5062.27	-174.87
5063.01	-185.89
5063.40	-378.96
5063.45	-292.93
5064.09	-391.98
5064.17	-178.92
5065.69	-198.96
5065.90	-273.99
5065.90	-273.99
5066.46	-208.98
5067.23	-302.03
5067.29	-258.02
5067.40	-295.03
5067.79	-237.02
5068.05	-226.03
5068.29	-216.03
5068.43	-210.03
5068.65	-167.02
5069.00	-228.05
5069.29	-216.05
5069.66	-326.09
5069.69	-326.09
5069.81	-278.08
5070.00	-228.07
5070.48	169.03
5070.55	-205.08
5070.59	-287.10
5070.65	-243.09

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
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5072.76	-322.16
5072.84	-193.13
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5073.67	-116.13
5074.61	-246.20
5074.64	-243.19
5074.65	-159.16
5074.88	-191.18
5074.99	-312.22
5075.73	-323.24
5075.87	-318.24
5076.02	-311.24
5076.04	-268.23
5076.32	-340.26
5076.97	-229.24
5079.28	-258.30
5079.54	-247.31
5079.71	-240.31
5081.36	-129.32
5083.40	-299.41
5083.41	-169.38
5083.69	-115.37
5084.29	-216.41
5085.12	-97.40
5085.42	-252.45
5085.61	-244.45
5085.62	-160.43
5086.19	-136.43
5086.51	-245.47
5086.86	-192.46
5086.87	-183.49
5088.23	-218.50
5088.86	-191.51
5088.97	-229.53
5089.23	-218.53
5089.74	-197.53
5090.17	-137.53
5090.26	-175.54
5090.31	-255.57
5090.42	-252.57
5090.52	-164.54
5091.40	-253.59
5091.76	-194.57
5092.19	-220.60
5092.31	-131.58
5092.59	-203.60
5093.09	-144.60
5093.24	-134.60
5093.64	-242.64
5094.71	-240.67
5095.11	-223.67
5095.21	-177.66
5095.21	-135.65
5095.61	-202.68
5096.35	-255.71
5098.40	-253.78
5100.42	-168.78
5101.11	-223.81

X	Z
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5101.37	-254.83
5102.54	-205.84
5103.06	-267.87
5103.07	-224.86
5104.25	-259.90
5105.16	-137.94
5105.40	-127.89
5105.51	-248.93
5105.56	-204.91
5106.15	-305.96
5106.35	-213.94
5106.56	-204.94
5107.35	-171.95
5107.75	-238.98
5107.83	-193.97
5108.35	-256.00
5111.48	-292.08
5111.73	-198.96
5111.83	-152.05
5112.08	-309.10
5112.96	-230.10
5112.96	-230.10
5113.86	-67.07
5114.54	-122.11
5114.99	-271.16
5115.75	-154.14
5116.51	-207.18
5116.91	-274.21
5118.10	-266.23
5118.49	-250.24
5118.65	-243.24
5118.89	-233.24
5118.97	-194.21
5119.02	-144.22
5119.24	-302.27
5119.42	-211.25
5119.42	-211.25
5119.99	-145.24
5121.34	-212.29
5121.58	-246.31
5121.97	-146.29
5122.13	-273.32
5122.18	-179.30
5122.34	-212.32
5122.73	-198.32
5122.82	-278.35
5123.04	-145.33
5123.23	-135.32
5123.82	-152.34
5124.10	-224.36
5124.74	-237.38
5125.98	-271.42
5126.09	-275.41
5127.13	-223.43
5128.51	-249.47
5128.58	-204.46
5129.68	-200.46
5129.23	-216.48

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
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5130.42	-127.49
5130.63	-244.52
5130.63	-160.50
5130.66	-117.49
5130.74	-239.53
5131.20	-262.54
5131.61	-161.52
5131.94	-103.52
5133.56	-121.56
5134.29	-258.62
5135.44	-168.62
5136.35	-130.63
5137.22	-219.67
5137.35	-130.65
5138.20	-220.70
5138.81	-278.73
5140.54	-122.73
5140.79	-279.78
5141.03	-227.77
5141.07	-351.80
5141.15	-222.77
5142.01	-144.77
5142.08	-225.79
5142.74	-281.82
5143.38	-254.83
5145.65	-201.87
5145.93	-231.89
5146.98	-145.89
5147.07	-225.91
5147.24	-260.93
5147.37	-129.89
5147.48	-208.92
5147.93	-231.93
5148.10	-266.95
5148.60	-203.94
5150.03	-227.98
5151.07	-310.03
5151.79	-238.03
5153.17	-138.03
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5154.69	-242.10
5155.40	-254.12
5155.95	-231.12
5156.00	-271.14
5158.86	-235.20
5159.45	-210.20
5160.24	-219.22
5161.20	-137.22
5161.26	-302.27
5161.33	-257.26
5161.84	-234.27
5163.31	-132.27
5163.50	-166.29
5164.43	-127.30
5165.26	-218.34
5166.29	-217.37

X	Z
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5167.55	-80.36
5168.78	-238.43
5168.92	-232.43
5168.95	-273.45
5169.41	-169.43
5169.71	-241.46
5170.06	-310.48
5170.33	-215.46
71.65	-76.46
5172.30	-300.53
5172.59	-246.53
5173.12	-142.52
5173.35	-214.54
5174.09	-143.54
5174.53	-123.54
5174.71	-241.58
5175.09	-183.57
5176.23	-219.61
5176.66	-243.62
5177.04	-185.62
5178.04	-185.64
5178.64	-244.67
5178.92	-232.67
5179.00	-145.65
5181.04	-269.73
5181.11	-182.71
5182.11	-182.74
5182.59	-120.73
5183.61	-245.79
5185.54	-248.84
5185.54	-248.84
5185.90	-149.82
5185.95	-189.83
5187.42	-250.88
5187.51	-249.88
5189.61	-245.93
5189.61	-203.92
5190.04	-227.94
5190.56	-247.96
5190.58	-288.97
5191.01	-228.96
5191.85	-193.97
5192.37	-256.00
5192.56	-230.02
5192.85	-236.01
5193.97	-231.03
5194.30	-133.01
5194.80	-196.04
5196.23	-220.08
5196.23	-176.07
5196.87	-193.09
5196.91	-275.11
5197.23	-220.11
5197.63	-245.12
5198.89	-234.15
5199.89	-234.17
5199.99	-146.15
5200.44	-211.18

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
5200.58	-247.19
5200.72	-283.21
5202.13	-224.22
5202.33	-132.20
5202.56	-248.24
5202.56	-248.24
5202.80	-154.22
5202.96	-273.26
5203.13	-266.26
5203.63	-161.24
5203.96	-273.28
5205.51	-250.31
5205.79	-238.32
5207.48	-251.36
5207.48	-251.36
5209.03	-228.39
5209.15	-265.40
5209.58	-205.40
5210.56	-164.41
5210.87	-193.42
5211.40	-129.42
5211.70	-242.46
5212.10	-267.48
5212.13	-182.45
5212.96	-231.49
5212.97	-147.46
5213.53	-207.49
5213.67	-243.51
5213.67	-243.51
5214.36	-256.53
5214.94	-232.53
5215.62	-245.55
5217.03	-270.59
5217.34	-215.59
5217.60	-246.60
5217.60	-246.60
5218.41	-212.61
5219.27	-260.64
5221.10	-225.68
5221.55	-248.70
5224.62	-245.77
5225.62	-245.79
5226.03	-144.77
5227.30	-133.80
5228.03	-228.84
5228.29	-217.85
5228.39	-213.85
5229.24	-219.87
5230.27	-218.89
5230.27	-134.87
5230.46	-210.90
5231.65	-202.92
5231.69	-200.92
5231.86	-193.93
5232.91	-233.96
5232.98	-230.96
5233.00	-187.95
5233.22	-220.97
5233.22	-220.97

X	Z
5233.93	-232.99
5234.34	-215.99
5234.83	-237.01
5236.03	-229.04
5237.08	-185.05
5237.86	-236.08
5239.41	-213.11
5239.41	-213.11
5240.88	-277.16
5241.17	-181.14
5241.38	-214.16
5241.42	-296.18
5241.69	-285.19
5241.81	-238.18
5242.14	-307.20
5242.64	-203.19
5242.81	-238.20
5244.00	-230.23
5244.26	-177.22
5245.53	-166.24
5245.60	-205.26
5246.00	-230.27
5246.60	-163.27
5246.91	-192.28
5248.69	-201.33
5249.24	-220.35
5249.71	-200.35
5250.68	-327.41
5250.93	-191.38
5251.16	-265.41
5251.41	-171.39
5251.88	-151.39
5256.63	-329.56
5256.71	-200.52
5257.05	-186.52
5258.40	-213.56
5258.79	-282.59
5258.85	-194.57
5259.47	-168.58
5259.69	-159.58
5259.92	-275.62
5260.09	-184.60
5261.07	-227.63
5261.16	-223.63
5261.28	-218.64
5261.76	-240.65
5262.61	-204.66
5262.95	-190.67
5264.09	-268.72
5264.69	-201.71
5264.90	-192.71
5264.96	-315.75
5265.07	-143.70
5265.16	-223.73
5265.92	-191.74
5266.63	-287.78
5266.92	-275.79
5267.14	-182.76
5267.37	-214.78

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
5268.30	-259.81
5268.59	-247.82
5269.38	-172.82
5269.51	-292.85
5269.58	-289.85
5269.82	-279.86
5269.83	-193.92
5270.39	-255.86
5270.78	-189.84
5270.80	-280.88
5270.91	-317.89
5271.77	-281.90
5272.33	-216.90
5272.92	-233.92
5273.06	-227.92
5274.75	-282.97
5275.11	-267.98
5275.20	-305.99
5275.56	-240.98
5276.16	-223.99
5276.63	-204.00
5276.68	-244.01
5277.20	-222.02
5277.51	-251.03
5278.25	-202.05
5278.97	-140.04
5279.30	-260.08
5279.41	-297.09
5279.75	-241.08
5279.94	-2[illegible].08
5280.68	-286.12
5280.70	-285.12
5280.91	-276.12
5281.65	-287.14
5282.51	-293.16
5282.63	-288.16
5282.82	-238.15
5282.87	-256.16
5283.44	-170.15
5284.42	-129.16
5284.87	-236.20
5285.13	-183.19
5285.44	-254.22
5285.46	-253.22
5285.67	-246.24
5285.75	-241.23
5285.75	-199.21
5286.01	-188.22
5287.03	-229.25
5287.71	-159.25
5287.96	-232.28
5288.11	-184.27
5288.39	-172.27
5288.96	-232.30
5288.99	-231.30
5289.27	-261.32
5289.39	-298.33
5289.44	-212.31
5289.91	-234.32

X	Z
5290.22	-221.33
5291.89	-235.37
5291.99	-147.35
5292.84	-195.38
5293.32	-217.40
5294.91	-318.47
5294.99	-189.43
5295.30	-176.43
5295.89	-277.48
5296.06	-228.47
5296.20	-264.48
5296.60	-205.47
5297.17	-282.52
5297.77	-240.51
5297.82	-238.51
5298.20	-138.49
5299.03	-229.54
5299.08	-185.53
5299.24	-304.57
5299.48	-294.57
5301.12	-267.60
5301.48	-210.59
5301.65	-287.62
5301.82	-238.61
5302.39	-256.63
5303.01	-146.61
5303.98	-273.67
5304.22	-221.66
5305.06	-144.66
5306.39	-214.71
5306.64	-287.74
5306.69	-285.74
5307.08	-227.73
5307.24	-304.76
5307.25	-136.71
5307.72	-242.75
5308.26	-261.77
5308.41	-213.76
5309.10	-226.78
5309.79	-239.80
5310.46	-169.79
5310.81	-280.83
5311.58	-206.83
5312.27	-135.83
5312.45	-253.87
5313.79	-239.89
5314.10	-226.90
5316.34	-216.95
5316.98	-147.94
5316.98	-147.94
5317.88	-278.00
5318.60	-206.00
5318.97	-316.04
5319.86	-279.05
5319.86	-195.03
5319.88	-278.05
5320.57	-207.05
5320.64	-288.07
5320.98	-232.06

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
5321.95	-233.09
5322.52	-251.11
5322.74	-242.11
5323.03	-188.10
5323.21	-264.13
5323.21	-222.11
5323.50	-252.13
5324.12	-184.13
5325.05	-187.15
5325.93	-234.18
5326.14	-225.18
5326.91	-193.19
5327.12	-224.21
5327.81	-239.23
5328.07	-186.22
5328.22	-180.22
5328.90	-217.27
5328.98	-148.23
5329.45	-254.27
5329.74	-158.25
5330.59	-248.30
5330.69	-202.29
5332.45	-170.32
5332.50	-126.31
5332.54	-292.36
5332.69	-244.35
5332.88	-194.34
5334.04	-271.39
5334.26	-220.38
5334.36	-216.38
5334.49	-244.39
5335.35	-300.43
5336.55	-208.43
5336.79	-156.42
5336.97	-232.45
5337.17	-140.42
5337.95	-191.46
5338.38	-257.49
5338.57	-123.45
5338.99	-273.51
5339.88	-194.50
5340.09	-311.54
5340.31	-176.51
5340.95	-233.54
5342.16	-182.56
5342.52	-209.57
5342.59	-206.57
5342.88	-236.59
5343.39	-298.62
5343.42	-213.59
5344.30	-218.62
5344.66	-203.62
5346.83	-238.68
5347.85	-195.69
5347.95	-191.70
5348.13	-267.72
5348.13	-267.72
5348.46	-295.74
5350.62	-163.75

X	Z
5350.82	-280.79
5351.25	-220.78
5351.40	-214.78
5352.39	-298.83
5352.92	-192.81
5353.61	-205.84
5354.28	-219.85
5356.06	-270.91
5357.35	-174.92
5357.54	-208.93
5357.63	-239.95
5358.51	-251.97
5359.00	-147.95
5359.47	-169.96
5359.76	-157.97
5360.30	-219.00
5360.56	-208.00
5361.20	-265.03
5363.25	-221.07
5363.89	-236.09
5364.04	-230.09
5364.58	-249.11
5365.25	-221.12
5365.51	-252.13
5365.94	-192.13
5366.99	-232.16
5367.34	-259.18
5367.35	-217.17
5367.82	-281.20
5368.13	-261.20
5368.65	-2[illegible]21
5368.75	-2[illegible]21
5369.41	-29[illegible].24
5369.80	-240.23
5370.25	-221.24
5370.77	-241.25
5371.08	-186.25
5371.65	-246.26
5371.96	-233.28
5372.63	-205.29
5373.53	-251.32
5373.60	-248.32
5373.99	-190.32
5374.27	-220.33
5374.51	-294.36
5374.86	-28.29
5375.53	-251.37
5376.61	-206.38
5376.65	-204.38
5377.08	-270.41
3377.68	-203.41
5379.05	-271.46
5379.60	-206.46
5380.17	-266.49
5380.41	-214.48
5381.00	-273.51
5381.68	-161.49
5381.94	-234.52
5381.98	-232.52

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
5383.27	-178.54
5383.29	-261.56
5383.29	-261.56
5384.17	-308.59
5385.70	-202.60
5386.39	-215.62
5387.17	-266.65
5387.74	-284.67
5387.84	-238.66
5388.29	-261.68
5389.10	-269.70
5390.01	-189.70
5390.62	-247.73
5391.29	-219.74
5391.74	-284.77
5392.38	-257.78
5392.46	-212.76
5392.56	-166.75
5393.08	-186.77
5393.13	-184.77
5393.95	-275.82
5395.13	-184.82
5396.09	-311.88
5397.55	-250.90
5397.67	-203.89
5397.90	-319.92
5398.05	-271.91
5398.19	-265.92
5398.53	-251.92
5399.90	-277.96
5400.91	-235.97
5401.50	-210.98
5401.57	-249.99
5401.62	-205.98
5402.07	-271.01
5403.00	-232.02
5403.48	-254.04
5404.45	-255.06
5405.05	-230.07
5405.12	-227.01
5405.43	-172.06
5405.50	-253.09
5405.76	-200.08
5406.50	-169.09
5407.00	-274.13
5407.19	-266.13
5407.38	-258.13
5407.88	-279.15
5408.31	-219.14
5408.97	-275.18
5409.15	-184.15
5409.17	-225.17
5409.47	-296.19
5409.75	-242.19
5409.82	-114.15
5409.88	-279.20
5410.16	-267.20
5412.12	-269.25
5412.60	-207.24

X	Z
5412.66	-246.26
5412.80	-282.27
5412.88	-237.26
5413.43	-256.28
5413.95	-276.30
5413.95	-276.30
5414.14	-184.27
5414.21	-223.29
5414.85	-280.32
5415.28	-262.32
5415.33	-218.31
5416.43	-214.34
5416.45	-213.34
5416.66	-288.36
5416.88	-195.34
5418.11	-269.39
5418.28	-220.38
5419.14	-226.40
5419.26	-263.42
5420.00	-190.42
5421.38	-174.44
5421.87	-279.49
5422.28	-178.47
5423.64	-163.49
5424.59	-207.53
5424.64	-247.54
5425.42	-214.55
5425.57	-250.57
5427.38	-174.59
5428.07	-229.62
5428.78	-241.64
5428.85	-238.64
5428.95	-192.63
5429.26	-221.65
5429.85	-196.65
5430.47	-254.68
5431.09	-228.69
5431.40	-257.71
5431.40	-257.71
5431.73	-201.70
5432.02	-231.71
5432.21	-139.69
5432.47	-170.71
5432.49	-211.72
5433.87	-237.76
5435.25	-305.81
5435.34	-301.81
5436.14	-184.80
5437.37	-216.84
5438.06	-229.86
5439.42	-214.89
5440.08	-270.92
5440.39	-299.93
5440.71	-202.91
5440.76	-158.90
5441.59	-207.94
5441.85	-238.95
5441.99	-232.95
5442.44	-255.97

X	Z
5443.06	-229.98
5443.75	-243.00
5444.14	-184.99
5445.49	-254.04
5445.71	-202.03
5445.91	-278.06
5445.96	-276.06
5446.59	-208.05
5447.91	-253.09
5447.91	-278.11
5449.01	-232.1
5449.04	-188.1
5450.11	-228.14
5450.34	-260.16
5450.84	-281.18
5451.20	-224.17
5451.56	-251.19
5452.18	-183.18
5452.30	-178.18
5452.84	-281.22
5452.90	-153.19
5453.10	-270.23
5453.22	-265.23
5456.46	-213.29
5458.96	-276.37
5459.63	-164.35
5460.30	-136.36
5462.27	-221.43
5462.29	-220.43
5462.55	-251.45
5463.46	-213.46
5464.44	-172.47
5465.29	-220.50
5465.48	-212.51
5468.32	-219.58
5468.82	-240.59
5469.39	-258.61
5470.03	-189.61
5470.34	-260.64
5470.55	-209.63
5470.75	-201.63
5472.27	-221.67
5473.36	-259.71
5477.00	-232.79
5478.02	-273.82
5478.41	-257.83
5481.05	-230.88
5481.93	-235.91
5482.36	-217.91
5483.91	-194.94
5484.52	-294.98
5485.19	-224.98
5485.26	-263.99
5486.64	-248.02
5487.86	-239.05
5489.07	-232.07
5489.22	-182.06
5489.90	-237.10
5490.50	-212.10

X	Z
5490.67	-247.12
5491.41	-174.11
5491.98	-234.15
5493.19	-225.17
5497.50	-212.27
5502.07	-230.39
5502.23	-307.41
5504.00	-149.41
5504.83	-282.47
5505.16	-310.48
5507.68	-288.54
5508.02	-232.53
5508.35	-260.54
5508.66	-247.55
5508.68	-246.55
5508.71	-287.56
5508.83	-240.55
5509.02	-232.55
5509.02	-190.54
5509.06	-272.56
5509.81	-199.56
5509.85	-239.57
5511.14	-227.60
5512.04	-189.61
5512.99	-317.67
5515.33	-177.69
5515.71	-245.72
5516.35	-218.72
5517.95	-193.75
5518.14	-227.77
5518.21	-224.77
5519.40	-216.80
5520.58	-292.85
5521.63	-248.86
5522.33	-135.84
5522.47	-171.86
5523.32	-261.90
5524.23	-181.90
5525.21	-140.91
5525.25	-264.95
5525.54	-252.95
5529.21	-183.02
5529.39	-259.05
5530.04	-232.05
5530.08	-230.05
5532.08	-230.10
5532.72	-329.15
5533.59	-167.12
5534.40	-175.14
5536.06	-231.20
5539.46	-214.27
5539.99	-192.28
5542.42	-216.34
5543.44	-257.38
5546.49	-213.44
5549.63	-249.53
5551.67	-289.59
5551.91	-237.58
5552.31	-262.59

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
5552.56	-168.57
5553.36	-218.61
5555.20	-225.65
5555.39	-217.65
5555.43	-257.67
5556.07	-314.70
5558.19	-309.75
5560.29	-263.78
5562.31	-262.83
5564.98	-234.89
5567.35	-217.94
5568.88	-238.98
5569.88	-196.99
5569.98	-193.00
5570.41	-217.01
5571.84	-199.04
5572.69	-247.08
5572.88	-197.07
5574.81	-158.10
5575.19	-184.12
5577.95	-194.19
5578.53	-170.19
5581.55	-169.26
5585.05	-190.35
5585.97	-235.39
5586.24	-182.38
5589.33	-220.47
5590.83	-241.51
5595.47	-256.62
5598.99	-276.71
5599.16	-227.70
5599.42	-258.72
5602.79	-75.75
5604.25	-223.82
5606.01	-233.91
5608.34	-303.94
5618.53	-254.17
5619.80	-243.20
5620.84	-241.22
5620.89	-197.21
5624.74	-287.33
5631.67	-248.48
5631.91	-238.49
5632.85	-157.49
5634.99	-151.54
5636.94	-195.59
5638.74	-245.65
5640.98	-277.71
5644.69	147.79
5649.10	-188.88
5652.36	-261.98
5653.38	-261.01
5661.14	-271.19
5661.55	-170.17
5669.88	-240.39
5671.11	-272.43
5671.78	-244.44
5673.45	-216.47
5674.88	-198.50

X	Z
5674.90	-281.52
5675.38	-177.51
5676.30	-254.55
5676.35	-220.54
5682.33	-221.69
5683.41	-50.66
5683.44	-258.72
5687.39	-302.83
5689.26	-265.86
5691.47	-215.90
5693.24	-99.91
5696.93	-194.03
5708.17	-270.32
5723.41	-260.68
5724.34	-179.68
5730.05	-233.83
5730.50	-298.86
5732.33	-263.89
5742.24	-184.10
5764.85	-200.65
5769.40	-219.76
5770.10	-106.75
5770.20	-311.81
5779.78	-204.01
5782.94	-195.08
5785.40	-136.12
5805.34	-180.61
5811.38	-262.78
5813.89	-199.82
5815.17	-187.85
5823.81	-203.06
5826.57	-213.13
5827.41	-178.14
5835.69	-250.35
5837.59	-212.39
5838.35	-222.41
5843.42	-219.53
5845.35	-222.58
5849.47	-217.67
5853.25	108.33
5854.80	-203.80
5857.66	-209.87
5859.28	-183.90
5861.01	14.12
5863.14	-189.99
5864.92	-241.05
5866.64	-169.07
5867.11	-191.09
5869.13	-190.13
5870.75	-248.19
5873.32	-224.24
5876.87	-201.32
5881.94	-198.44
5884.32	-182.50
5886.70	-208.56
5891.14	-315.70
5892.58	-213.70
5892.68	-167.69
5894.10	-233.74

DOCUMENT UNCLASSIFIED JCP-I, DPG

x	z
5894.34	-181.73
5895.10	-191.76
5896.10	-191.78
5897.24	-309.84
5903.86	-201.97
5906.31	-225.03
5912.88	-243.19
5916.29	-184.26
5916.45	-177.26
5931.97	-197.64
5933.45	-217.68
5934.19	-138.69
5935.30	-225.72
5935.83	-203.73
5936.92	-199.76
5938.97	-197.80
5946.49	-217.99
5948.18	-231.03
5949.31	-223.06
5950.92	-200.09
5964.46	-177.41
5966.72	-208.47
5969.10	-234.53
5972.46	-219.61
5975.91	-200.69
5989.95	-241.01
5990.74	-208.04
5991.74	-208.07
5995.67	-211.16
5997.24	-229.20
5998.93	-200.24
6007.93	-200.45
6012.85	-245.58
6022.64	-211.81
6024.06	-236.85
6025.47	-219.87
6062.44	-179.75
6070.25	-228.95
6102.38	-224.71
6135.32	-185.49
6192.19	-149.83
6198.28	-167.99
6225.13	-152.62
6226.55	-218.67
6228.86	-247.74
6236.34	-185.90
6237.70	-123.91
6238.60	-132.94
6268.29	-146.65
6281.14	-152.96
6283.71	-171.02
6287.39	-226.13
6295.66	-173.31
6319.86	-164.89
6327.84	-208.09
6350.60	-134.61
6355.52	-179.74
6359.21	-234.84
6361.89	-289.92

x	z
6369.00	-76.03
6370.24	-108.07
6371.25	-275.14
6371.64	-91.10
6372.39	-269.17
6373.45	-99.15
6379.04	-116.28
6384.83	-41.40
6387.90	-55.47
6395.20	-109.67
6396.58	-177.72
6396.78	-420.79
6397.25	-65.70
6404.08	-156.89
6413.10	-114.10
6420.93	-121.29
6422.24	-192.34
6423.13	-29.31
6429.57	-178.51
6431.73	-213.57
6432.98	-161.58
6442.85	-166.82
6442.96	-287.86
6444.00	-34.81
6444.21	-109.84
6448.04	-200.95
6449.53	-54.95
6457.15	-322.09
6462.11	-114.27
6467.68	-132.40
6474.21	-68.54
6483.51	-223.81
6485.68	-132.83
6491.56	-53.95
6493.19	-279.05
6493.37	-62.00
6493.41	-102.01
6508.20	-111.37
6516.01	-77.54
6518.85	-251.66
6522.26	-150.71
6529.68	-216.91

DOCUMENT UNCLASSIFIED JCP-I, DPG

27 APRIL 1965, MISSION 20, PASS 3
(APGC MISSION 115, PASS 3)

DOWNRANGE	CROSSRANGE
2044.15	321.25
2067.64	454.37
2089.19	462.15
2089.39	373.80
2095.82	414.60
2109.98	389.67
2118.01	376.67
2122.53	362.52
2132.45	394.67
2152.07	416.76
2157.26	458.80
2168.16	457.87
2176.57	459.29
2188.50	435.46
2190.50	450.39
2200.11	419.47
2207.30	432.76
2234.62	449.10
2255.10	427.36
2256.22	414.74
2264.86	391.83
2270.56	419.25
2270.76	375.15
2274.24	382.87
2278.13	400.59
2279.75	430.37
2280.49	432.72
2281.51	364.57
2281.55	452.02
2282.66	414.74
2291.99	372.27
2296.36	431.04
2300.14	384.52
2310.35	409.97
2315.55	403.82
2315.83	355.85
2316.61	331.55
2319.21	390.93
2324.39	358.79
2336.61	400.35
2338.63	393.08
2341.86	448.80
2342.99	415.87
2343.02	405.36
2345.06	459.19
2348.83	432.78
2352.10	368.99
2355.36	359.59
2356.72	426.18
2358.52	482.87
2358.64	386.53
2364.59	404.78
2368.37	429.48
2371.18	416.58
2373.61	400.37
2373.92	385.95
2375.77	442.04
2376.42	447.06
2381.74	324.39

DOWNRANGE	CROSSRANGE
2384.10	431.67
2390.49	407.32
2391.73	343.72
2398.61	373.50
2399.29	375.96
2408.06	373.92
2411.05	446.64
2424.63	412.35
2433.94	369.99
2441.98	350.20
2445.66	385.29
2445.82	424.93
2450.58	399.67
2450.76	388.13
2451.39	328.49
2456.05	398.94
2456.19	355.95
2462.60	369.30
2463.36	414.99
2463.70	349.34
2464.86	376.69
2465.19	463.81
2469.69	426.01
2471.57	437.15
2474.10	425.37
2477.41	420.92
2478.41	383.24
2478.61	424.21
2479.91	433.00
2481.99	467.27
2482.65	427.63
2483.67	389.28
2485.71	353.20
2489.07	453.23
2489.58	398.83
2490.38	409.11
2497.62	40 .32
2501.46	346.54
2502.93	413.82
2503.42	380.54
2504.28	385.03
2506.99	371.98
2508.14	416.96
2508.24	340.22
2509.26	367.53
2511.32	370.75
2516.27	430.39
2516.43	352.23
2516.96	404.76
2518.59	398.47
2518.85	370.59
2519.65	388.96
2520.09	381.65
2522.02	393.54
2523.60	385.88
2525.19	389.58
2525.26	410.76
2529.06	354.56
2530.20	314.91

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
2531.38	377.86
2533.62	408.20
2534.10	451.34
2535.37	378.28
2537.06	449.12
2537.14	349.12
2538.16	408.34
2540.78	420.52
2540.92	373.12
2541.64	349.46
2548.94	393.84
2549.39	352.97
2552.05	410.13
2552.77	364.76
2552.98	382.10
2556.68	373.19
2557.03	393.77
2558.57	370.32
2559.40	362.05
2559.78	387.13
2561.85	365.98
2565.56	414.22
2566.32	315.99
2568.01	387.18
2570.89	408.22
2571.37	369.10
2575.19	367.84
2577.97	369.21
2580.72	350.86
2585.89	384.82
2588.39	358.81
2587.41	378.17
2587.69	413.27
2587.89	408.89
2589.23	410.88
2590.24	377.15
2594.59	405.50
2595.62	399.90
2601.18	419.55
2602.09	405.43
2602.87	382.99
2603.16	452.31
2603.74	437.78
2604.86	377.84
2610.06	397.84
2612.34	391.99
2615.02	390.16
2616.25	366.34
2617.08	403.83
2619.77	378.72
2619.83	385.92
2622.24	342.43
2622.30	361.13
2623.64	421.56
2629.92	382.83
2633.75	352.94
2634.14	348.99
2635.33	397.51
2643.42	357.00

X	Z
2645.03	353.02
2645.31	376.41
2645.36	326.17
2647.50	412.84
2648.33	343.95
2649.27	381.01
2650.06	375.71
2650.22	383.37
2652.44	397.71
2652.92	360.04
2653.05	365.26
2655.57	405.12
2656.03	384.95
2656.08	410.28
2660.42	374.09
2660.78	419.48
2661.10	410.53
2663.49	420.91
2664.53	398.52
2668.43	326.99
2669.13	403.86
2669.20	374.24
2671.25	409.84
2671.30	430.50
2672.19	387.71
2672.66	377.85
2672.71	353.26
2672.77	413.63
2674.14	401.50
2675.62	404.37
2675.82	413.57
2676.06	405.99
2678.17	410.98
2678.88	381.78
2680.59	405.17
2683.43	332.58
2683.71	344.54
2685.36	361.34
2686.13	400.78
2686.68	389.31
2687.43	368.70
2687.99	434.40
2688.88	390.64
2691.71	389.15
2692.28	445.00
2692.31	430.99
2693.08	348.15
2694.17	369.67
2695.08	412.66
2695.20	428.19
2696.98	357.87
2697.14	401.47
2697.86	374.79
2698.22	353.50
2701.12	404.56
2701.37	423.91
2704.02	407.32
2704.64	402.40
2704.75	327.51

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
2707.48	390.33
2715.30	334.63
2716.88	428.13
2720.49	396.25
2721.15	427.05
2722.73	368.51
2724.05	340.18
2725.58	404.16
2726.85	369.09
2727.45	346.98
2729.76	429.86
2730.64	402.74
2731.19	384.04
2731.37	376.42
2731.94	391.77
2732.09	388.66
2732.30	372.37
2734.19	375.15
2734.60	465.34
2734.90	391.18
2736.29	348.71
2737.82	358.73
2738.84	394.43
2739.45	368.94
2740.07	399.88
2740.10	424.29
2740.16	382.80
2743.80	411.05
2744.05	405.25
2750.64	402.72
2753.90	411.39
2754.28	363.62
2754.29	386.20
2757.00	371.82
2758.27	382.23
2759.13	343.09
2760.48	411.41
2761.38	389.85
2762.84	378.67
2763.30	347.59
2764.59	390.62
2766.29	381.00
2768.85	418.26
2776.19	382.86
2776.22	357.04
2777.24	370.23
2779.39	408.82
2779.76	390.46
2782.45	396.77
2785.99	370.65
2787.01	342.37
2788.40	422.48
2790.41	382.87
2790.74	389.53
2792.81	356.18
2795.49	373.88
2796.84	394.73
2796.99	407.91
2798.02	446.96

X	Z
2798.13	404.08
2799.95	390.59
2800.66	453.05
2802.30	393.97
2803.89	426.53
2804.27	357.13
2805.54	387.04
2805.63	400.71
2805.93	437.71
2809.87	352.49
2810.62	381.13
2810.81	385.12
2811.02	390.59
2813.10	399.09
2814.86	388.90
2815.80	336.59
2817.78	381.32
2817.84	389.01
2818.01	356.35
2820.68	347.26
2821.23	365.70
2821.48	379.30
2824.49	356.54
2828.45	419.96
2828.64	374.93
2833.97	405.97
2835.60	404.35
2835.72	367.14
2838.78	355.69
2840.42	398.19
2840.54	379.32
2840.72	347.66
2847.07	405.09
2847.63	403.73
2848.58	394.88
2850.13	390.01
2852.48	349.26
2854.94	372.29
2856.14	367.40
2856.31	336.47
2856.46	365.11
2856.74	374.69
2856.46	407.13
2859.58	366.32
2860.20	352.54
2860.42	374.27
2860.58	405.13
2861.27	423.16
2863.29	416.14
2863.61	379.42
2864.30	364.47
2865.77	391.70
2866.74	436.19
2871.06	393.33
2871.38	380.60
2873.14	401.80
2873.40	384.17
2873.62	404.55
2877.13	393.53

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
2879.13	362.45
2880.71	370.89
2882.10	420.9[illegible]
2882.93	413.42
2885.62	451.56
2886.[illegible]	428.41
2887.99	438.76
2892.67	433.31
2894.47	454.18
2900.25	324.97
2900.98	384.03
2902.81	358.89
2904.12	404.55
2905.25	425.09
2907.12	362.10
2910.54	376.05
2911.02	380.65
2913.75	366.99
2913.90	389.42
2915.72	324.21
2916.36	394.28
2918.58	415.63
2918.83	381.63
2921.86	388.47
2924.16	391.51
2924.45	405.65
2925.66	48[illegible].47
2927.48	431.09
2929.55	370.30
2929.60	404.28
2929.84	403.22
2930.45	380.34
2930.53	416.69
2930.84	349.68
2934.03	462.85
2940.83	352.93
2941.02	380.26
2941.13	451.31
2942.04	375.14
2942.56	340.01
[illegible]43.72	341.89
2944.86	413.4[illegible]
2944.95	390.0[illegible]
2948.55	405.59
2949.10	395.24
2949.26	357.95
2949.66	382.22
2950.87	411.54
2951.32	448.30
2958.50	384.72
2961.49	351.04
2961.49	353.4[illegible]
2962.61	379.6[illegible]
2963.36	355.87
2964.01	417.16
2970.80	413.57
2972.07	282.76
2974.36	474.20
2976.13	457.21

X	Z
2978.92	423.54
2979.71	433.97
2980.54	345.50
2981.28	460.32
2982.20	384.28
2982.48	416.52
2985.17	418.49
2985.87	409.41
2986.35	431.79
2990.23	356.79
2990.38	409.56
2991.39	444.80
2992.06	424.57
2996.38	448.30
2997.05	391.76
2998.32	410.54
2999.22	469.53
3002.06	365.26
3007.31	419.59
3010.28	385.17
3014.14	402.64
3017.05	373.32
3020.09	421.97
3024.26	395.99
3024.31	394.43
3025.64	402.91
3026.78	360.66
3027.92	346.34
3034.90	356.21
3036.56	378.71
3039.62	404.10
3040.39	410.98
3046.01	399.13
3048.65	488.69
3051.26	408.98
3054.59	481.48
3057.57	368.99
3062.18	422.15
3062.86	359.56
3063.29	436.32
3068.28	413.59
3068.71	354.85
3070.59	385.48
3074.84	442.29
3077.65	424.48
3081.38	439.27
3083.39	344.43
3086.[illegible]	418.25
3096.77	374.95
3103.82	293.3[illegible]
3104.62	400.59
3107.47	408.83
3109.41	383.08
3109.68	392.53
3117.13	363.00
3119.07	436.57
3119.08	365.77
3132.83	415.37
3133.61	481.76

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
3134.55	494.32
3136.47	423.97
3137.09	411.68
3138.33	421.53
3142.06	364.67
3145.63	403.81
3146.58	412.80
3151.32	416.60
3155.48	424.72
3157.18	417.97
3158.56	411.10
3160.36	396.92
3160.69	443.69
3163.76	418.41
3168.54	406.51
3169.80	395.82
3170.53	393.38
3174.60	405.34
3175.02	387.02
3179.73	424.54
3181.64	402.41
3186.50	439.69
3188.60	405.70
3189.23	411.41
3190.54	391.76
3194.60	448.84
3204.32	424.94
3206.83	415.94
3212.77	368.69
3220.09	414.31
3233.64	442.84
3233.92	395.75
3236.80	472.56
3240.28	408.31
3242.34	362.12
3244.76	494.32
3247.53	371.91
3248.37	423.68
3252.46	367.58
3254.50	441.30
3254.67	391.56
3255.74	388.05
3256.85	373.04
3256.11	394.69
3259.45	454.45
3261.65	378.80
3262.91	358.95
3263.30	357.75
3265.63	374.02
3266.44	367.64
3267.14	388.50
3267.72	377.98
3267.72	357.12
3269.15	378.93
3269.53	358.06
3272.31	395.88
3276.11	387.47
3277.53	368.60
3277.70	362.21

X	Z
3279.91	413.71
3280.35	365.32
3281.04	479.82
3283.22	384.81
3284.70	362.81
3285.54	365.91
3287.74	384.42
3287.89	414.40
3289.01	407.82
3289.18	393.70
3291.15	381.34
3292.34	371.02
3292.60	378.84
3294.78	362.08
3295.04	385.28
3296.29	428.50
3296.96	379.80
3298.42	418.42
3298.47	408.77
3300.18	351.24
3300.49	428.26
3300.60	413.31
3300.75	389.35
3304.09	371.65
3304.49	391.12
3305.25	425.45
3307.57	406.85
3307.93	378.45
3308.50	352.34
3308.56	418.21
3308.81	360.75
3313.21	412.79
3313.61	418.24
3313.88	366.09
3315.99	371.46
3316.97	354.22
3318.02	340.04
3319.83	386.54
3321.09	436.41
3322.52	415.20
3323.38	368.28
3324.54	407.83
3324.61	442.15
3324.62	401.84
3324.89	355.19
3325.09	397.59
3325.27	453.62
3325.57	395.38
3326.60	446.03
3331.58	446.60
3331.95	462.17
3334.02	396.33
3336.64	462.29
3338.13	328.26
3338.49	412.45
3339.02	409.96
3341.30	446.11
3341.42	392.72
3342.97	384.70

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
3344.55	435.84
3345.41	379.31
3346.56	405.69
3346.59	416.99
3348.69	425.08
3349.65	412.93
3350.52	392.03
3350.77	412.41
3352.08	422.57
3352.33	397.70
3353.34	447.83
3353.69	383.33
3354.43	396.17
3355.00	423.34
3355.42	469.70
3356.38	397.23
3358.46	407.57
3358.68	432.44
3360.66	448.24
3361.69	392.00
3362.62	358.62
3363.96	441.50
3364.21	420.83
3364.64	439.33
3367.55	415.19
3368.00	444.49
3368.03	406.63
3369.74	391.63
3370.49	453.42
3370.63	404.38
3370.85	445.57
3372.85	461.89
3372.94	423.01
3374.16	422.59
3376.72	391.49
3379.35	417.3[illegible]
3380.86	385.83
3381.71	363.61
3385.77	415.20
3389.37	371.73
3391.06	398.93
3391.13	470.94
3391.91	450.91
3392.09	413.09
3392.28	386.95
3393.00	448.77
3394.65	393.2[illegible]
3395.60	405.93
3396.02	447.49
3400.04	399.42
3400.25	458.64
3400.60	406.02
3400.76	446.24
3401.50	408.43
3402.58	399.38
3403.10	429.99
3403.78	378.33
3407.52	397.66
3409.29	445.17

X	Z
3410.07	444.52
3410.84	416.34
3410.93	395.99
3416.76	388.53
3417.08	404.54
3418.31	445.29
3418.73	429.45
3418.80	423.99
3420.26	374.1[illegible]
3421.2[illegible]	455.76
3421.43	426.23
3422.73	391.06
3423.60	434.84
3427.70	439.47
3427.80	415.98
3428.05	428.26
3429.41	464.16
3429.90	396.26
3430.97	385.28
3431.56	394.64
3432.00	469.01
3432.60	447.04
3433.73	461.85
3436.57	432.09
3438.19	436.41
3439.47	456.89
3439.67	423.57
3441.19	350.45
3441.79	420.16
3442.67	451.73
3443.32	406.35
3443.47	382.24
3445.59	371.00
3446.44	417.53
3447.20	355.82
3447.50	428.03
3449.11	401.31
3449.44	414.04
3450.00	451.64
3451.04	454.85
3453.24	364.49
3453.40	408.10
3453.45	381.37
3454.06	425.82
3454.57	361.26
3455.42	438.29
3458.03	443.41
3458.15	441.44
3458.48	391.25
3461.36	415.67
3461.99	373.44
3462.10	424.35
3464.15	436.11
3464.32	441.97
3464.44	499.23
3464.97	355.13
3465.01	398.90
3465.06	370.61
3465.57	431.95

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
3465.75	413.91
3466.39	457.25
3467.68	352.14
3467.71	436.83
3469.91	436.55
3469.55	399.38
3472.17	462.81
3472.71	353.96
3473.49	407.86
3473.92	386.92
3476.57	399.70
3480.01	436.33
3480.26	379.41
3480.93	365.67
3484.04	458.49
3484.12	386.91
3484.18	423.65
3487.32	372.01
3487.55	457.65
3488.14	368.47
3488.45	408.85
3488.64	386.56
3488.68	359.74
3489.01	329.06
3489.11	393.24
3490.64	404.17
3491.42	396.58
3492.45	456.26
3492.49	431.11
3492.85	439.25
3493.33	428.14
3493.43	423.53
3493.90	444.54
3495.22	412.06
3495.28	370.54
3495.44	418.22
3496.89	390.89
3498.74	376.83
3499.21	456.45
3499.67	416.99
3500.05	363.23
3501.32	439.42
3501.51	423.98
3501.62	388.51
3501.94	415.03
3503.54	398.43
3503.65	435.63
3504.18	425.85
3504.64	403.85
3505.35	370.81
3505.90	395.80
3506.24	412.35
3506.52	408.11
3506.64	402.44
3506.81	427.80
3507.40	445.97
3507.68	423.83
3508.13	494.21
3508.56	466.37

X	Z
3508.75	417.01
3509.29	380.17
3509.31	365.21
3511.23	385.18
3511.43	440.81
3511.51	418.96
3511.58	437.06
3511.64	448.82
3512.14	447.57
3512.37	364.87
3513.38	389.81
3515.16	392.42
3515.17	367.03
3515.73	376.84
3516.59	429.90
3516.97	351.84
3517.93	440.22
3518.12	391.83
3518.52	408.41
3518.64	402.44
3519.93	362.26
3521.47	396.51
3521.95	423.42
3522.06	428.29
3522.35	394.52
3523.60	434.93
3524.08	377.60
3524.49	382.63
3524.63	401.41
3524.65	434.09
3529.27	374.76
3529.67	446.15
3529.[illegible]	409.92
3530.50	396.93
3531.04	379.97
3531.23	424.23
3531.24	415.67
3532.66	368.26
3533.16	413.18
3533.30	407.91
3533.32	384.44
3535.86	383.89
3536.07	445.86
3538.42	416.42
3538.52	467.22
3538.56	405.62
3538.76	423.21
3538.84	395.14
3539.19	409.12
3540.41	370.82
3540.42	457.62
3540.46	376.00
3541.49	448.63
3541.96	438.23
3542.06	385.02
3543.31	388.64
3545.46	392.60
3548.65	385.71
3548.76	478.52

DOCUMENT UNCLASSIFIED JCP-I, DPG

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3551.39	427.99
3552.18	376.24
3552.64	402.39
3552.93	420.32
3553.06	438.37
3553.08	400.44
3553.54	371.44
3554.74	386.35
3556.92	353.15
3557.02	465.82
3557.48	365.47
3558.68	392.40
3559.51	364.93
3561.06	376.31
3561.12	349.59
3561.96	393.81
3562.09	385.08
3563.64	404.06
3564.05	399.64
3565.18	324.96
3566.13	379.82
3567.14	334.83
3568.09	394.34
3568.58	373.55
3569.43	360.05
3569.94	369.31
3570.31	372.53
3570.32	429.65
3571.31	359.29
3571.34	425.11
3572.09	351.41
3572.12	401.31
3572.30	377.60
3572.56	385.54
3572.88	373.47
3573.13	330.91
3573.28	364.80
3574.52	353.17
3575.12	371.06
3575.52	398.71
3575.55	365.98
3576.52	416.31
3577.03	383.35
3579.57	437.46
3579.67	390.58
3580.40	349.37
3580.75	351.75
3580.97	382.27
3581.27	391.14
3581.63	401.48
3581.69	380.90
3581.84	377.80
3583.65	355.62
3584.23	369.55
3584.26	352.69
3584.96	333.18

X	Z
3584.71	390.62
3584.86	377.42
3585.65	393.89
3586.57	367.32
3587.47	384.35
3588.37	396.14
3588.57	383.76
3588.91	378.85
3589.78	345.44
3591.84	395.56
3591.93	396.87
3591.95	409.11
3592.70	386.66
3593.11	356.37
3595.40	351.03
3595.58	368.45
3596.41	409.78
3596.53	385.32
3596.73	365.81
3596.97	372.57
3598.67	378.67
3599.11	413.41
3599.44	397.04
3600.62	366.22
3600.83	334.95
3602.96	389.98
3603.06	360.09
3603.16	365.90
3603.64	402.80
3605.46	409.27
3605.50	369.72
3607.23	385.59
3607.63	377.40
3608.19	382.18
3609.13	375.16
3609.39	410.74
3609.52	397.83
3609.85	355.62
3610.18	338.56
3610.64	340.37
3612.70	403.12
3612.94	390.47
3613.98	352.58
3614.11	414.20
3614.13	435.56
3617.76	362.20
3619.11	404.45
3619.20	393.11
3619.45	375.55
3619.57	336.87
3619.62	402.21
3619.75	341.46
3620.73	391.74
3621.14	393.69
3621.39	395.69
3622.62	393.73
3622.96	416.09
3625.09	397.85
3625.55	435.47

DOCUMENT UNCLASSIFIED JCP-I, DPG

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3625.99	351.52
3626.12	404.31
3626.51	334.24
3627.03	355.50
3627.47	380.36
3628.06	385.45
3628.09	378.00
3629.51	384.94
3629.58	351.76
3630.03	415.78
3630.49	356.45
3630.52	400.43
3630.89	424.62
3630.90	399.26
3631.00	392.90
3632.03	366.42
3632.36	363.42
3632.49	382.17
3632.76	382.60
3634.19	343.46
3637.92	400.09
3637.53	390.35
3637.61	380.96
3638.22	372.18
3638.76	380.95
3640.04	353.55
3640.24	396.59
3640.71	358.08
3641.30	336.07
3641.57	356.17
3642.39	326.27
3642.39	407.83
3644.21	88.27
3644.24	362.31
3644.86	347.16
3644.94	368.59
3645.30	385.41
3645.31	394.44
3645.94	390.72
3646.45	365.65
3647.09	347.71
3647.63	404.43
3647.84	358.10
3649.73	389.22
3650.22	346.47
3650.59	359.67
3651.04	370.33
3651.40	380.52
3652.20	410.04
3652.41	391.70
3652.64	402.48
3652.92	360.93
3653.78	358.03
3654.27	419.49
3655.46	398.61
3656.18	397.02
3657.15	371.84
3657.47	424.13

X	Z
3657.81	379.00
3658.45	358.27
3658.58	380.93
3658.84	397.15
3659.11	362.60
3659.26	345.44
3659.32	393.26
3660.11	395.14
3660.63	383.77
3662.09	385.17
3662.30	409.81
3663.30	396.61
3664.84	368.19
3665.34	409.46
3665.46	376.56
3665.56	415.20
3666.13	391.52
3666.30	345.74
3669.33	355.40
3669.55	378.92
3671.02	383.66
3671.91	373.84
3672.30	410.28
3672.35	331.66
3672.70	391.43
3672.95	389.92
3673.89	419.42
3674.61	412.14
3674.94	379.30
3676.02	330.41
3677.02	382.87
3677.77	364.92
3678.50	359.61
3679.77	345.77
3679.98	419.60
3680.17	381.12
3682.27	341.63
3682.26	379.92
3683.62	405.34
3684.21	418.85
3684.52	350.31
3684.66	387.26
3685.58	393.36
3686.06	386.55
3686.64	403.87
3686.96	359.82
3687.06	377.99
3687.71	364.97
3688.16	343.07
3688.57	355.31
3689.62	358.47
3690.02	351.72
3691.24	342.27
3691.85	359.57
3692.03	333.04
3692.05	385.97
3692.18	393.88
3692.99	414.25
3693.14	351.15

DOCUMENT UNCLASSIFIED JCP-I, DPG

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3694.80	3[illegible].17
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3695.63	376.98
3695.83	366.36
3696.54	398.71
3697.49	363.75
3697.74	379.15
3698.09	392.72
3699.81	368.50
3699.82	362.82
3700.63	404.88
3701.51	370.46
3701.58	353.28
3702.38	356.14
3702.40	390.85
3702.49	367.0[illegible]
3702.67	388.96
3704.49	381.84
3704.64	404.01
3705.44	387.17
3705.61	4[illegible].89
3705.75	361.51
3705.97	356.81
3706.54	362.16
3706.73	358.61
3707.31	376.18
3707.71	371.93
3708.64	392.74
3712.76	373.29
3712.95	360.73
3713.33	385.67
3713.44	338.29
3715.57	368.53
3716.83	417.06
3717.08	391.72
3717.79	394.09
3718.35	341.02
3719.19	384.49
3719.64	402.98
3720.05	375.74
3720.13	384.00
3720.96	369.14
3721.66	338.73
3721.88	372.62
3724.84	411.93
3725.79	371.77
3725.94	345.14
3726.43	397.05
3727.46	[illegible].05
3727.49	3[illegible].18
3727.84	360.88
3731.73	363.21
3731.94	424.[illegible]1
3732.39	341.22
3732.97	396.54
3733.06	397.03

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3733.31	390.54
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3735.54	388.03
3735.88	335.79
3737.24	375.07
3737.59	401.22
3737.88	385.90
3738.62	401.89
3739.71	383.91
3740.14	394.21
3741.36	378.54
3742.27	397.63
3742.37	381.49
3744.03	378.16
3744.63	412.90
3745.19	396.82
3745.24	376.26
3746.32	388.36
3746.33	329.85
3746.59	437.34
3747.14	329.12
3747.22	351.25
3747.53	406.52
3747.75	409.43
3748.47	399.10
3748.67	354.72
3749.32	414.82
3750.18	410.15
3750.22	384.35
3750.56	379.97
3752.72	393.35
3752.80	412.78
3753.06	358.62
3756.26	324.09
3757.13	390.01
3757.34	415.61
3757.45	347.98
3759.63	411.14
3760.71	389.98
3761.52	386.94
3761.59	391.81
3762.50	399.04
3764.35	351.29
3764.85	414.51
3765.11	391.73
3766.92	345.78
3769.13	404.84
3769.13	339.97
3769.14	325.91
3769.74	386.83
3770.62	401.34
3772.42	346.29
3773.[illegible]9	425.75
3775.88	386.77
3776.63	404.87
3777.01	370.60
3777.48	350.57
3778.08	378.15
3779.14	358.99

DOCUMENT UNCLASSIFIED JCP-I, DPG

x	z
3866.64	404.19
3866.84	377.51
3866.84	376.15
3867.36	385.64
3869.12	388.73
3871.09	432.07
3872.08	364.94
3873.83	452.54
3874.48	421.48
3874.69	436.55
3874.94	379.48
3875.24	426.32
3875.52	443.86
3876.11	388.00
3876.14	448.86
3876.49	408.29
3876.81	380.46
3877.46	398.98
3878.04	430.64
3878.04	419.31
3880.58	380.88
3880.73	344.85
3881.71	385.44
3882.14	421.86
3882.36	425.01
3883.23	388.67
3883.44	397.54
3883.67	417.27
3884.56	407.10
3885.11	442.50
3885.27	462.40
3885.69	386.54
3886.73	433.05
3887.69	401.85
3887.81	429.64
3888.29	354.97
3888.36	391.52
3889.07	454.47
3889.07	424.96
3889.11	405.86
3889.75	416.10
3892.67	444.19
3893.26	448.67
3893.75	435.67
3894.74	427.05
3896.18	433.06
3898.98	372.58
3899.06	351.79
3899.66	361.30
3900.33	429.41
3900.62	374.60
3901.21	386.22
3902.12	421.08
3902.82	416.42
3903.84	404.51
3904.74	435.84
3904.75	383.34
3905.93	379.21
3907.33	395.96

x	z
3907.61	406.15
3908.25	372.16
3908.66	429.07
3909.67	443.16
3910.46	396.99
3910.90	368.81
3912.87	446.03
3913.55	381.41
3913.61	418.78
3914.64	402.11
3914.90	440.22
3915.02	391.37
3915.52	444.62
3917.06	415.05
3917.42	410.59
3920.16	414.18
3921.07	399.02
3921.34	370.70
3923.26	393.64
3923.64	403.90
3924.48	435.87
3925.19	433.01
3928.17	408.68
3928.38	383.48
3928.84	387.03
3930.42	379.50
3930.96	420.18
3932.24	393.79
3932.59	429.50
3933.06	421.55
3934.75	431.61
3935.13	422.97
3935.42	407.51
3936.40	445.71
3936.64	394.78
3938.91	371.13
3938.33	422.24
3939.68	390.75
3939.94	339.89
3941.53	393.75
3942.06	415.16
3942.77	394.77
3943.48	429.52
3946.47	389.03
3948.55	450.70
3949.07	379.39
3949.28	455.62
3949.56	418.02
3949.84	360.60
3949.85	412.43
3950.18	389.22
3951.26	364.70
3952.64	364.13
3952.65	366.07
3953.62	443.15
3953.84	433.56
3956.52	368.04
3959.17	442.16
3960.63	419.28

DOCUMENT UNCLASSIFIED JCP-I, DPG

X	Z
3780.24	388.18
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3782.48	398.02
3783.02	373.60
3783.70	381.20
3783.95	355.32
3784.86	377.60
3784.87	345.44
3785.06	357.32
3785.81	459.84
3786.44	409.28
3787.65	384.56
3787.64	439.08
3787.89	414.84
3787.98	350.31
3788.01	354.37
3788.61	400.87
3789.12	356.43
3789.27	368.59
3789.65	384.25
3790.40	378.80
3790.55	365.35
3791.42	388.24
3792.64	402.76
3794.05	451.24
3794.60	426.60
3795.68	373.67
3796.66	393.62
3797.81	387.07
3798.25	373.51
3800.06	366.34
3802.24	354.17
3802.58	424.00
3802.85	379.11
3802.91	316.33
3803.16	386.08
3803.82	381.15
3804.28	362.13
3805.12	362.73
3805.64	402.32
3806.94	359.30
3807.36	340.85
3807.90	372.66
3808.62	405.72
3809.64	402.40
3810.57	407.29
3811.02	341.48
3811.32	371.90
3811.72	349.54
3812.21	411.24
3814.14	450.60
3814.37	373.62
3814.69	418.47
3814.92	336.94
3815.41	346.47
3817.14	414.22
3817.60	366.96
3818.22	347.59
3818.60	353.15

X	Z
3819.08	366.39
3819.36	375.64
3819.66	325.56
3820.81	365.22
3821.53	428.64
3822.19	422.22
3822.96	365.40
3823.36	411.69
3823.92	453.39
3824.33	412.18
3824.99	452.04
3826.53	354.24
3827.13	363.41
3827.31	373.11
3827.80	412.71
3828.12	385.77
3829.44	399.90
3830.68	435.74
3831.12	429.17
3831.15	393.55
3831.47	420.94
3832.61	419.93
3833.31	398.82
3833.46	459.12
3834.97	396.42
3835.11	332.78
3839.03	414.76
3839.73	372.69
3839.83	364.37
3840.80	367.51
3841.06	372.35
3841.10	405.29
3841.78	416.64
3842.10	429.78
3842.09	395.75
3844.20	453.41
3844.56	396.10
3845.44	442.59
3845.86	381.81
3846.35	414.45
3847.33	390.17
3849.57	395.77
3849.70	372.13
3850.39	384.91
3850.59	372.94
3850.84	430.63
3851.48	407.53
3851.78	426.42
3854.08	395.54
3855.18	419.18
3857.31	431.12
3861.05	372.58
3861.15	432.36
3861.66	378.02
3864.64	404.30
3865.19	450.95
3865.19	427.93
3865.47	441.36
3865.78	383.70

DOCUMENT UNCLASSIFIED JCP-I, DPG

K	L
3962.22	430.07
3965.06	371.05
3968.75	387.18
3970.62	364.43
3971.92	409.16
3971.98	398.64
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3973.61	401.17
3974.12	369.71
3975.32	422.34
3975.44	417.05
3978.80	431.56
3978.85	375.49
3979.61	404.71
3980.47	353.53
3981.52	418.76
3984.12	387.10
3985.21	434.44
3986.28	368.02
3988.42	397.14
3989.74	376.64
3990.91	427.98
3999.77	394.65
4001.07	397.65
4001.29	420.13
4007.11	426.93
4007.44	387.31
4010.51	409.00
4011.25	400.66
4011.98	426.06
4014.13	432.05
4015.41	447.86
4016.98	452.29
4020.37	437.76
4023.29	412.81
4023.42	390.07
4036.01	397.37
4041.10	416.72
4042.39	408.18
4048.98	387.12
4051.99	432.87
4055.19	437.31
4061.61	388.90
4074.60	406.13
4075.96	416.45
4082.44	417.75
4097.49	398.09
4251.23	303.75
4289.49	398.45

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APPENDIX VI

TARGET ARRAY AND DAMAGE ASSESSMENT

TARGET ARRAY AT HILL AFB, UTAH

(U) A composite target array (Fig. VI-1) was constructed in the Utah desert south and west of the Great Salt Lake. It consisted of actual and simulated targets grouped into five areas. These areas were: (a) a munitions area containing live munitions of diverse types; (b) a vehicle area containing various ground and AGE vehicles; (c) a revetment area containing a revetted F-86 aircraft, a revetted simulated SAM control site containing six simulated vans, and a revetted simulated surface-to-air missile launcher; (d) a barracks area containing small wood frame buildings, plywood manikins, and trenches; and (e) a POL area containing gasoline trucks, 50-gal drums of various fuels, fuel pipes, and various other POL targets.

(U) The exact arrangement of the areas and a listing of the targets in them are contained in Appendix VII.

(U) The design of the various revetments and targets conformed as closely as possible to designs obtained from various intelligence sources.

(U) The evaluation and analysis of the damage to the targets within the array were conducted by Captain James Whatley, USAF. Assisting him were Hill AFB personnel from various support organizations such as aircraft maintenance, motor pool, ammunition, civil engineers, POL, and the Medical Corps. These personnel evaluated the damage to targets within their specialty.

(U) The damage assessment to the simulated targets such as the SAM control site vans is based upon the opinions of the evaluators who considered what the overall effect would have been if, for example, electronic components had been inside the vans.

(U) The damage assessment to the actual targets is completely factual. For example, the three target aircraft were in a flyable condition prior to the mission. Only the TACAN and the clock had been removed. Almost all of the ground vehicles were operable. The ordnance and POL were drawn from stock.

(U) The manikins were fabricated according to a design which was considered to be a fairly accurate representation of a man, including moving joints. The use of the three-dimensional aspects provides greater accuracy in

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assessing the damage while limiting the expense and time required to construct completely life-like targets.

EFFECTIVENESS EVALUATION

(U) The areas of particular interest in evaluating the effectiveness of the system were:

1. Functional reliability.
2. Pattern size and distribution.
3. Target damage.

(U) FUNCTIONAL RELIABILITY. Due to the unique nature of the system being evaluated, the functional reliability may be considered in the following three areas:

1. System reliability - both carton and bomb function.
2. Carton reliability - carton functions properly.
3. Bomb reliability - bombs dispensed in a good carton function.

(C) The reliability rates as calculated from actual results obtained are present in Table VI-1.

TABLE VI-1. RELIABILITY

Mission	System (%)	Carton (%)	BIU-3B (%)
22	94.33	94.44	98.47
23, Pass 1	96.45	97.26	98.50
23, Pass 2	96.55	97.26	98.46

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(U) The above results show that the SUU-24/A dispenser loaded with BLU-3/B bombs is a highly reliable system.

(C) PATTERN SIZE AND DISTRIBUTION. The patterns obtained from the missions at Hendover AFB, Utah were rectangularly shaped with the dimension parallel to the flight path far longer than the dimension perpendicular to flight path.

(C) The distribution of the bombs downrange was almost constant throughout the majority of the patterns. The exceptions were the normal and expected "build-up" and "tail-off" at the ends of the pattern. This was due to the intervalometer setting being such to give overlapping of bombs from several cells.

(C) The distribution of the bombs in deflection was concentrated along the long axis of the pattern, decreasing symetrically on either side of axis. The pattern densities varied due to the varying delivery characteristics. There were small noticeable gaps in the patterns which could logically be attributed to the cartons which either did not function properly or functioned early or late. The actual pattern dimensions for 90% and 95% of the bombs for each mission are found in Table VI-2.

TABLE VI-2. PATTERN DIMENSIONS.

Mission	90% of Bombs		95% of Bombs	
	Length (ft)	Width (ft)	Length (ft)	Width (ft)
22	5500	150	4900	125
25, Pass 1	1980	210	1550	160
25, Pass 2	3500	210	3100	190

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(U) From the actual pattern dimensions and the knowledge gained from the various other drops during the project, it was possible to make a prediction of the distribution of bombs to be expected for the delivery characteristics of missions 22 and 25, Passes 1 and 2. These predicted patterns are given in Tables VI-3, VI-4, and VI-5.

(U) TARGET DAMAGE. It is felt that this subject can be more adequately expressed by grouping the damaged targets by type. This is advantageous due

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to the large number of targets and the diversified information available on some types. The grouped types are:

1. Aircraft.
2. Vehicle.
3. POL.
4. Munitions.
5. Radar vans.
6. Shop vans.
7. Guns and missiles.
8. Wood structures.
9. Personnel.

TABLE VI-3. PERCENT OF BOMBS IMPACTING IN INTERVALS ABOUT THE MEAN OF THE PATTERN, MISSION 22.

Range		Deflection	
Interval (ft)	Percent of Bombs	Interval (ft)	Percent of Bombs
< -2500	0.80	< -75.0	0.40
-2400 to -2500	1.20	-62.5 to -75.0	0.82
-2300 to -2400	2.00	-50.0 to -62.5	2.37
-2200 to -2300	2.00	-37.5 to -50.0	5.26
-2100 to -2200	2.00	-25.0 to -37.5	9.56
-2000 to -2100	2.00	-12.5 to-25.0	14.23
-1900 to -2000	2.00	00.0 to -12.5	17.36
-1800 to -1900	2.00	00.0 to 12.5	17.36
-1700 to -1800	2.00	12.5 to 25.0	14.23
-1600 to -1700	2.00	25.0 to 37.5	9.56
-1500 to -1600	2.00	37.5 to 50.0	5.26
-1400 to -1500	2.00	50.0 to 62.5	2.37
-1300 to -1400	2.00	62.5 to 75.0	0.82
-1200 to -1300	2.00	> 75.0	0.40
-1100 to -1200	2.00		
-1000 to -1100	2.00		

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TABLE VI-3 (Continued)

Range		Deflection	
Interval (ft)	Percent of Bombs	Interval (ft)	Percent of Bombs
- 900 to -1000	2.00		
- 800 to - 900	2.00		
- 700 to - 800	2.00		
- 600 to - 700	2.00		
- 500 to - 600	2.00		
- 400 to - 500	2.00		
- 300 to - 400	2.00		
- 200 to - 300	2.00		
- 100 to - 200	2.00		
- 000 to - 100	2.00		
000 to 100	2.00		
100 to 200	2.00		
200 to 300	2.00		
300 to 400	2.00		
400 to 500	2.00		
500 to 600	2.00		
600 to 700	2.00		
700 to 800	2.00		
800 to 900	2.00		
900 to 1000	2.00		
1000 to 1100	2.00		
1100 to 1200	2.00		
1200 to 1300	2.00		
1300 to 1400	2.00		
1400 to 1500	2.00		
1500 to 1600	2.00		
1600 to 1700	2.00		
1700 to 1800	2.00		
1800 to 1900	2.00		
1900 to 2000	2.00		
2000 to 2100	2.00		
2100 to 2200	2.00		
2200 to 2300	2.00		
2300 to 2400	2.00		
2400 to 2500	1.20		
> 2500	0.80		

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TABLE VI-9. PERCENT OF BOMBS IMPACTING IN INTERVALS ABOUT THE MEAN OF THE PATTERN, MISSION 25, PASS 1.

Range		Deflection	
Interval (ft)	Percent of Bombs	Interval (ft)	Percent of Bombs
< -800	1.0	< -100	1.0
-700 to -800	1.5	-75 to -100	4.0
-600 to -700	4.3	-50 to - 75	8.0
-500 to -600	7.2	-25 to -50	16.0
-400 to -500	7.2	00 to -25	21.0
-300 to -400	7.2	00 to 25	21.0
-200 to -300	7.2	25 to 50	16.0
-100 to -200	7.2	50 to 75	8.0
000 to -100	7.2	75 to 100	4.0
000 to 100	7.2	> 100	1.0
100 to 200	7.2		
200 to 300	7.2		
300 to 400	7.2		
400 to 500	7.2		
500 to 600	7.2		
600 to 700	4.3		
700 to 800	1.5		
> 800	1.0		

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TABLE VI-5 PERCENTAGE OF BOMBS IMPACTING IN INTERVALS ABOUT THE MEAN OF THE PATTERN, MISSION 24, PASS 2.

Range		Deflection	
Interval (ft)	Percent of Bombs	Interval (ft)	Percent of Bombs
< -1500	1.20		
-1400 to -1500	1.60	< -100	1.0
-1300 to -1400	2.00	-75 to -100	4.0
-1200 to -1300	2.60	-50 to - 75	8.0
-1100 to -1200	3.55	-25 to - 50	16.0
-1000 to -1100	3.55	00 to - 25	21.0
- 900 to -1000	3.55	00 to 25	21.0
- 800 to - 900	3.55	25 to 50	16.0
- 700 to - 800	3.55	50 to 75	8.0
- 600 to - 700	3.55	75 to 100	4.0
- 500 to - 600	3.55	> 100	1.0
- 400 to - 500	3.55		
- 300 to - 400	3.55		
- 200 to - 300	3.55		
- 100 to - 200	3.55		
000 to - 100	3.55		
000 to 100	3.55		
100 to 200	3.55		
200 to 300	3.55		
300 to 400	3.55		
400 to 500	3.55		
500 to 600	3.55		
600 to 700	3.55		
700 to 800	3.55		
800 to 900	3.55		
900 to 1000	3.55		
1000 to 1100	3.55		
1100 to 1200	3.55		
1200 to 1300	2.60		
1300 to 1400	2.00		
1400 to 1500	1.60		
> 1500	1.20		

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(U) Photographs showing representative target damage will be included as appropriate for each type target. See e l of this appendix.

AIRCRAFT

(S) All three aircraft targets were damaged during mission 22. Only the two unrevetted aircraft were available for mission 25, and only one of these, the F-86, was damaged. The damage assessment information is presented in Table VI-c.

TABLE VI-c. AIRCRAFT DAMAGE ASSESSMENT, MISSIONS 22 AND 25.

Mission	Type Aircraft	Protection	Square Feet Per Bomb	Status	Repair Time (manhours)
22	T-33	None	212	Repairable	6
	F-84H	None	175	Repairable	151
	F-86	Revetment	35	Catastrophic Damage	Unrepairable
25, Pass 2 SECRET	F-84H	None	125	Repairable	2250

VEHICLES

MISSION 22

(U) The following type vehicles and quantities were available for mission 22:

Jeep - 3
1 1/2-ton truck - 2
Dump truck - 2
Sedan - 2
Fuel truck - 1
Air l *
Forklift - 1
Crane - 1

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(U) The following code for the status of the vehicles was established and used in Tables VI-7 and VI-8:

Status	Damage and Performance Description
1	Damage not sufficient to affect performance.
2	Vehicle stopped, but field repair can be effected.
3	Vehicle stopped. Shop facilities required to accomplish repair.
4	Catastrophic damage.

(U) The damage assessment information is given in Table VI-7.

TABLE VI-7. VEHICLE DAMAGE ASSESSMENT, MISSION 22.

Type Vehicle	Square Feet Per Bomb	Status	Repair Time[1]
Jeep	15,150	2	1.0
	55	3	11.5
	250	4	N/A[2]
Forklift	6,540	1	N/A
1 1/2-ton truck	2,550	3	3.5
	250	3	4.0
Dump truck	3,540	2	1.0
	6,200	2	2.0
Crane	6,900	1	N/A
APC	2,900	1	N/A
Sedan	65	3	5.0
	12,150	1	N/A
Fuel truck	5,525	1	N/A

[1] Manhours.
[2] N/A: Not applicable - damage either too great for repair or not requiring repair.
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MISSION 23

(S) The same targets with the exception of one jeep were available for this mission. Pass 1 did not inflict any significant damage on the targets. The damage assessment information for Pass 2 is given in Table VI-8.

TABLE VI-8. VEHICLE DAMAGE ASSESSMENT, MISSION 23, PASS 2.

Vehicle	Square Feet Per Comb	Repair Time[1]	Status
Jeep	2650	2.0	3
	600	3.5	3
Sedan	245	1.0	3
1 1/2-ton truck	125	N/A[2]	4
Dump truck	7450	7.5	3

[1] Manhours.
[2] N/A: Not applicable - damage beyond repair.
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POL

MISSION 22

(U) The following type POL containers were available in stated quantities for mission 22:

55-gal drum - 118
5-gal cans - 30
500-gal tanks - 2
Fuel truck - 1
6-in. pipe - 3
4-in. pipe - 3
2-in. pipe - 3

(U) Damage assessment information including the type fuel in the containers is given in Table VI-9.

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TABLE VI-9. POL DAMAGE ASSESSMENT, MISSION 22

Type Container	No. of Containers	Type Fuel	Percent Destroyed	Square Feet Per Bank	Remarks
55-gal drum	12	Motor gas	41.6	4,360	
	8	145	87.5	800	
	12	JP4	100.	65	
	9	145	0	19,400	
	9	JP4	0	18,000	
	12	JP4	100.	60	
	12	145	100.	750	
	12	Motor gas	14.0	5,75[illegible]	
	8	Motor gas	12.1	11,270	
	12	JP4	100.	45	
	12	145	100.	35	
5-gal can	0	Motor gas	100.	45	
	12	JP4	100.	50	
	12	JP4	100.	50	
500-ga .ank	1	Motor gas	0	36,400	
	1	JP4	0	16,850	Semi-buried
6-inch pipe	1	145	0	1,575	1 ft above ground
4-inch pipe	1	145	0	1,575	1 ft above ground
2-inch pipe	1	145	100.	1,575	1 ft above ground
6-inch pipe	1	145	0	1,575	Resting on ground
4-inch pipe	1	145	0	1,575	Resting on ground
2-inch pipe	1	145	100.	1,575	Resting on ground
6-inch pipe	1	145	0	1,575	Buried
4-inch pipe	1	145	0	1,575	Buried
2-inch pipe	1	145	0	1,575	Buried
Truck	1	145	0	5,525	

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MISSION 23, PASSES 1 AND 2

(U) The following type POL containers were available in stated quantities for mission 23:

Container	Number
55-gal drum	19
500-gal tank	2
Fuel truck	1
6-in. pipe	3
4-in. pipe	3
2-in. pipe	3

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(S) With the exception of the truck and the above-ground 500-gal tank, the POL containers were in the target area of pass 2. These two containers were not damaged on pass 1. Table VI-10 presents the damage assessment of the POL for mission 23.

TABLE VI-10. POL DAMAGE ASSESSMENT, MISSION 23, PASS 2

Type Container	No. of Containers	Type Fuel	Percent Destroyed	Square Feet Per Bomb	Remarks
6-inch pipe	1	145	0	8200	Outside the impact pattern
4-inch pipe	1	145	0	8200	
2-inch pipe	1	145	0	8200	
6-inch pipe	1	145	0	8200	
4-inch pipe	1	145	0	8200	
2-inch pipe	1	145	0	8200	
6-inch pipe	1	145	0	8200	
4-inch pipe	1	145	0	8200	
2-inch pipe	1	145	0	8200	
55-gal drum	1	145	100.	75	
	1	Motor gas	94.5	150	
	12	Motor gas	8.3	5200	
	5	Motor [illegible]	18.0	2650	
Tank	1	JP4	0	640	Semiburied

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MUNITIONS

(U) Due to the large number of different type items in the ammunition area, only the items that received damage are listed in Table VI-11. The damage inflicted entirely during mission 22 with the exception of four 2.75-in. rocket motors destroyed during mission 23, pass 2.

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TABLE VI-11. MUNITIONS DAMAGE ASSESSMENT, MISSION 22.

Type	Amount	Percent Destroyed	Square Feet Per Bomb	Remarks
50 cal. ball	2 cases	100.	45	Located in Shed I (Burned)
Hand grenades	2 cases	100.	45	Located in Shed I (Burned)
2.75-in. rocket motors	1 case	100.	200	Located in Shed II (Burned)
2.75-in. heat heads	1 case	100.	200	Located in Shed II (Burned)
Blasting caps	1 case	100.	200	Located in Shed II (Burned)
Mech. bomb fuzes	1 case	100.	200	Located in Shed II (Burned)
20mm API	1 case	5.7	40	
50 cal. ball	1 case	2.4	40	
M111A1 fuze	2 cases	20.	50	
M19A1 grenade	1 case	0.	58	
Hand grenade	1 case	54.	58	
Blasting caps	1 case	100.	50	
2.75-in. rocket motor	2 cases	25.	3150	
2.75-in. heat heads	2 cases	12.5	1540	
M55	2 items	50.	3150	
M110A1	2 items	100.	4900	

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SAM SITE

(U) The SAM site contained six simulated radar vans and exposed cables connecting the vans. The simulated vans were considered to represent the following components of a SAM site:

Van Type	SAM Site Component
I	Command and control van
II	Missile control van
II-A (with antennas)	Radar control van
III	Power van

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(U) For assessment purposes the following status codes are used in Tables VI-12 and VI-13 and are defined as follows:

Status	Damage and Performance Description
1	Damage not sufficient to interrupt performance.
2	Performance hindered but operators can effect repair.
3	Performance hindered; maintenance and component replacement required.
4	Catastrophic damage.

(S) The site was damaged by missions 22 and 23, pass 2. Tables VI-12 and VI-13 contain the damage assessment information.

TABLE VI-12. SAM SITE DAMAGE ASSESSMENT, MISSION 22

Type Van	Square Feet Per Bomb	Status
I	45	3
II	45	2
II-a	45	3
III-a	250	2
III-b	250	2
III-c	250	2
Cable	45	4
Cable	250	1

TABLE VI-13. SAM SITE DAMAGE ASSESSMENT, MISSION 23, PASS 2.

Type Van	Square Feet Per Bomb	Status
I	650	2
II	650	2
II-a	650	2
III-a	160	3
III-b	160	3
III-c	160	3
Cable	650	1
Cable	160	1

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SHOP VANS

(S) There were two shop vans in the target area for mission 22. Since both these vans received catastrophic damage they were not considered for mission 23.

TABLE VI-14. SHOP VAN DAMAGE ASSESSMENT, MISSION 22.

Type Van	Square Feet Per Bomb	Status
Trailer	25	Unrepairable
Truck	30	Unrepairable

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GUNS AND MISSILES

(U) The following gun and missile targets were available for the missions 30 cal. gun, 50 cal. gun, Nike-Ajax missile, and Simulated missile.

(S) The guns were not damaged during either mission. The Nike-Ajax would have been completely destroyed in mission 22 and mission 23, pass 2, if the oxygen and fuel sections had been filled. The simulated missile received enough fragment hits during mission 23, pass 2, to have rendered an actual missile of comparable size inoperative.

TABLE VI-15. GUN AND MISSILE DAMAGE ASSESSMENT.

Mission	Target	Square Feet Per Bomb	Status
22	Nike-Ajax	1650	Unserviceable
23, pass 2	Nike-Ajax	660	Unserviceable
23, pass 2	Simulated Missile	660	Unserviceable

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WOOD STRUCTURES

(U) The following wood structures were available for mission 22:

Ammunition sheds	2
Barracks	2
Frame (simulated junk)	1
Witness Panels	150

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AMMUNITION SHEDS

(S) Both sheds were completely destroyed by fire. Shed 1 was located in an area where the bombs impacted with a density of one bomb per 64 sq ft and was ignited immediately. Shed 2, located in an area where the density was one bomb per 200 sq ft, was ignited several minutes after the mission.

BARRACKS

(S) The two barracks were located 200 ft and 250 ft, respectively, from the center line of the pattern. As a result, no direct hits were achieved on the barracks and relatively few fragment hits were obtained. The one-inch walls were not penetrated by the vast majority of fragments striking them. The assessment of the personnel inside the barracks will be contained in the personnel section.

SIMULATED JUNK

(S) The junk in the form of a wood shack was in one of the gaps of the pattern and did not receive direct bomb hits; however, 1848 fragment hits were obtained. The penetration characteristics of the fragments versus the two material thicknesses were:

Material	Fragment Hits	Fragment Penetrations
1 in. pine boards	118	83
2-in. pine boards	1730	649

The manikin located inside the structure received extensive damage from the fragments. This information is given in the personnel section.

WITNESS PANELS

(U) The witness panels located in various positions throughout the entire array were of 1/4-in. plywood sheets. The purpose of the witness panels was to give an indication of fragment distribution and penetrative capability in varying portions of the pattern. For mission 22 there were 60 panels that were located with the pattern and 90 panels that although outside the pattern were still within fragment range. The results for mission 22 are given in Table VI-16.

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TABLE VI-16. FRAGMENT HITS ON WITNESS PANELS, MISSION 22

Number Panels	Fragment Hits Per Sq Ft	Percent of Penetration	Distance From Pattern Centerline (ft)
60	8.75	92.5	7
60	0.83	67.0	250
30	0.22	59.0	310

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(S) Additionally, 8 of the 60 panels located within the pattern received one or more direct hits.

(U) Mission 23, passes 1 and 2, each had 30 panels that were located close enough to the pattern to obtain fragment hits. Table VI-17 gives the results of these fragment hits.

(C) The greater number of hits on pass 1 was due to a more dense distribution of the bombs created by the 100-ft BRIC setting compared to the 200-ft BRIC setting of pass 2.

TABLE VI-17. FRAGMENT HITS ON WITNESS PANELS, MISSION 23, PASSES 1 AND 2.

Pass	Number Panels	Fragment Hits Per Sq Ft	Percent of Penetration	Distance From Pattern Centerline (ft)
1	30	0.97	69.0	230
2	30	0.75	74.6	175

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PERSONNEL

(U) Resulting damage to the simulated personnel targets was determined by a medical evaluation team from Hill AFB, Utah. The team was headed by Lt. Col. Arthur L. Weigel, USAF, MC. The results are included as Attachments 1 and 2 to this Appendix.

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ATTACHMENT 1

APPENDIX VI

MEDICAL EVALUATION OF MANIKINS, PROJECT SHORT TRIP

APGC PROJECT 0266W2 (U)

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SECRET

2791 UNITED STATES AIR FORCE HOSPITAL
2849 AIR BASE GROUP (AFLC)
HILL AIR FORCE BASE, UTAH 84401

REPLY TO ATTN OF: OOBD 17 May 1965

SUBJECT: (U) Medical Evaluation of Manikins, Project Short Trip APGC Project 0266W2

TO: 2705 Airmun Wg (OOY)

1. (S) The following team of medical personnel performed the functions of target evaluation of wooden manikins in support of this mission:

Lt Colonel Arthur E. Weigel, USAF, MC
1/Lt Robert A. Roubik, USAF, NC
SMSgt Glenn E. Knight, USAF
S/Sgt Raul F. Martinez, USAF

2. (S) The wooden manikins in the target area were evaluated in their target positions. Based upon the wound characteristics observed, the manikins were divided into the following medical categories:

a. Dead - Instantly or before medical help could be rendered.

b. Major Injury - Requiring significant medical attention Unable to perform any military functions for periods of several days to several weeks.

c. Minor Injury - Requiring on the spot care - able to continue military mission.

d. None - Able to continue military mission

3. (S) An individual anatomical sheet was used for each casualty and the data contained therein was collected in the following chart summary:

AREA		DEAD	MAJOR	MINOR	NONE	TOTAL
I	F-86A	1	0	0	0	1
II	Vehicle Area					
	Jeep 1	2	0	0	0	2
	Jeep 2	1	0	0	1	2
	2 1/2 Ton 1	2	2	1	1	6
	Dump truck	0	2	1	3	6
	Dump truck	2	1	0	3	6

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Area A	DEAD	MAJOR	MINOR	NONE	TOTAL
Shop Van	2	0	0	0	2
Armored Personnel Carrier	0	0	0	8	8
Fork Litt	1	0	0	0	1
Crane	0	0	0	1	1
Trailer Van	6	0	0	0	6
Staff Car 1	1	1	0	0	2
Staff Car 2	0	0	1	1	2
	17 (39%)	6 (14%)	3 (7%)	16 (4 8)	44
III Revetment Targets					
Type D F-86D	4	0	0	0	4
Type B-1	0	0	0	4	4
Type B-2	0	1	1	2	4
Type A	4 (standing)	0	0	0	4
Type A-II	1	0	1	0	2
Type II-A	4	1	0	0	5
Type I-A	8	4	0	0	12
	21 (53%)	6 (15%)	2 (5%)	11 (27%)	40
IV Personnel Area					
Barracks East	0	0	0	12	12
Foxholes East	0	0	0	8	8
2 1/2 Ton Truck	3	2	1	0	6
Slit Trench	5	1	0	2	8
Tent	6	0	0	0	6

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AREA	DEAD	MAJOR	MINOR	NONE	TOTAL
Jeep	2	0	0	0	2
Wood Frame Up	5	0	0	0	5
Wood Frame Down	9	1	0	0	10
Net Area	9	1	2	0	12
West Slit & Fox Area	0	0	0	8	8
West Barracks	1	0	3	8	12
	40 (45%)	5 (6%)	6 (7%)	38 (42%)	89

4. (S) The total figures for each of the four (4) areas were collected in the following charts:

	DEAD	MAJOR	MINOR	NONE	TOTAL
F-86	1	0	0	0	1
Vehicle Area	17	6	3	18	44
Revetments	21	6	2	11	40
Personnel Area	40	5	6	38	89
	79 (45%)	17 (10%)	11 (6%)	67 (39%)	174

5. (S) Findings:

a.

Military Casualties = Dead + Majors 78 + 17 = 95 (55%).

b.

Non Casualties = Minor + None 11 + 67 = 78 (45%).

c. Casualty rates were the highest in the direct line of drop as anticipated.

d. Significant improvement in personnel protection experience was noted in:

(1) The armored personnel carrier in the vehicle area.

(2) East and West Foxholes in personnel area.

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e. Of the casualties depicted above (death and major injuries), a significant number might have been avoided or reduced in magnitude in the following instances by the protection noted:

	HELMET	ARMORED VEST
Dead	26	42
Major Injuries	0	9

This data is interpolated from the 78 dead and 17 with major injuries. In a significant number of cases both the Helmet and Armored Vest were required in the same individual to exert a significant protective effect.

ARTHUR E. WEIGEL
Lt Colonel, USAF, MC
Commander

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APGC (Capt Whatley)
Eglin AFB, Fla.

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ATTACHMENT 2

APPENDIX VI

MEDICAL EVALUATION OF MANIKINS, PROJECT SHORT TRIP

AFGC PROJECT 02666W2 (U)

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2705 UNI... ...ES AIR FORCE HOSP.
2849 ... Group (AFLC)
Hill Air Force Base, Utah 84101

REPLY TO
ATTN OF: OOnD 2 June 1965

SUBJECT: (U) Medical Evaluation of Manikins, Project Short Trip AFCC Project 5260x2

TO: 2705 Airman Sq (OOY)

1. (S) The following team of medical personnel performed the functions of target evaluation of wooden manikins in support of this mission, 26 May 1965:

Captain Robert C. Simon, USAF, MC
1/Lt Robert A. Koubik, USAF, MC
MSgt Leon L. Sulton, Sr., USAF
SSgt James F. Moulton, USAF

2. (S) The wooden manikins in the target area were evaluated in their target positions. Based upon the wound characteristics observed, the manikins were divided into the following medical categories:

a. Dead - Instantly or before medical help could be rendered.

b. Major Injury - Requiring significant medical attention
Unable to perform any military functions for periods of several days to several weeks.

c. Minor Injury - Requiring on the spot care - able to continue military mission.

d. None - Able to continue military mission.

3. (S) An individual anatomical sheet was used for each casualty and the data contained therein was collected in the following chart summary:

AREA	DEAD	MAJOR	MINOR	NONE	TOTAL
I F-86A	0	0	0	1	1
II Vehicle Area					
Jeep 1	2	0	0	0	2
Jeep 2	0	0	2	0	2
2 1/2 Ton	0	0	2	4	6
Dump Tk 1	2	2	1	1	6
Dump Tk 2	0	1	1	4	6

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AREA	DEAD	MAJOR	MINOR	NONE	TOTAL
Shop Van	2	0	0	0	2
Armored Van Carrier	0	0	0	8	8
Fork Lift	0	0	0	1	1
Crane	0	0	0	1	1
Trailer Van	6	0	0	0	6
Staff Car 1	0	0	0	2	2
Staff Car 2	0	0	0	2	2
	12	3	6	23	44
III Revetment Targets					
Type D 860	4	0	0	0	4
Type B-1 Artillery	4	0	0	0	4
Type B-2 M-Guns	0	0	2	2	4
Type A	4	0	0	0	4
Type A I Var.	0	0	0	12	12
Type A II Var.	0	0	2	0	2
Type II A	2	2	0	0	4
Type E	2 10	1 3	3 7	0 14	6 40
IV Personnel Area					
Barracks East	0	0	4	8	12
Foxholes East	0	1	3	4	8
2 1/2 Ton Truck	2	1	3	0	6
Slit Trench	8	0	0	0	8
Tent Area	6	0	0	0	6

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AREA	DEAD	MAJOR	MINOR	NONE	TOTAL
Jeep	2	0	0	0	2
Wood Frame Up	5	0	0	0	5
Wood Frame Down	10	0	0	0	10
Net Area	2	1	2	7	12
Foxholes West	0	0	0	8	8
Barracks West	3	1	1	7	12
	38	4	13	34	89

4. (S) The total figures for each of the four (4) areas were collected in the following charts:

	DEAD	MAJOR	MINOR	NONE	TOTAL
F-86	0	0	0	1	1
Vehicle Area	12	3	6	23	44
Revetments	16	3	7	14	40
Personnel Area	38	4	13	38	89
	66 (37.5%)	10 (5.7%)	26 (14.8%)	74 (42%)	

5. (a) Findings:

a.

Military Casualties = Dead + Majors 66 + 10 = 76 (43.2%)

b.

Non-Casualties = Minor + None 26 + 74 + 100 (56.8%)

c. Significant improvement in personnel protection experience was noted in:

(1) The armored personnel carrier in the vehicle area.

(2) East and West Foxholes in personnel area.

SIGNED

ARTHUR E. WEIGEL
Lt Colonel, USAF, MC
Commander

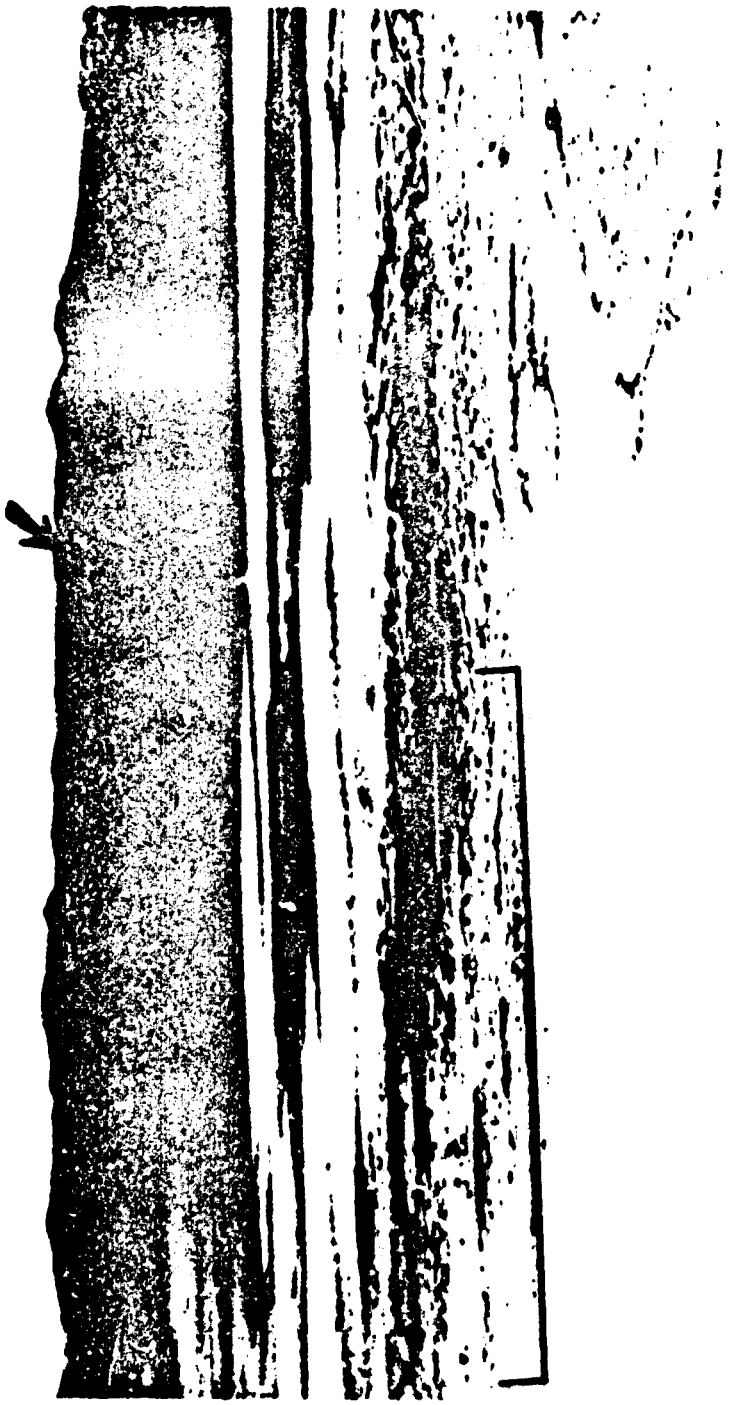
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AFGC (Capt Whatley)
Eglin AFB, Fla.

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Figure VI-1. Aerial View of Target Array.

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Figure VI-2 B-52 Aircraft and B-57 Photo Chase Aircraft (Arrow) at Moment of Release Over Target Array.

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Figure VI-4. Smoke and Dust Rising From Impact Pattern. POL Area Starting to Burn (Arrow).

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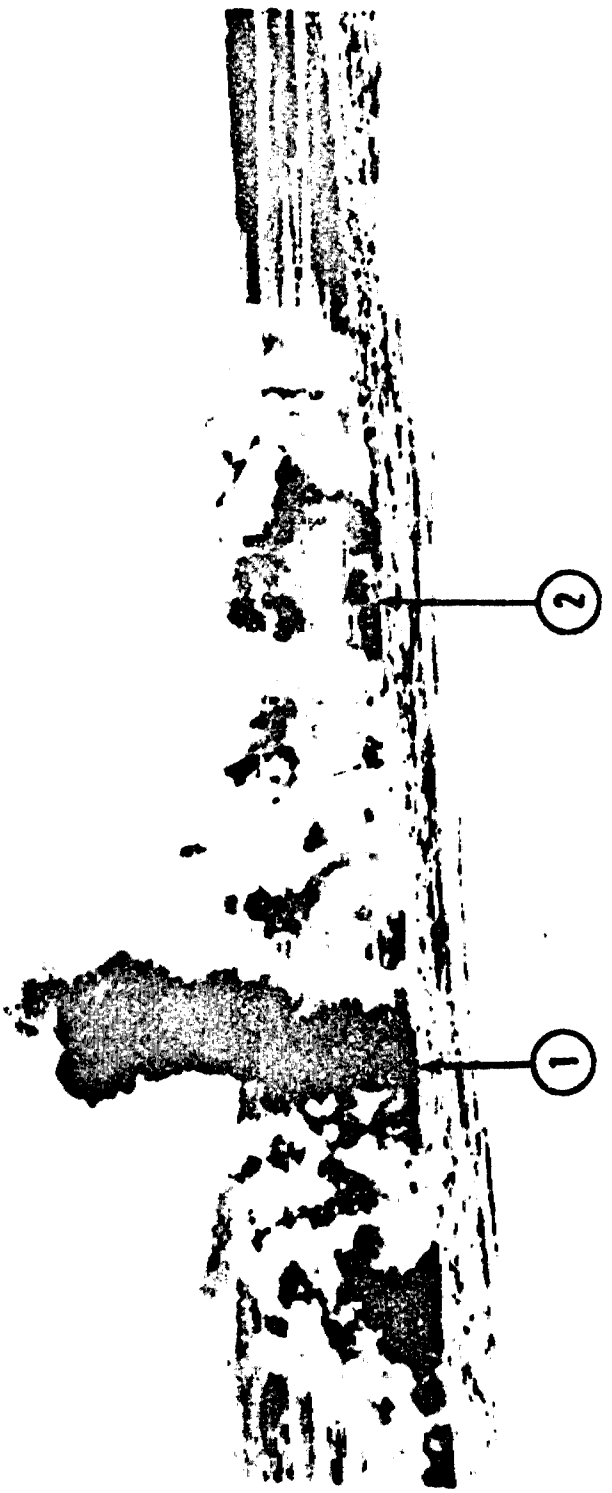


Figure VI-5. Smoke and Dust Dissipating. (1) Burning POL Area and (2) Burning Ammunition.

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Figure VI-[illegible]. Rewetted F-[illegible] Destroyed on Mission 22 by Direct Hits and Resultant Fire. Note Direct Hits on Wing (Arrow).

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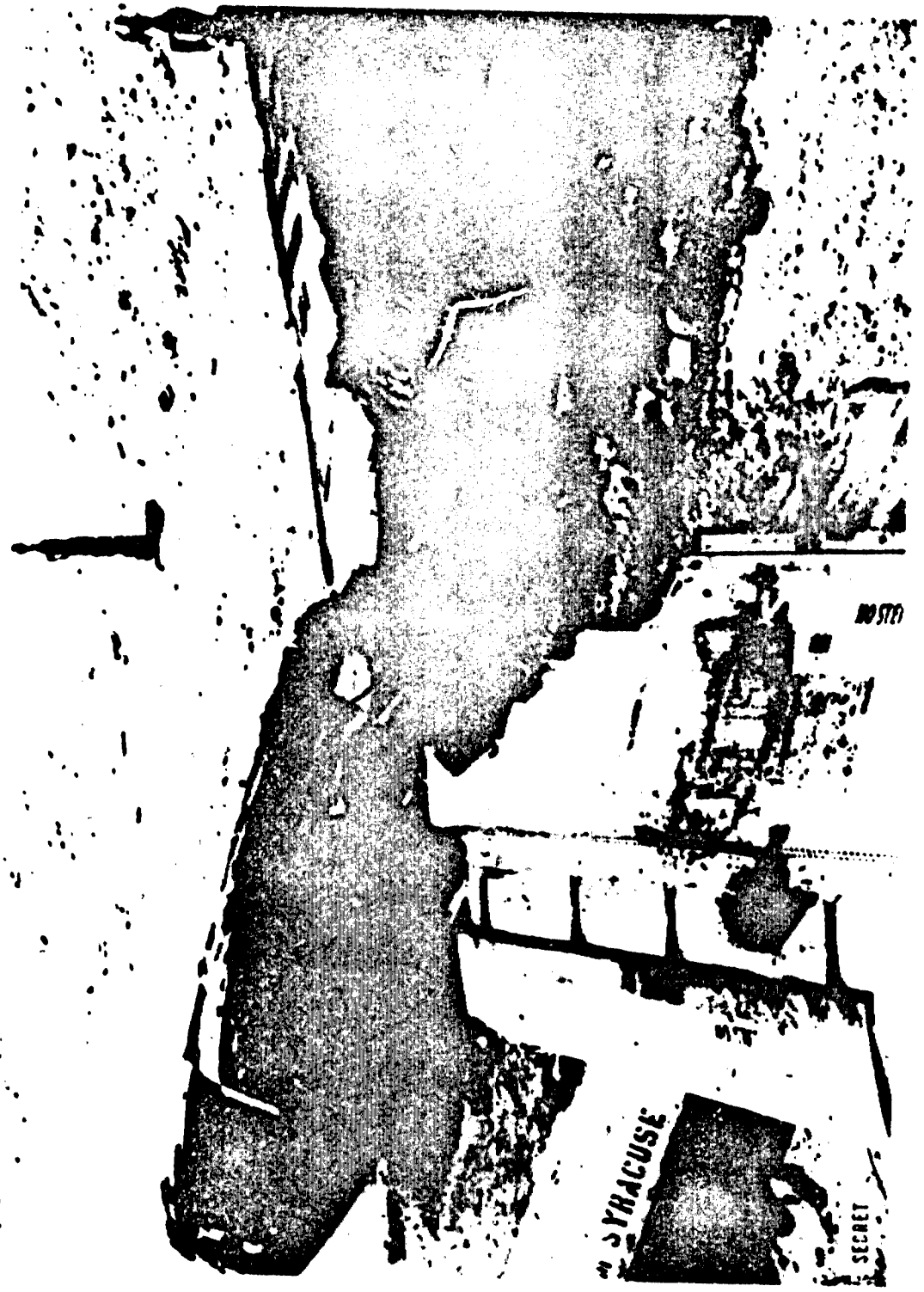


Figure VI-7. Rear View of Rewetted F-[illegible] Destroyed on Mission 22.

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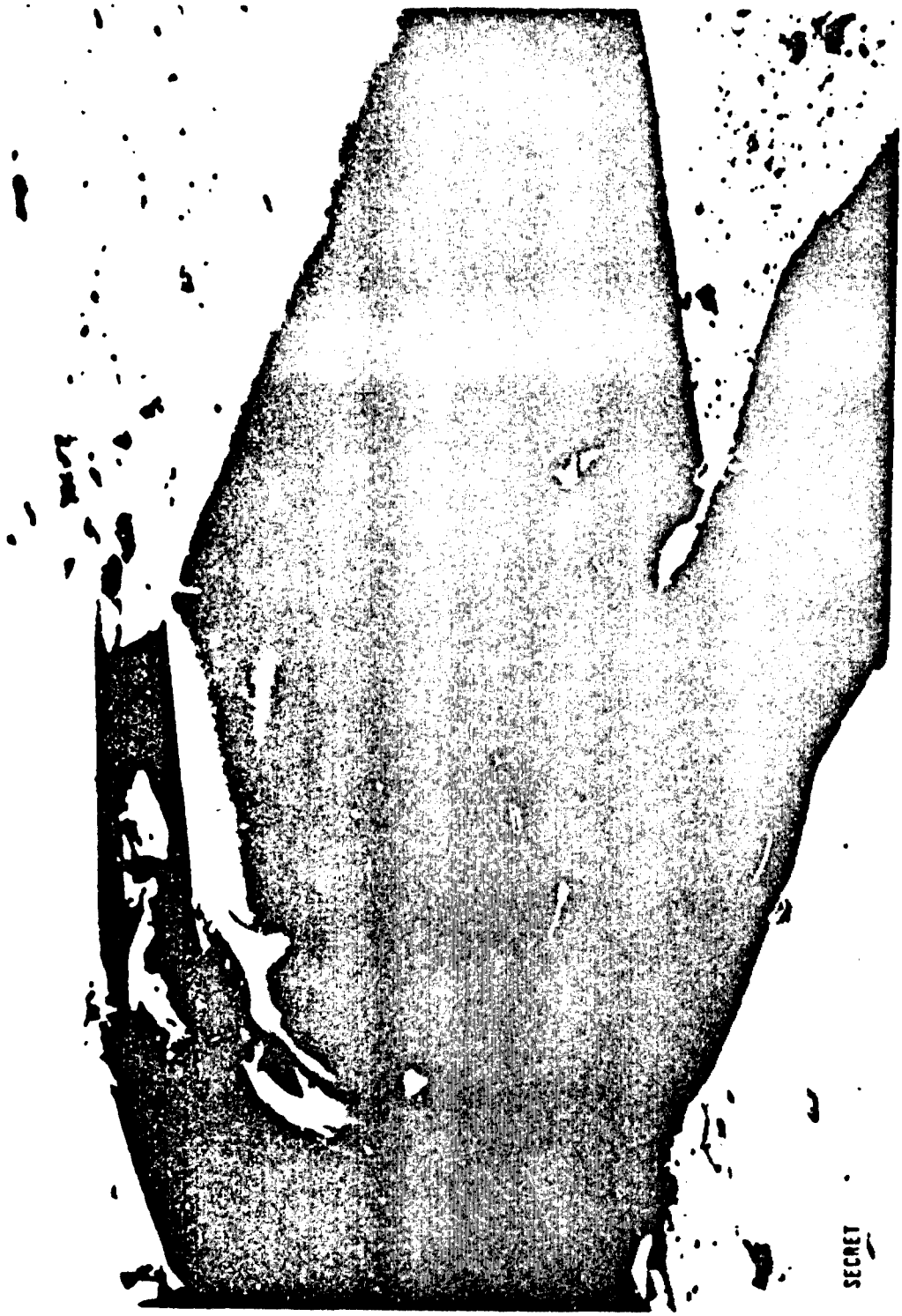


Figure VI-6. Close-up View of F-6[illegible] Wing Tank Which was Damaged by a Direct Hit on Mission 22.

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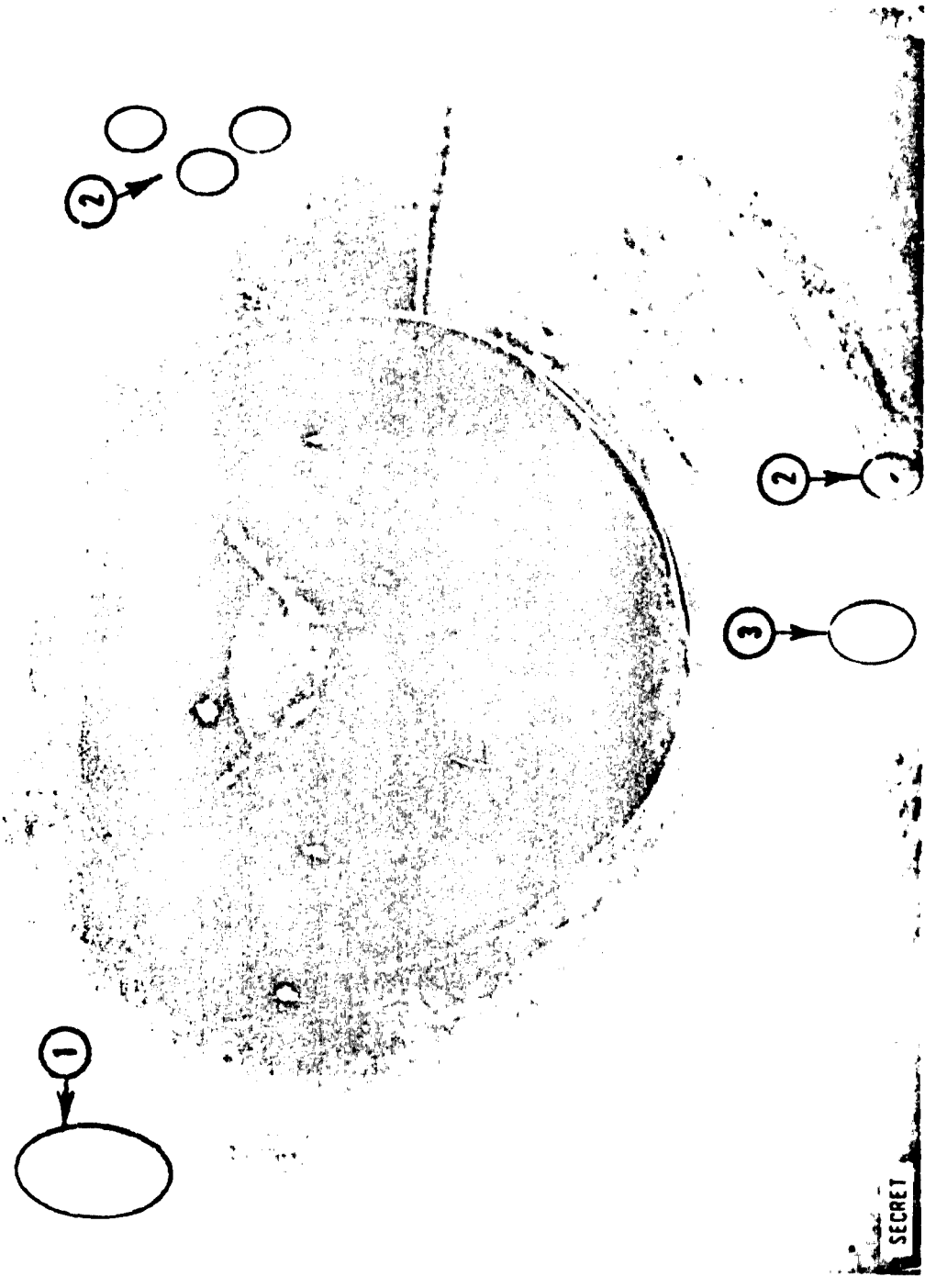


Figure VI-9. Tail Pipe of Unrevetted I-[illegible] Damaged on Mission 22. (1) Exit Holes of Fragments, (2) Entrance Holes, and (3) Steel Balls.

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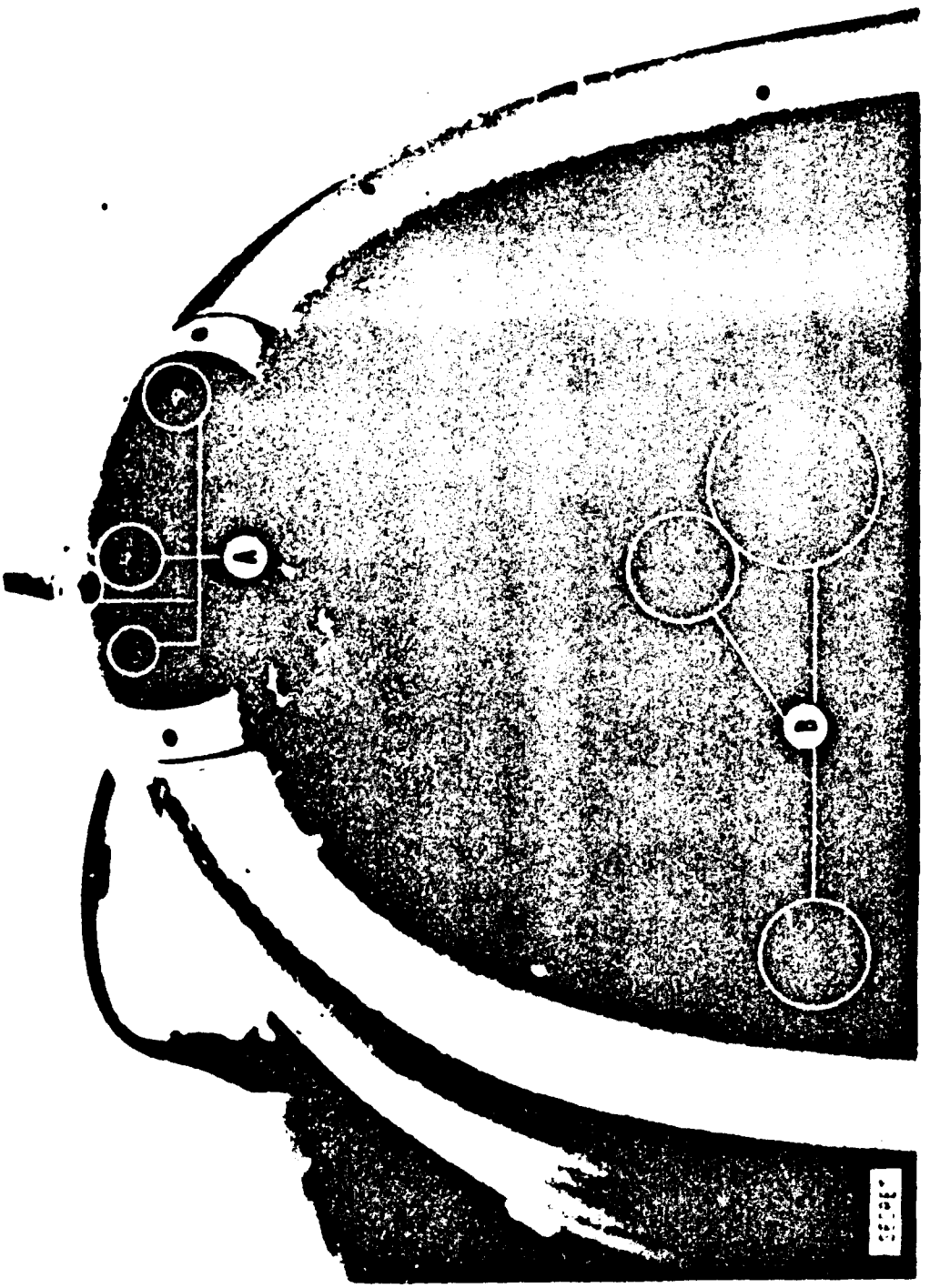


Figure VI-16. Air Intake of Unrevetted F-5[illegible] Damaged on Mission 27, Pass 1. (1) Damage to Antenna and (2) Structural Damage to Intake.

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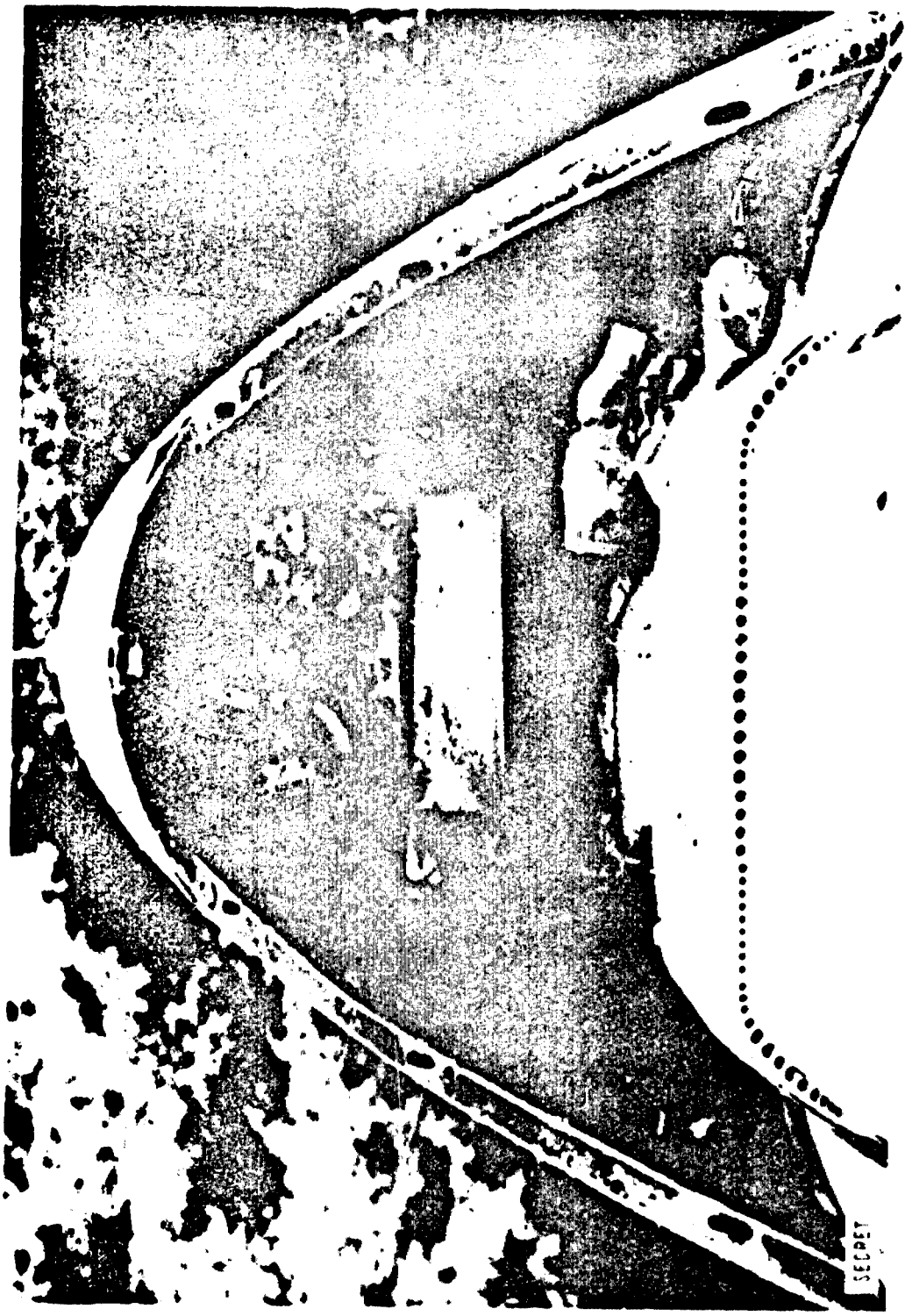


Figure VI-11. Damage to Avionics Compartment and Equipment of Unrevetted F-[illegible] on Mission 23, Pass 2.

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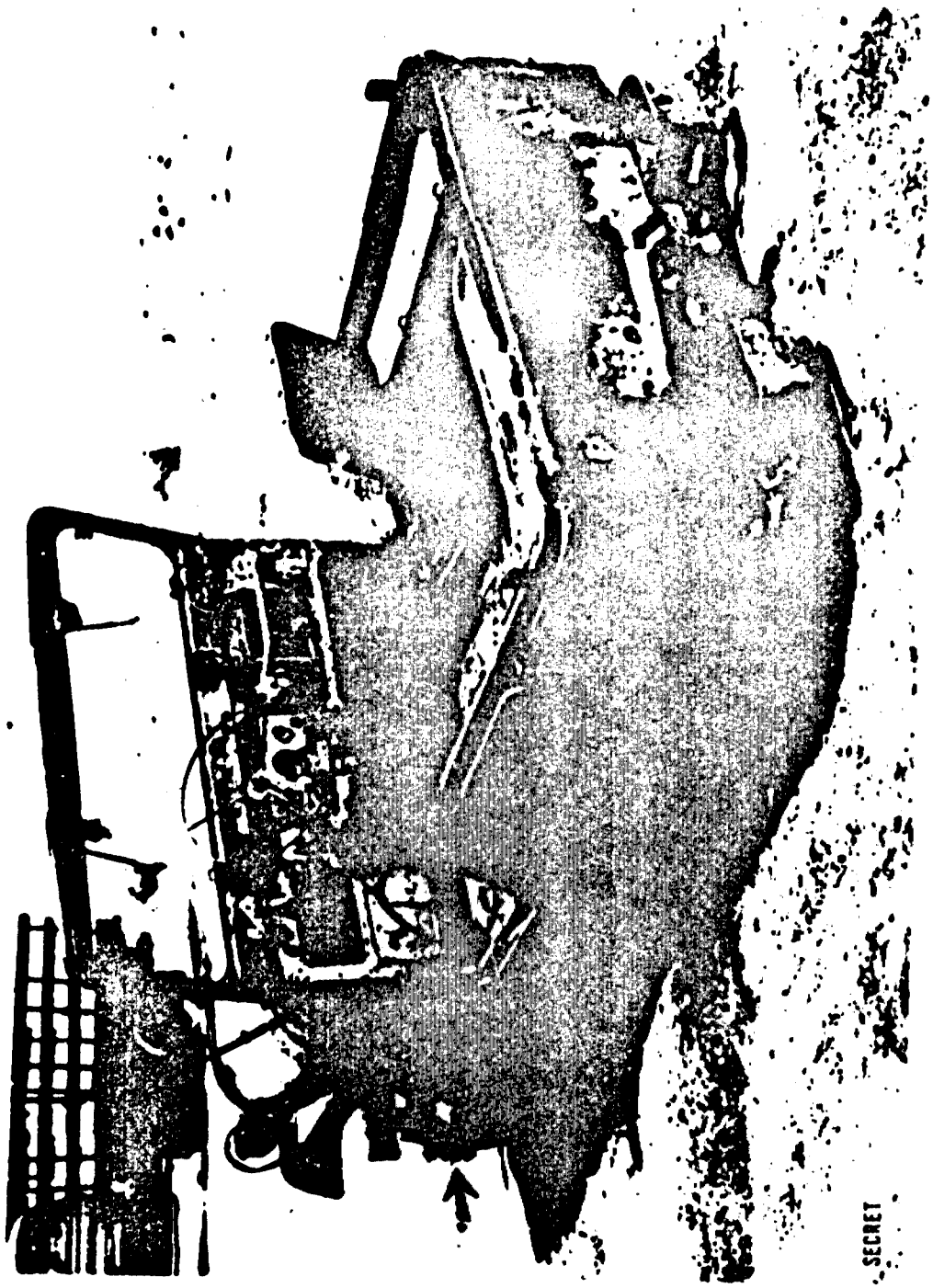


Figure VI-12. Jeep Totally Destroyed by Fire and Direct Hits on Mission 22. [illegible] Condition of Tire (Arrow).

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Figure VI-27. Sedan Damaged on Mission 22. Note Numerous Fragment Hits (Arrow).

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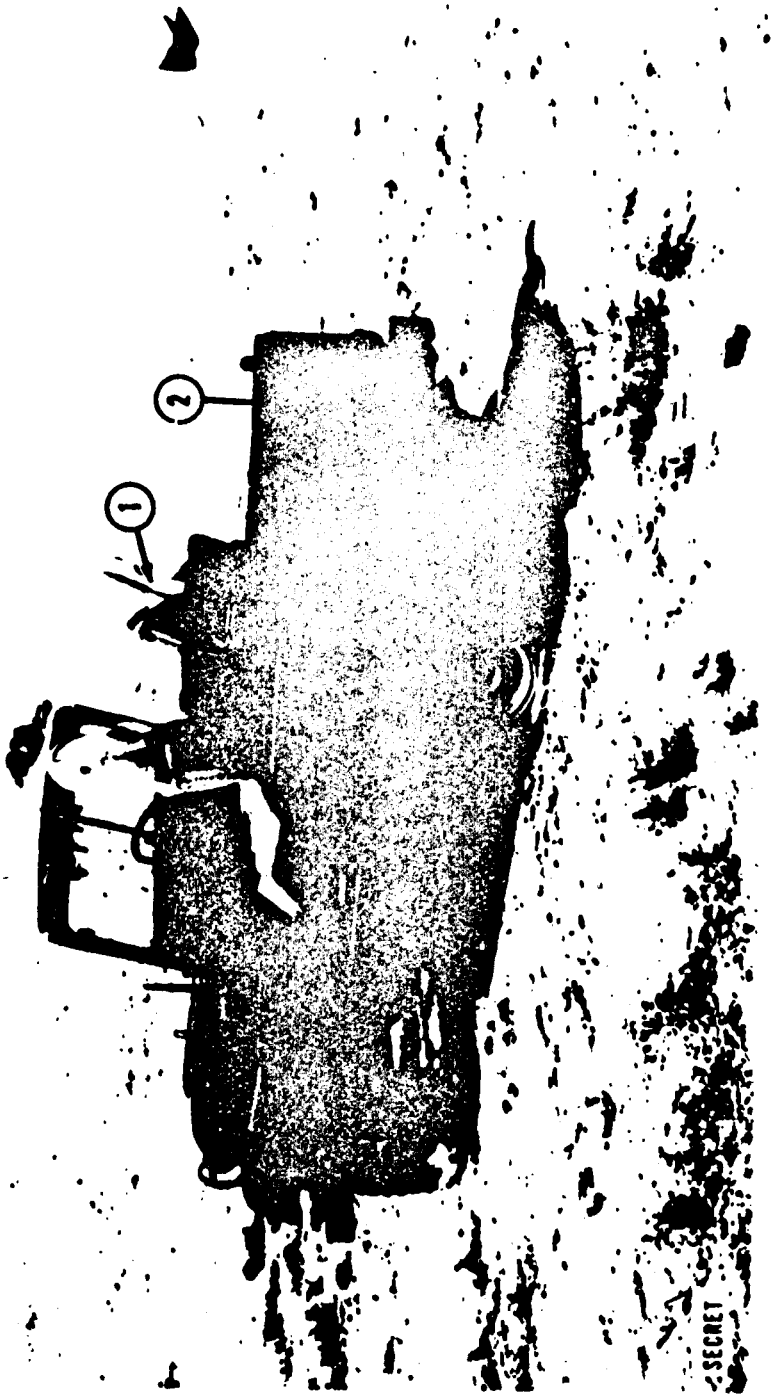


Figure VI-14. Jeep Damaged on Mission 27. (1) Damaged Manifolds, and (2) Direct Hit on the Rear of the Jeep.

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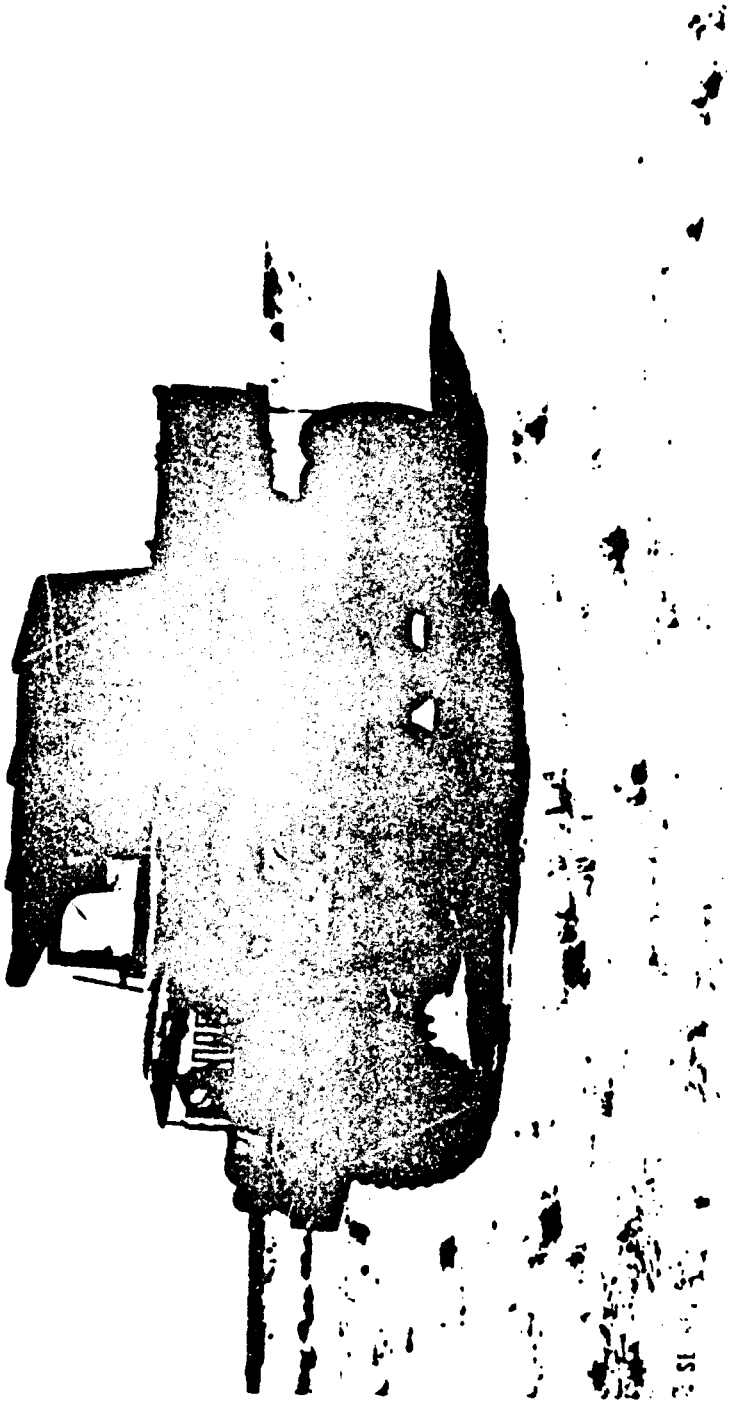


Figure VI-15. Minor Damage to Dump Truck on Mission 22.

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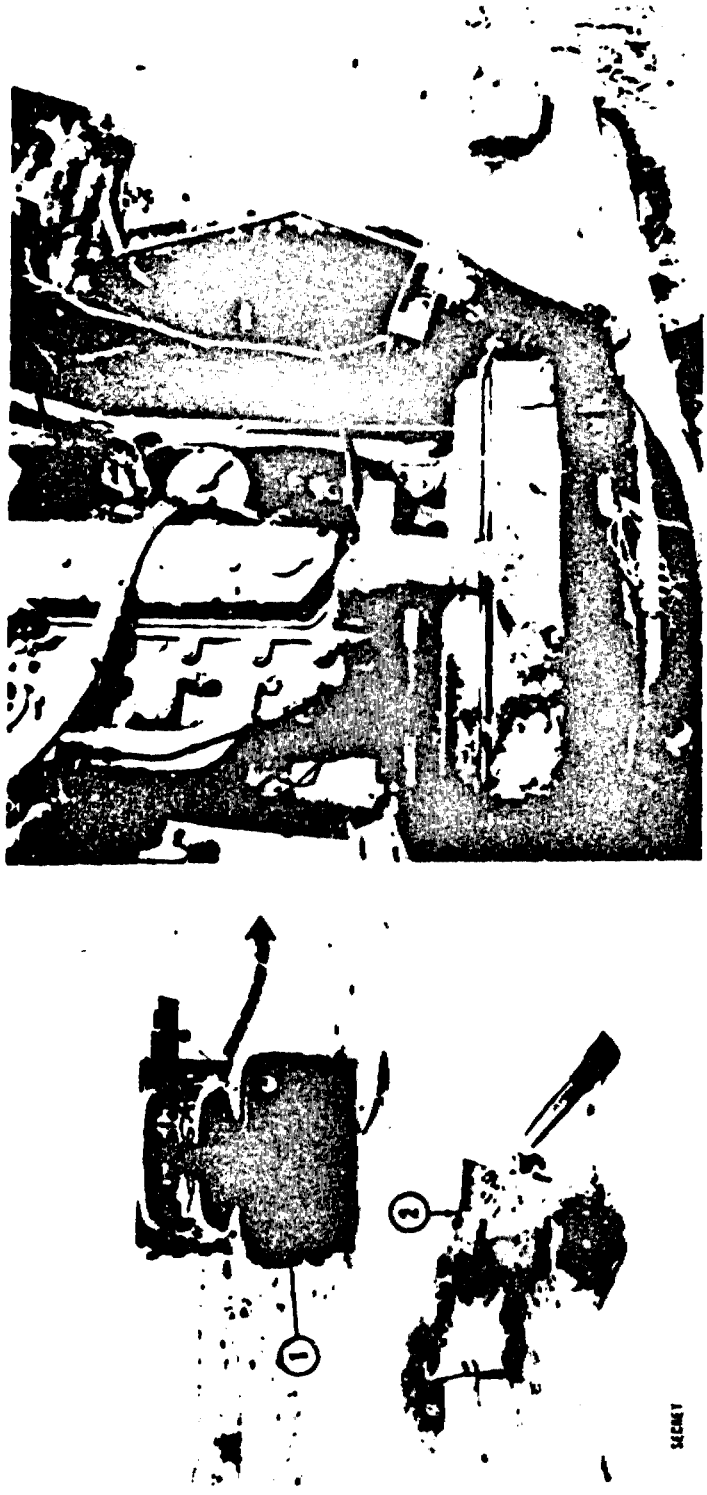


Figure VI-16. One and One-Half-Ton Truck Damaged on Mission 23, Pass 2. (1) Close-up of Engine Compartment, and (2) Position and Condition of Hood.

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Figure VI-17. Effects of Direct Hit on Cab and Manikin in 2 1/2-ton Truck on Mission 24, Pass 2.

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Figure VI-15. Remains of 12 Five Gallon Drums Filled with JP-4 Fuel Damaged on Mission 22. Destroyed Witness Panels (Arrow).

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Figure VI-19. Group of Twelve 55-Gallon Drums Filled with JP4 Fuel Damaged on Mission 22.

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Figure VI-20. Group of Twelve 55-Gallon Drums Filled with Motor Gas Damaged on Mission 22.

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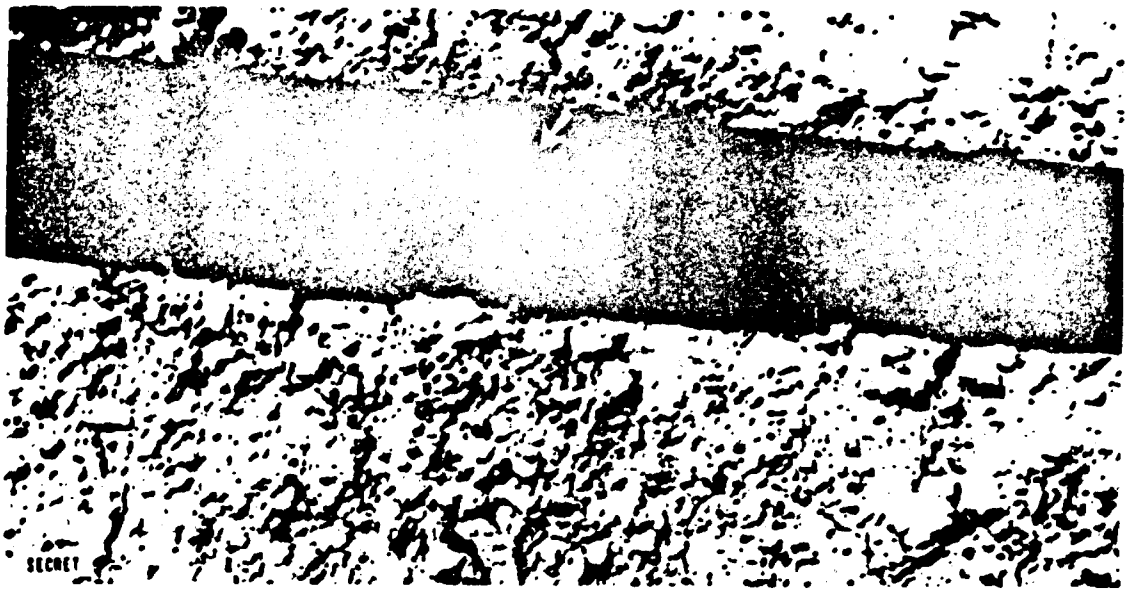


Figure VI-21. Fragment Hit on Exposed Fuel Pipe, Which Caused a Leak, Inflicted on Mission 22.



Figure VI-22. Fifty-five Gallon Drum Which Burned After a Direct Hit on Mission 23, Pass 2.

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Figure VI-23. Fifty-Five Gallon Fuel and Oil Drums Damaged and Burned on Mission 27, Pass 2. Some Drums Were Blown Over 10 Feet Away From Their Original Positions.

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Figure VI-24. Remains of Shed Containing .30 Calibre Ball Ammunition and Hand Grenades Which Were Destroyed on Mission 22.

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Figure VI-25. Remains of Shed Containing 2.75-In. Rocket Motor and HEAT Warheads Destroyed on Mission 22.

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Figure VI-2.. M11 Fire Bomb Destroyed on Mission 22.

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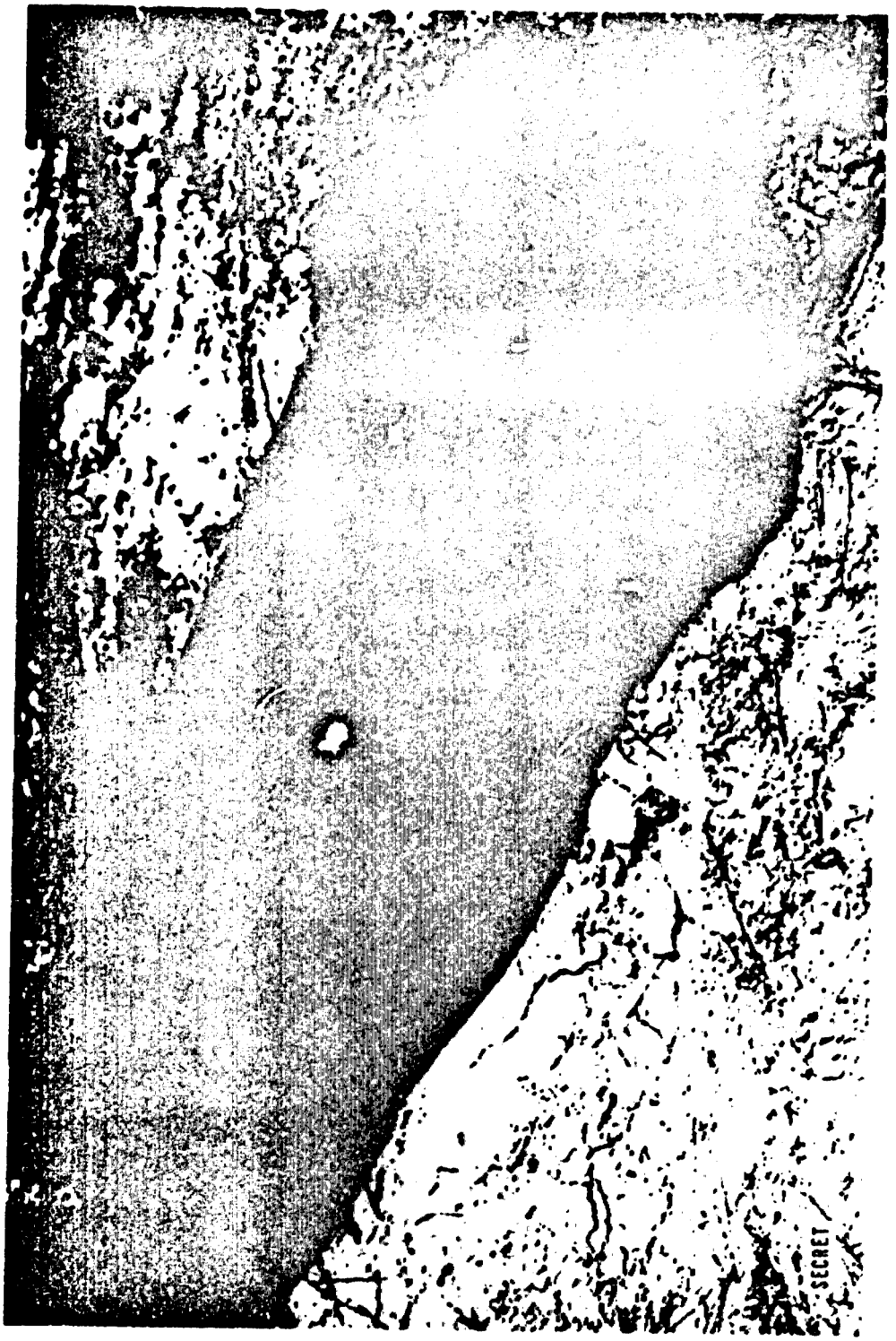


Figure VI-27. 2.75-In. Rocket and Shipping Containers Damaged on Mission 22.

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Figure VI-28. Damaged (1) 2.75-In Rocket Motors and (2) 2.75-In Rocket Warheads. Note Burn Effects on Motors.

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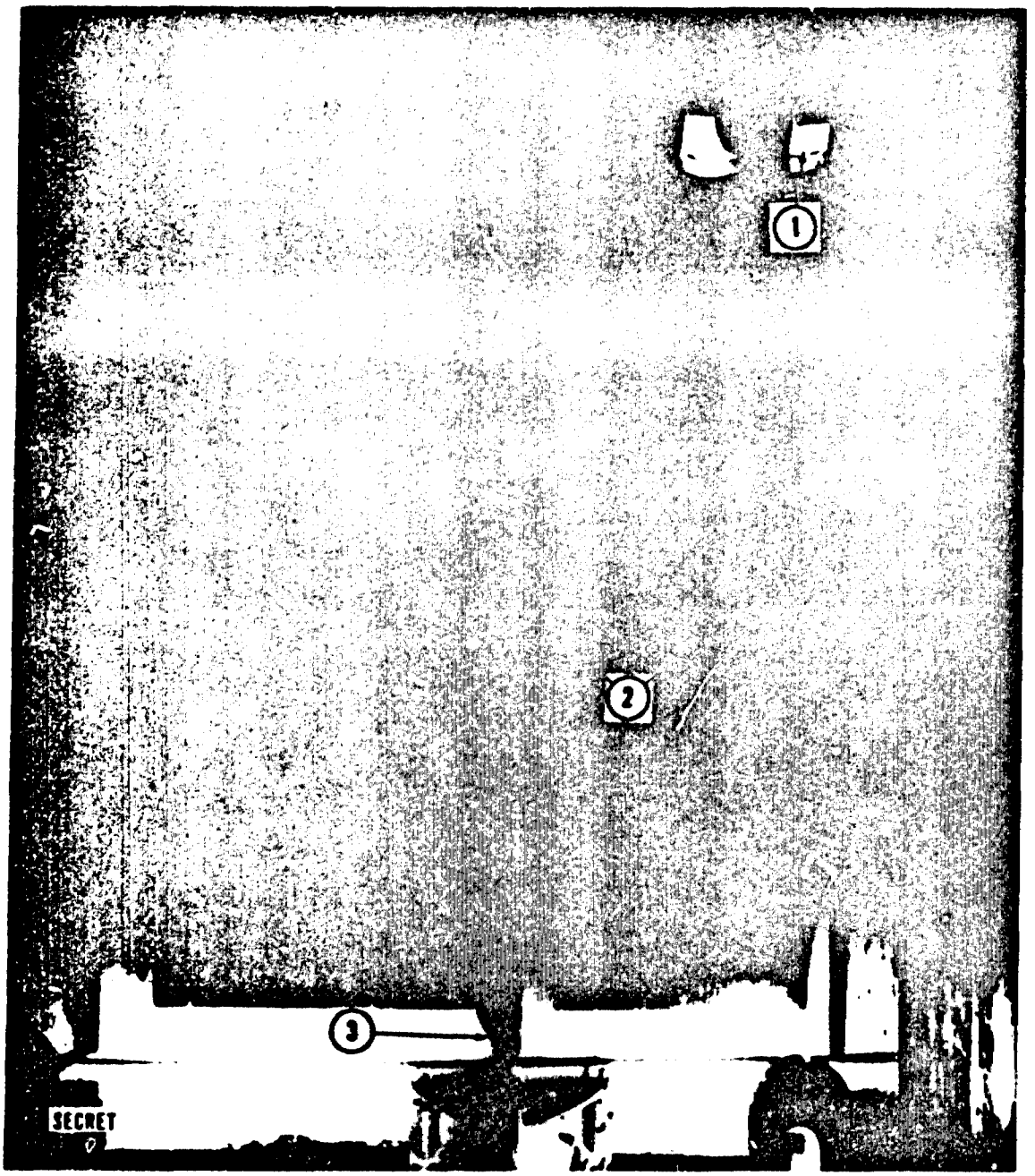


Figure VI-29. Simulated Radar Van Damaged on Mission 22. (1) Direct Hits, (2) Fragment Penetrations, and (3) Damaged Manikin.

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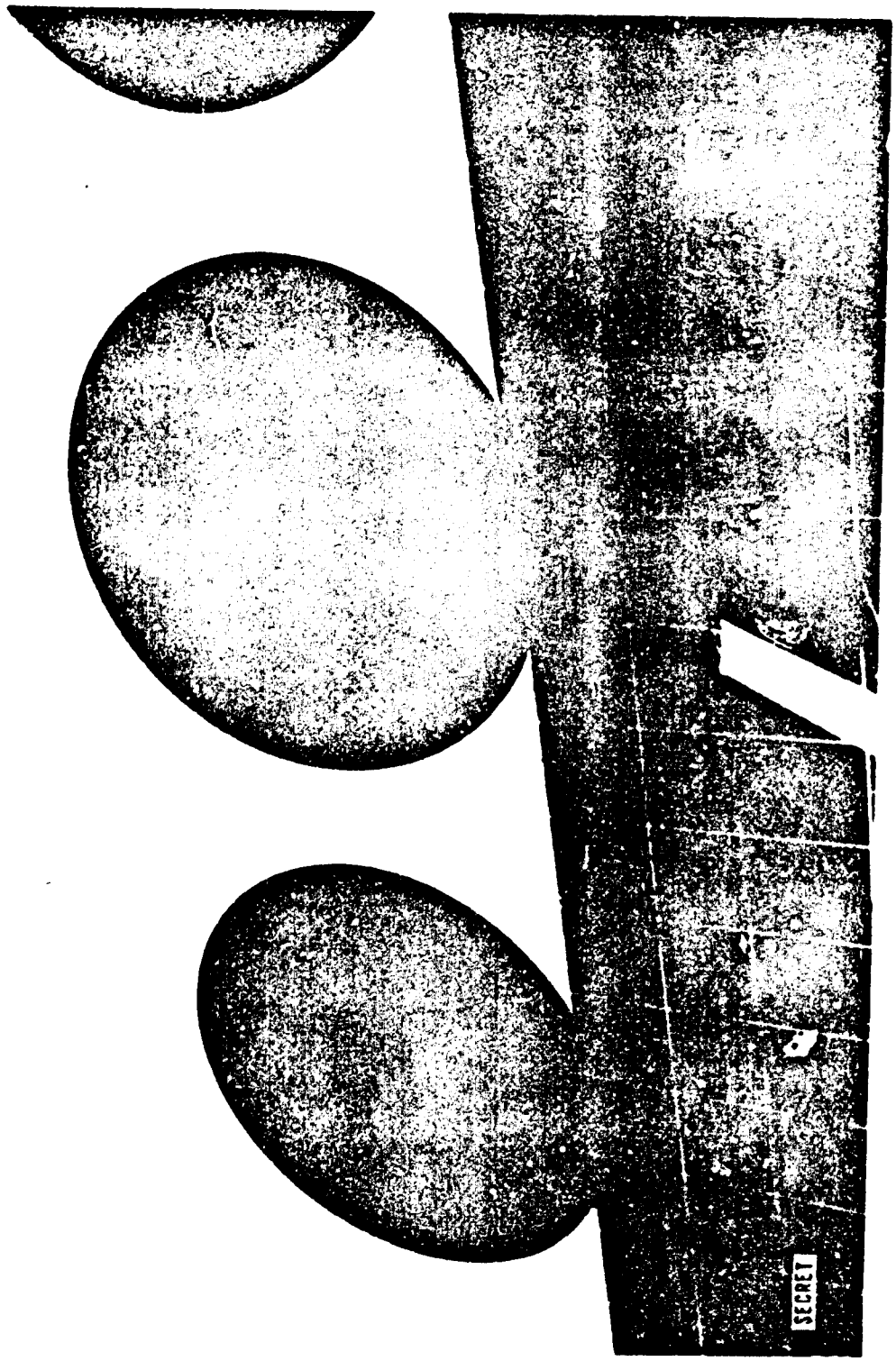


Figure VI-[illegible]. Simulated Radar Antennas on Simulated Radar Van Damaged on Mission 22.

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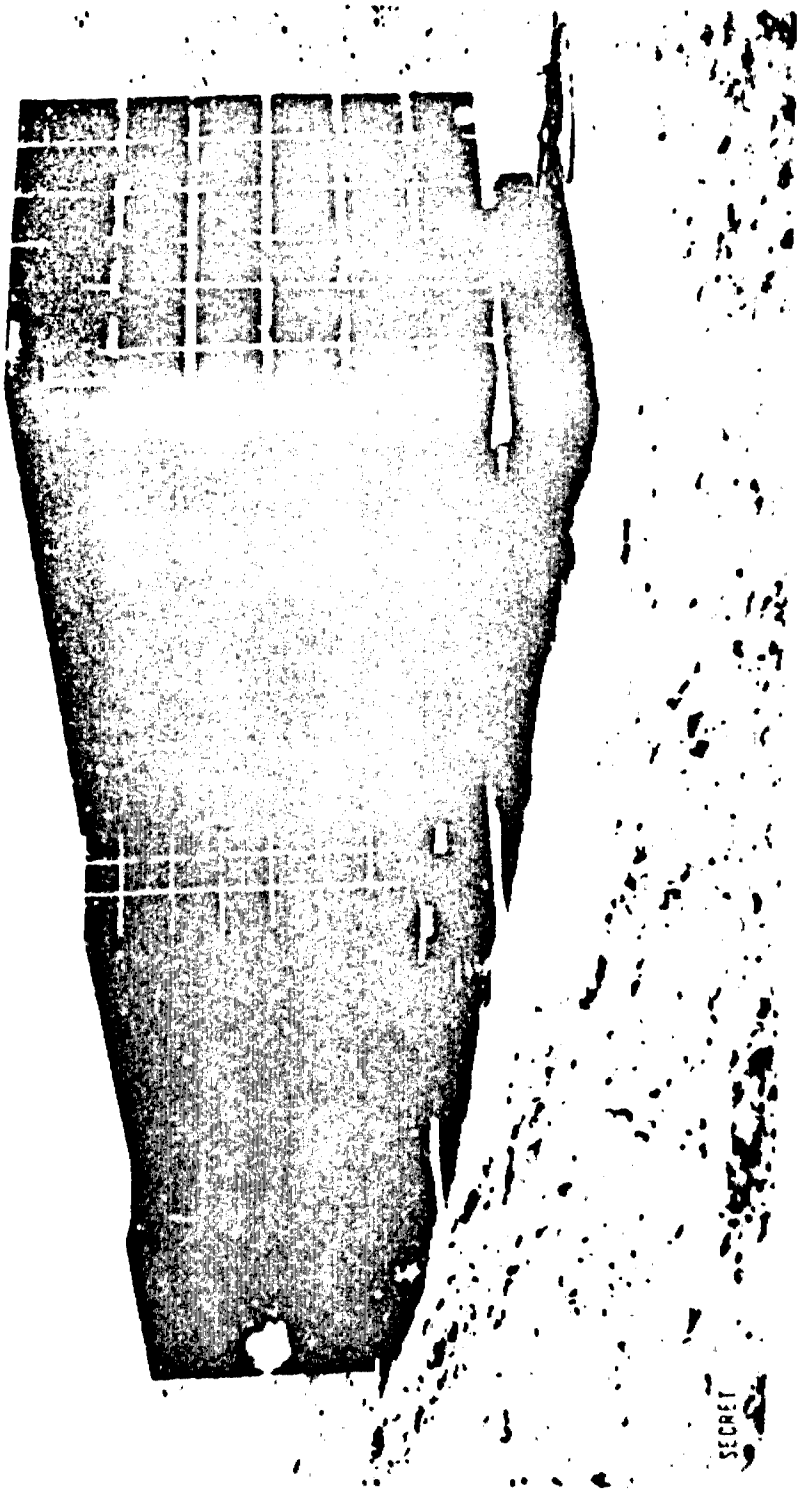


Figure 17-1 Simulated Power Plot Program on Mission 22.

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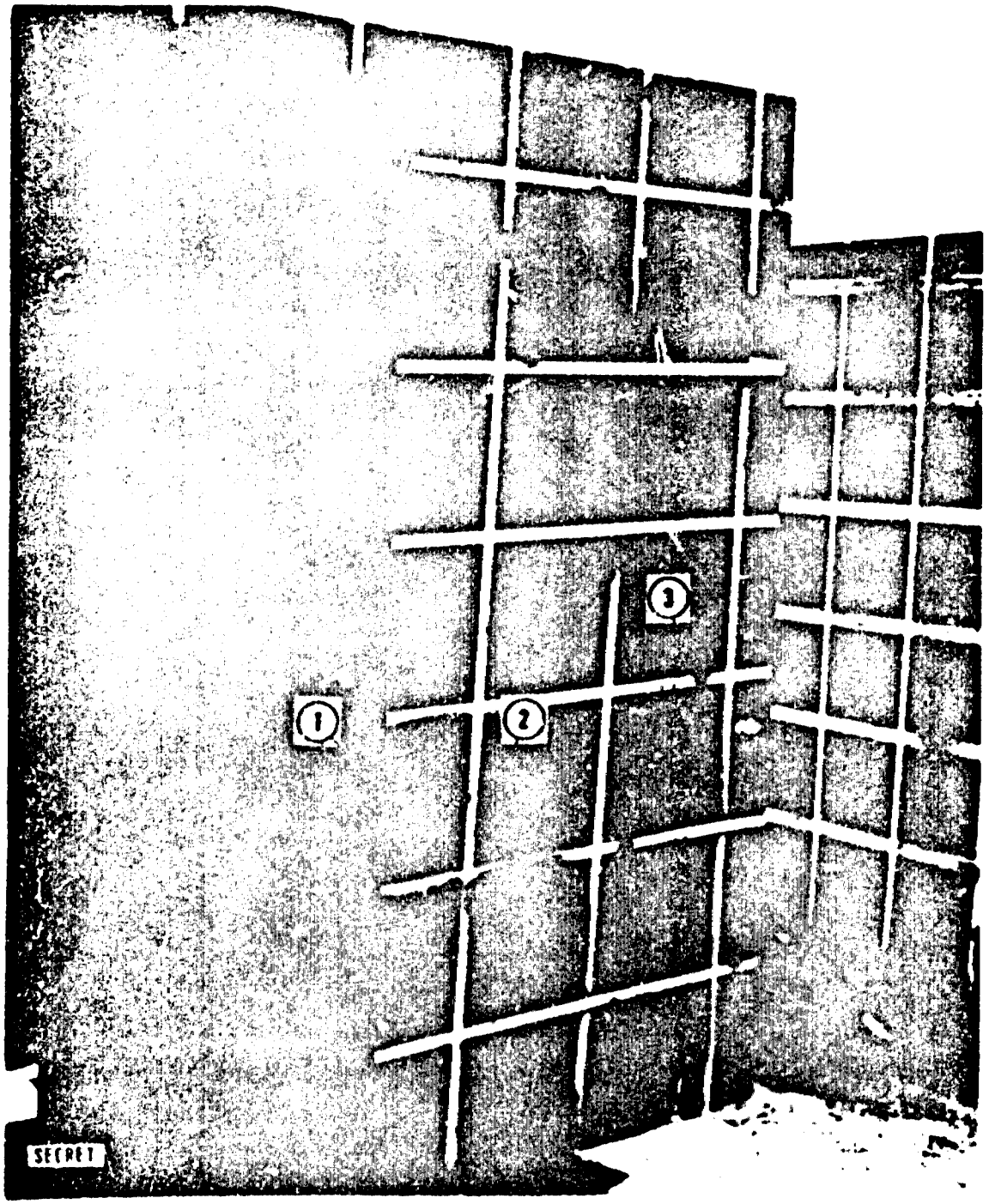


Figure VI-42. Close-up View of Fragment Hits and Penetrations on the Side of a Simulated Van Inflicted on Mission 22. (1) Indentation From Fragment Hit (2) Partial Fragment Penetration, and (3) Hole From Complete Fragment Penetration.

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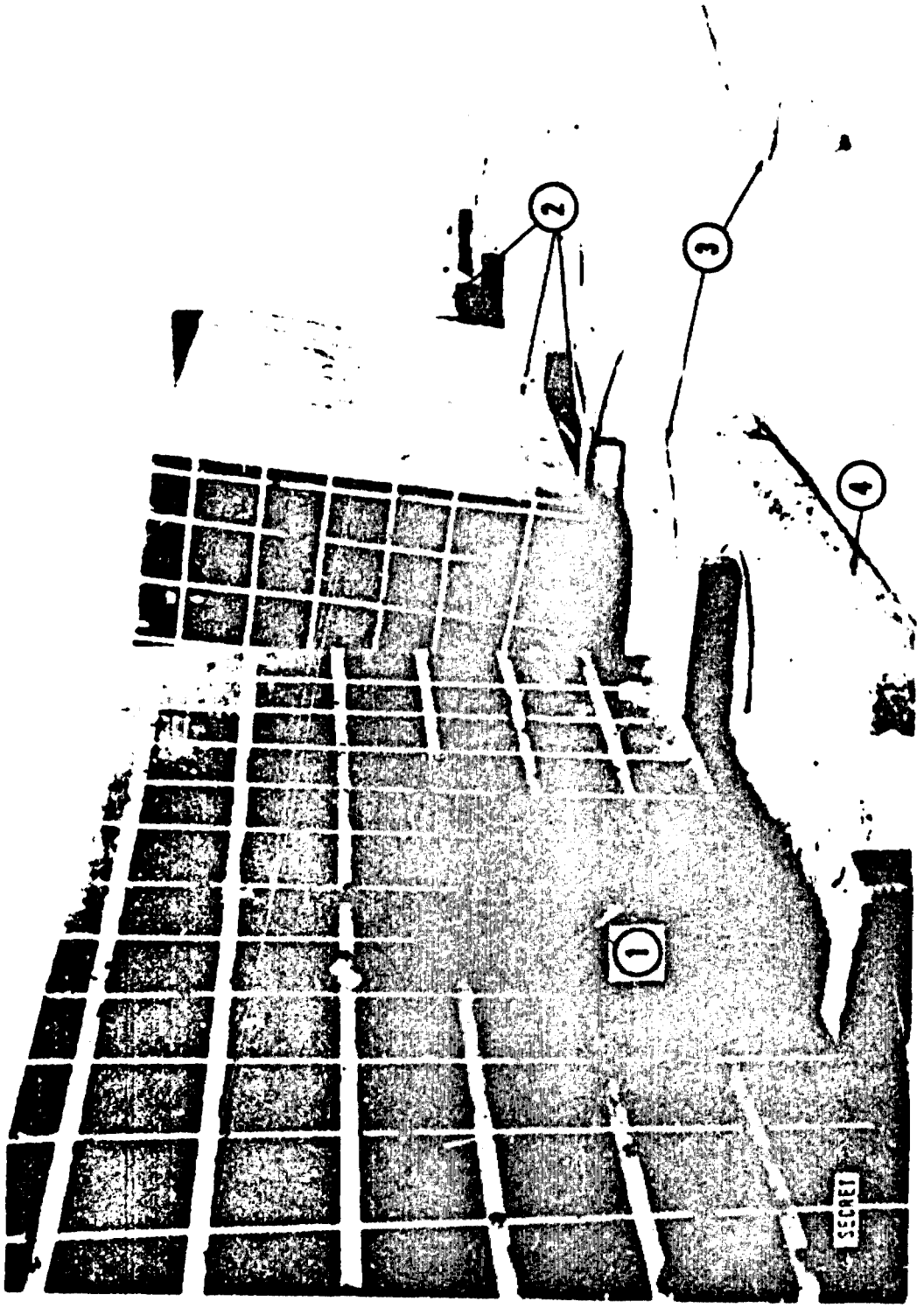


Figure VI-22. Simulated Power Vans Damaged on Mission 22, Pass 2. (1) Direct Hit, (2) Blast Effects, (3) Damaged Cables, and (4) Fragment Damage From a Near Miss.

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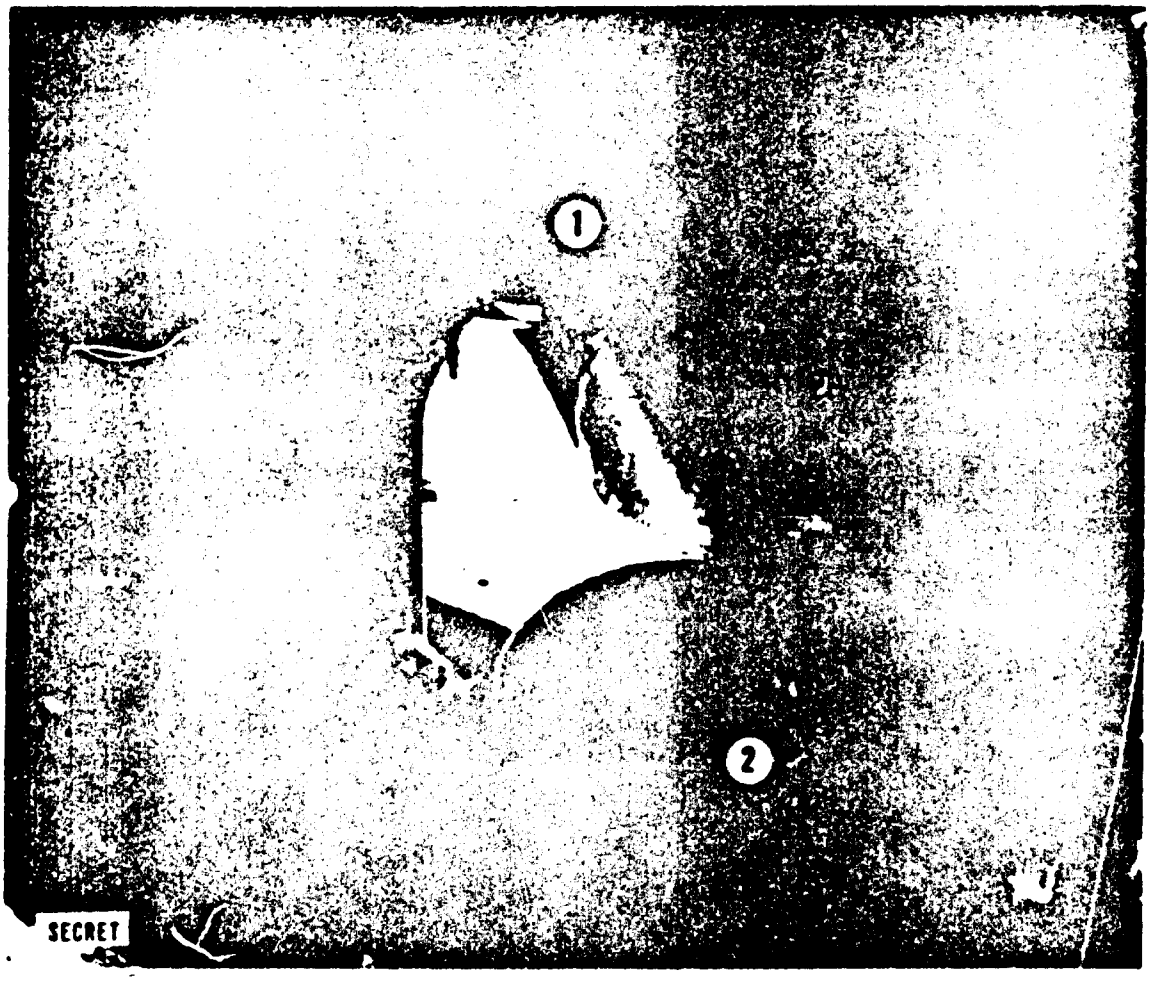


Figure VI-24. View From Inside the Simulated Power Van Showing Effects of a Direct Hit. (1) Gouges Caused by Fragments and (2) Deformation Caused by Partial Penetrations.

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Figure VI-35. Exterior View of Metal Shop Van Damaged Extensively on Mission 22. Effects of One Direct Hit (Arrow).

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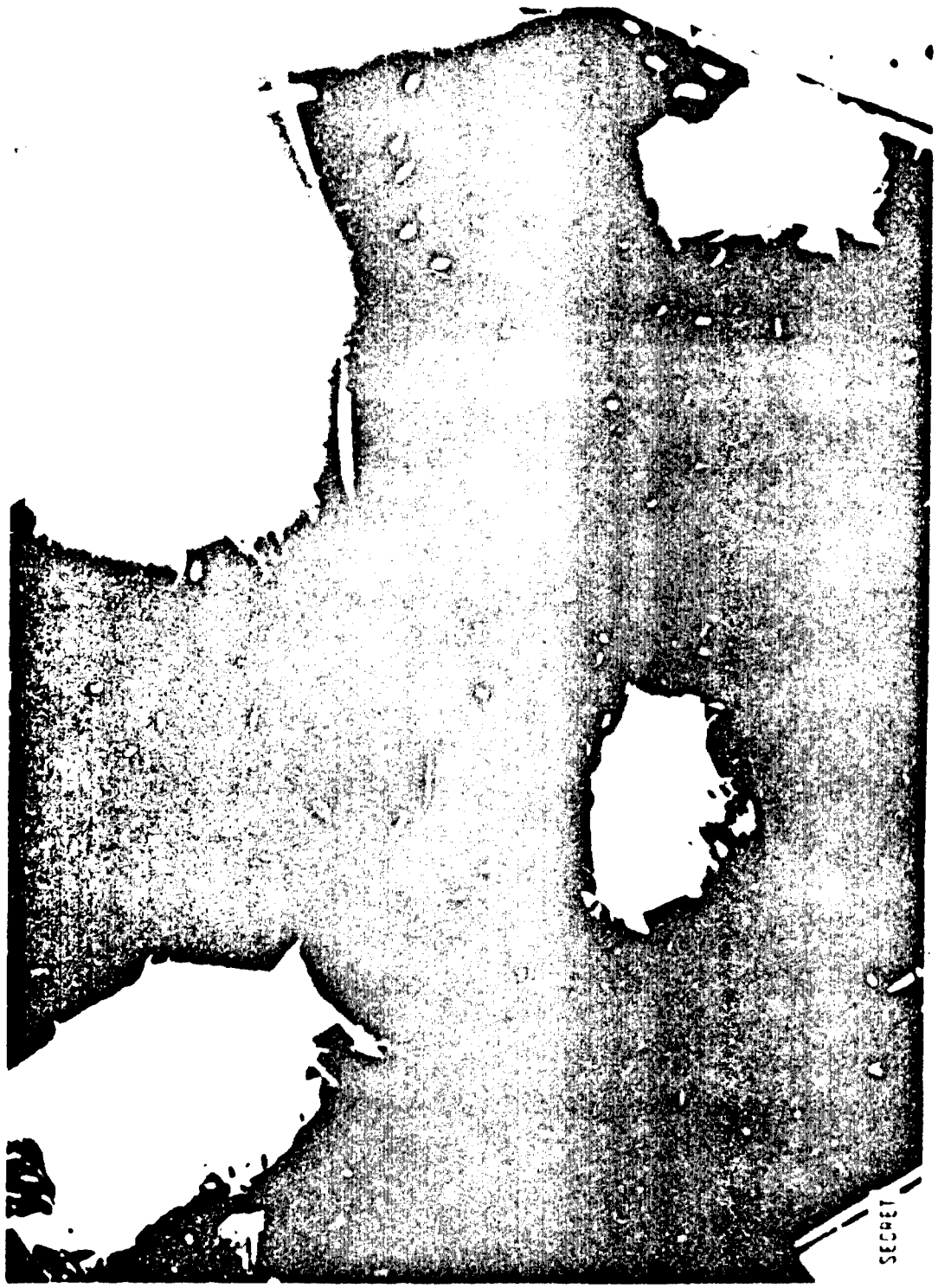


Figure VI-[illegible]. Interior View of Damage to Metal Shop Van Caused by Direct Hits and Fragments.

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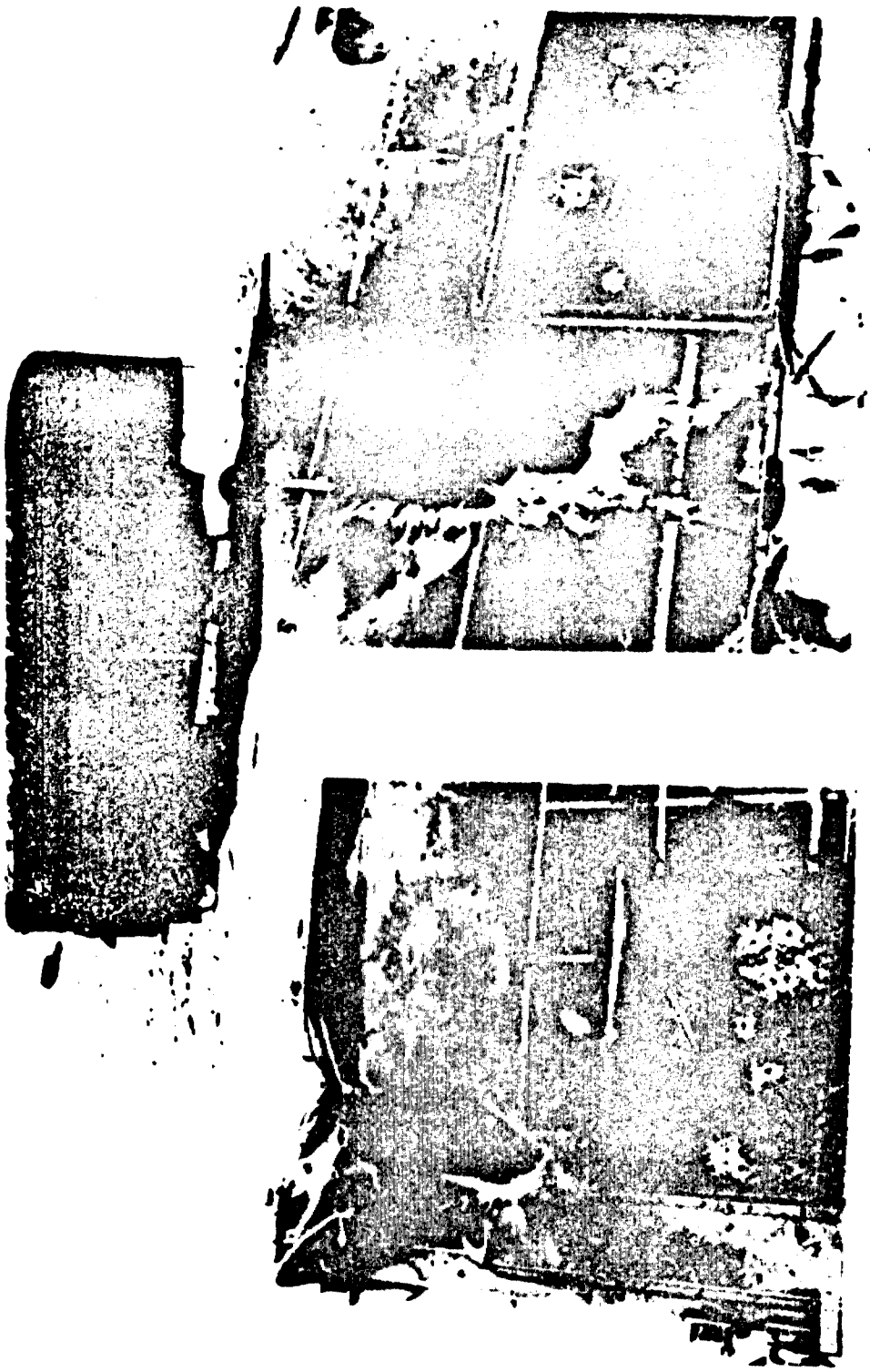


Figure VI-[illegible]. Interior View of Ship Van Damage on Mission 22.

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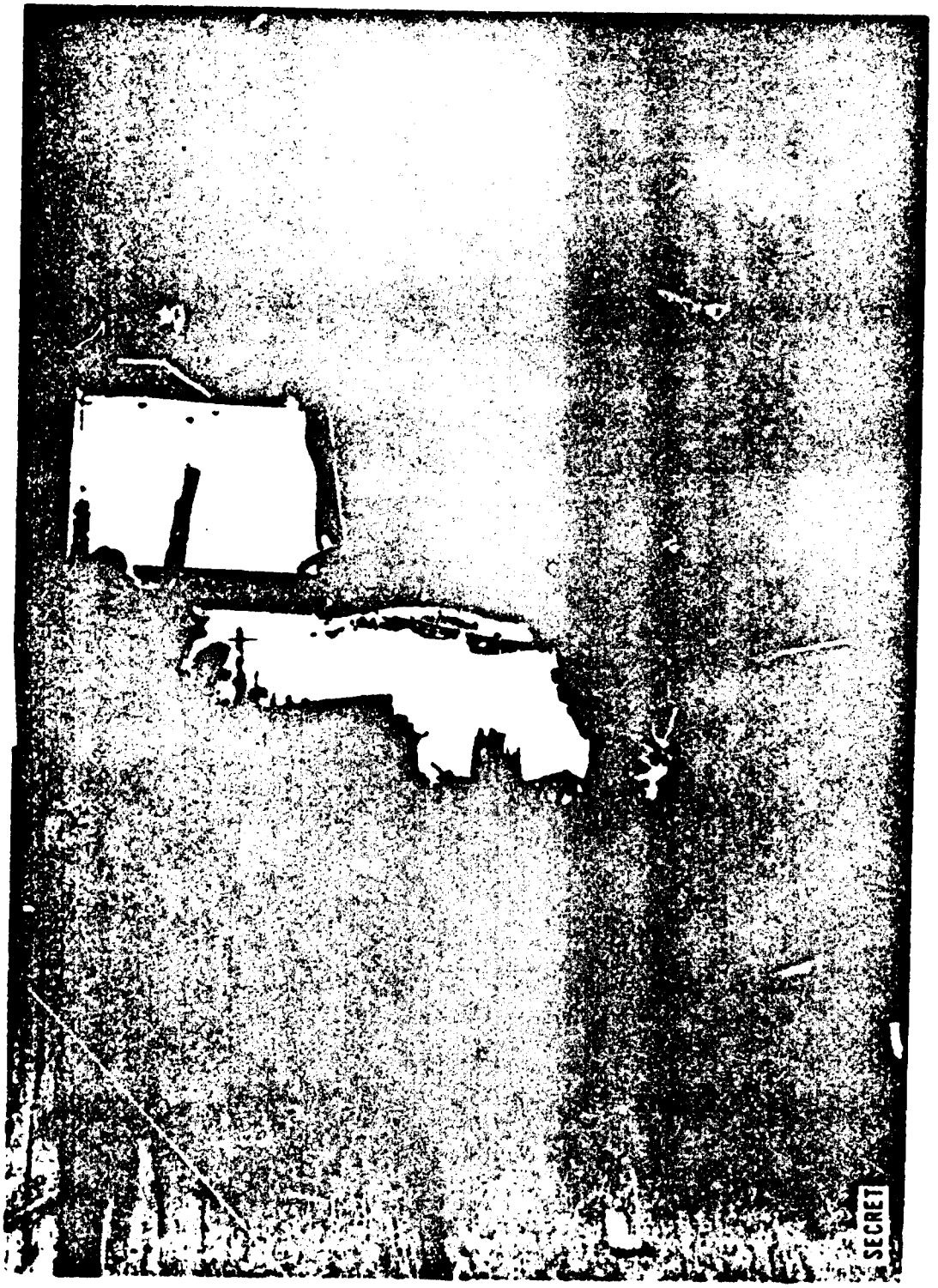


Figure VI-[illegible]. Interior View of Damage to Shop Van Damaged on Mission 22.

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Figure VI-7. Interior View of Damage to Ship Van Damaged on Mission 22.

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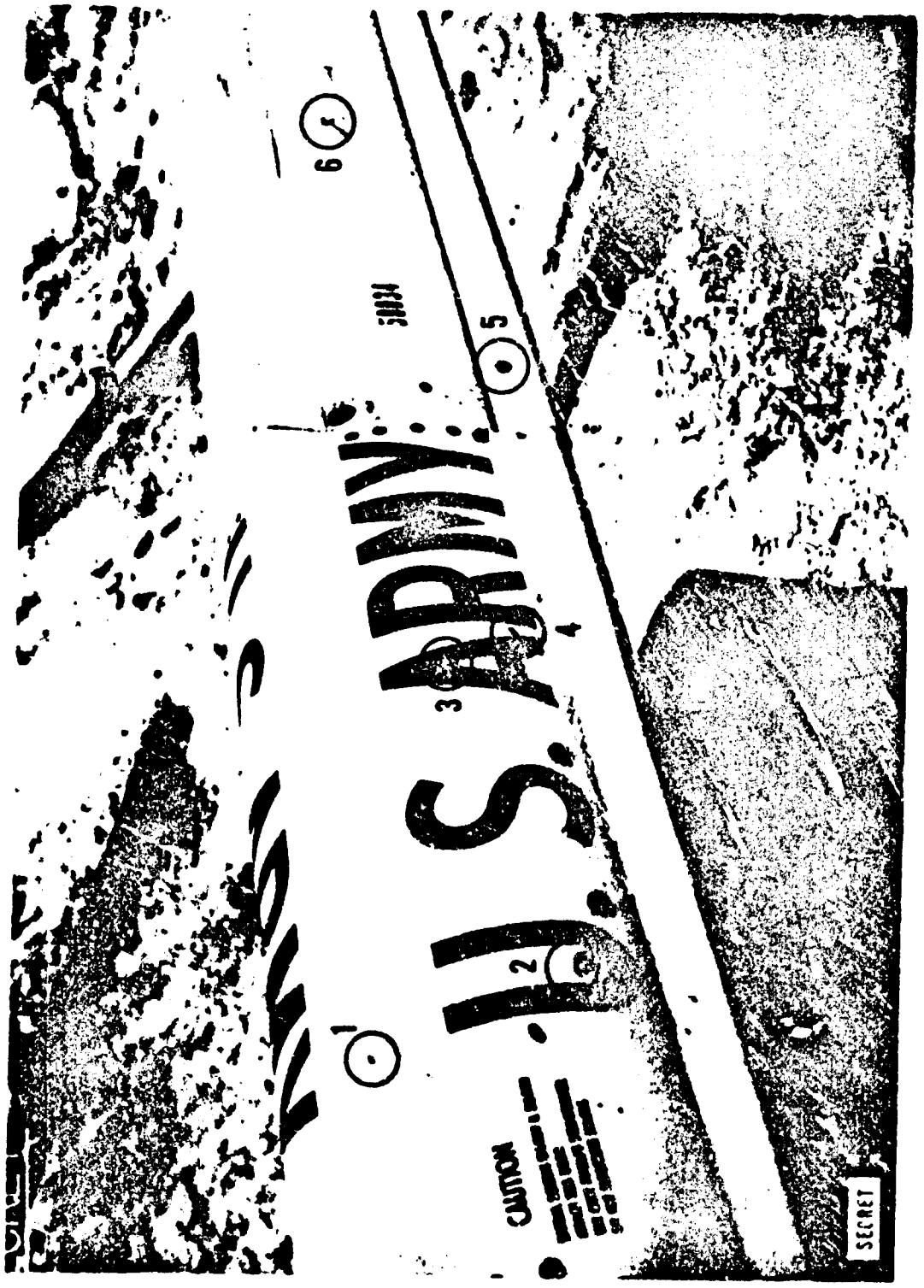


Figure VI-[illegible]. Nike-Ajax Missile (1), (2), (3), (4), and (5) Show Damage Inflicted on Mission 23, Pass 2; (4) Shows Damage Inflicted on Mission [illegible].

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Figure VI-41. Revetted Simulated SA-2 Missile Site. (1) Blast Damage to Camouflage and (2) Fragment Damage to Missile. Damage Inflicted on Mission 22.

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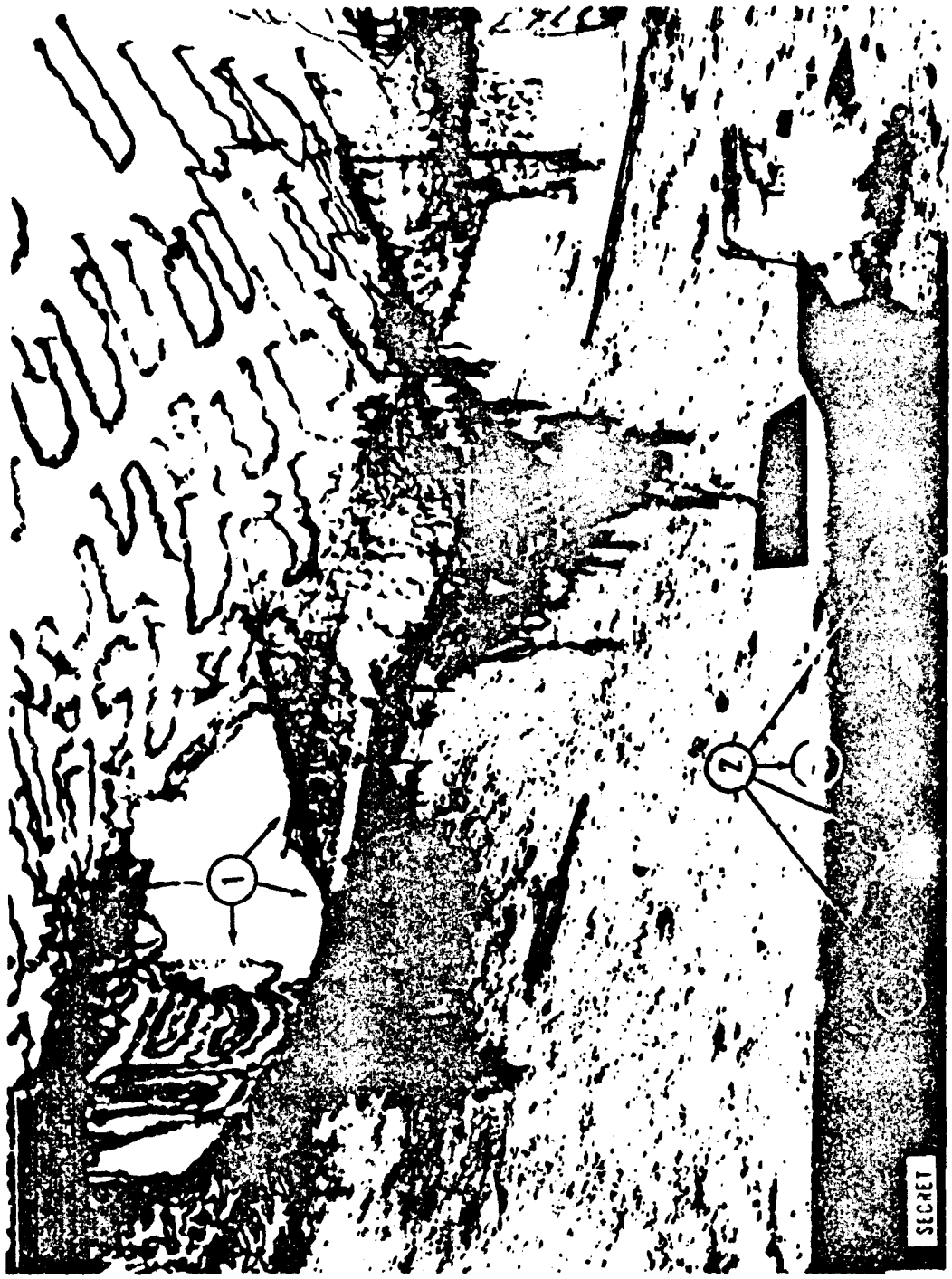


Figure VI-42. Another View of Damage Inflicted on Mission 22. Damage to Camouflage Netting and (2) Simulated SA-2 Missile.

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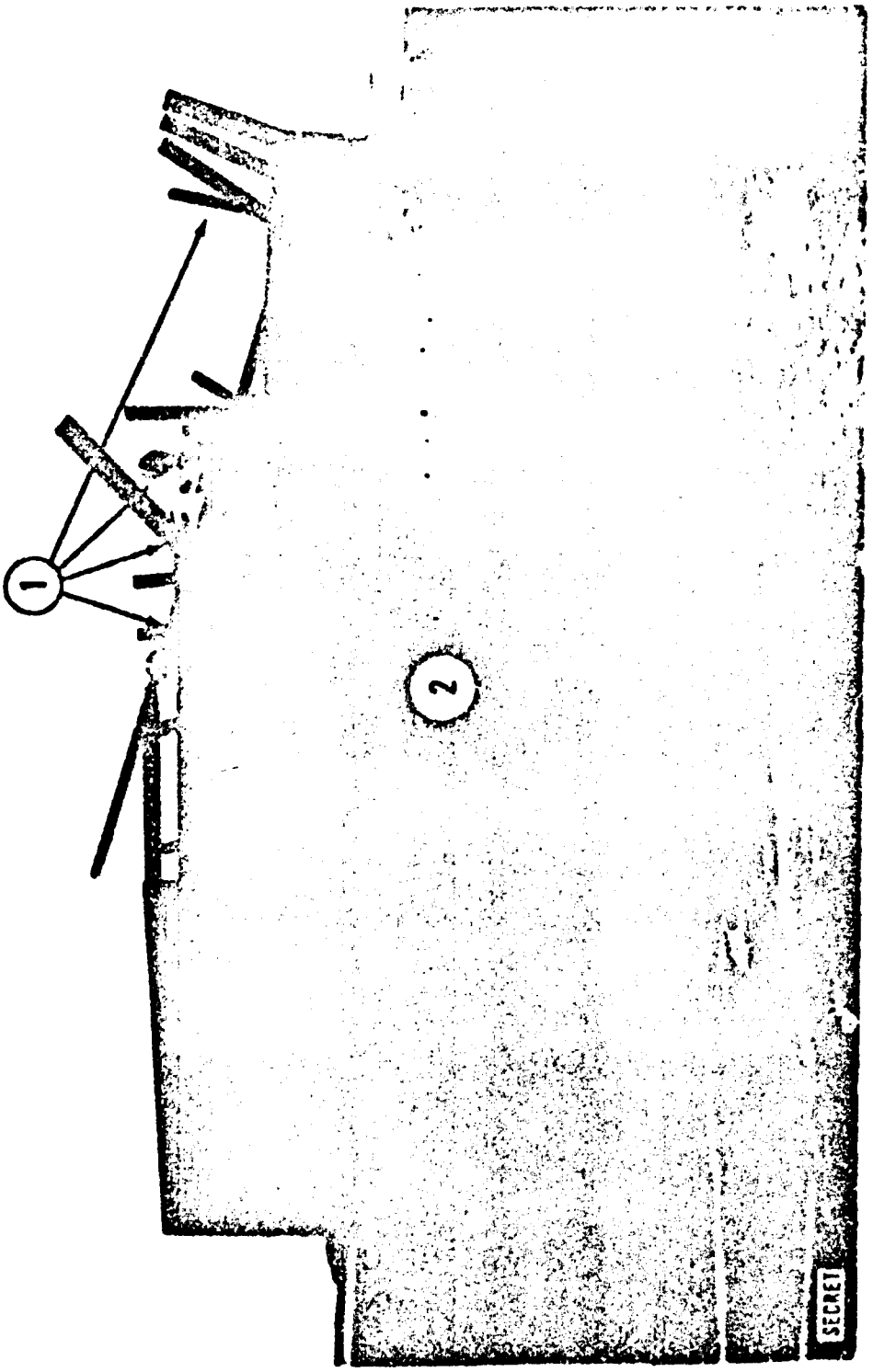


Figure VI-3. Damage to Simulated Jet Inflicted on Mission 2, Page 2. (1) Incipient Fracture Damage and (2) Effects of Direct Hits.

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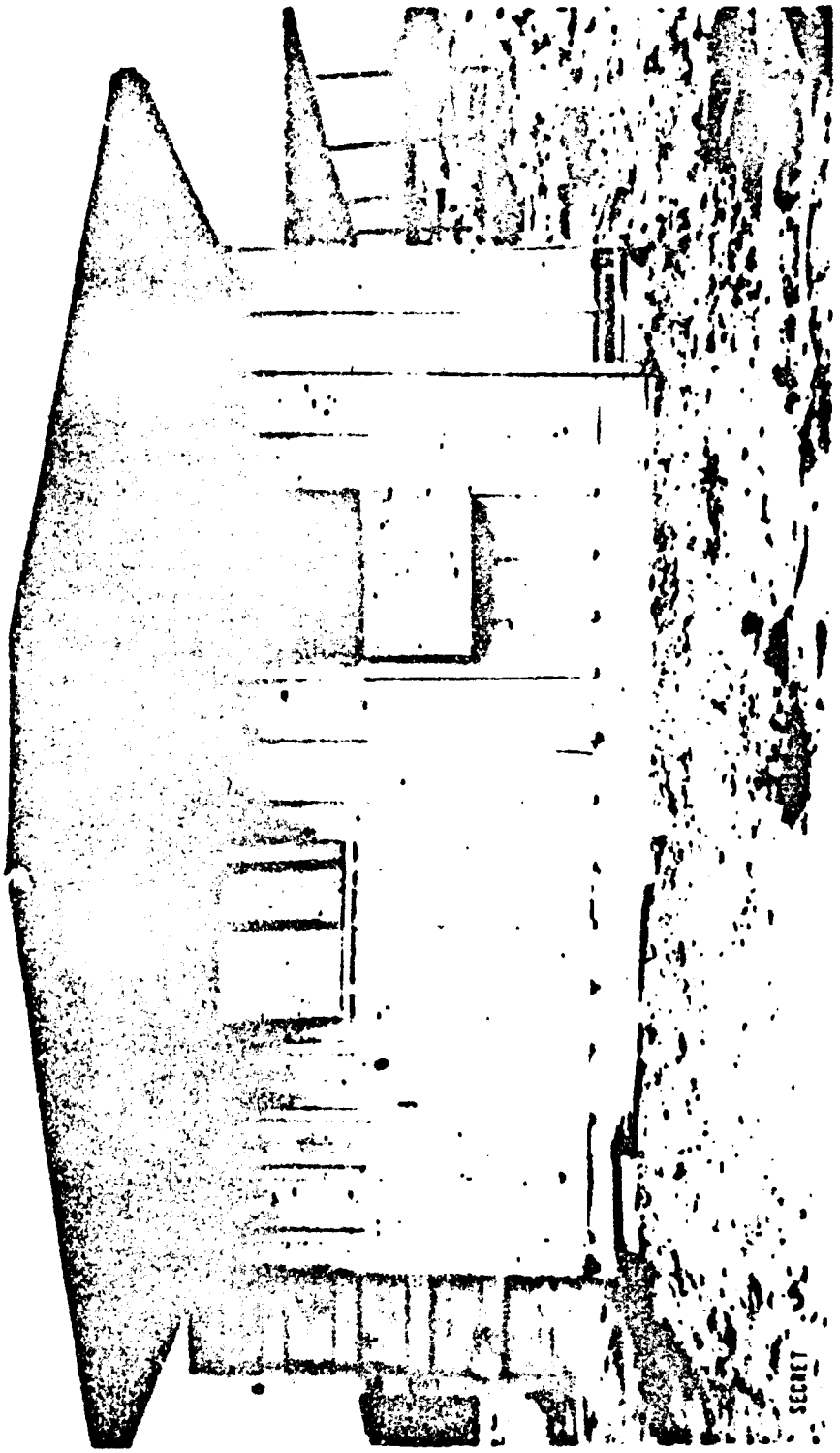


Figure VI-44. Fragment Damage Inflicted on Simulated Barracks on Mission 22.

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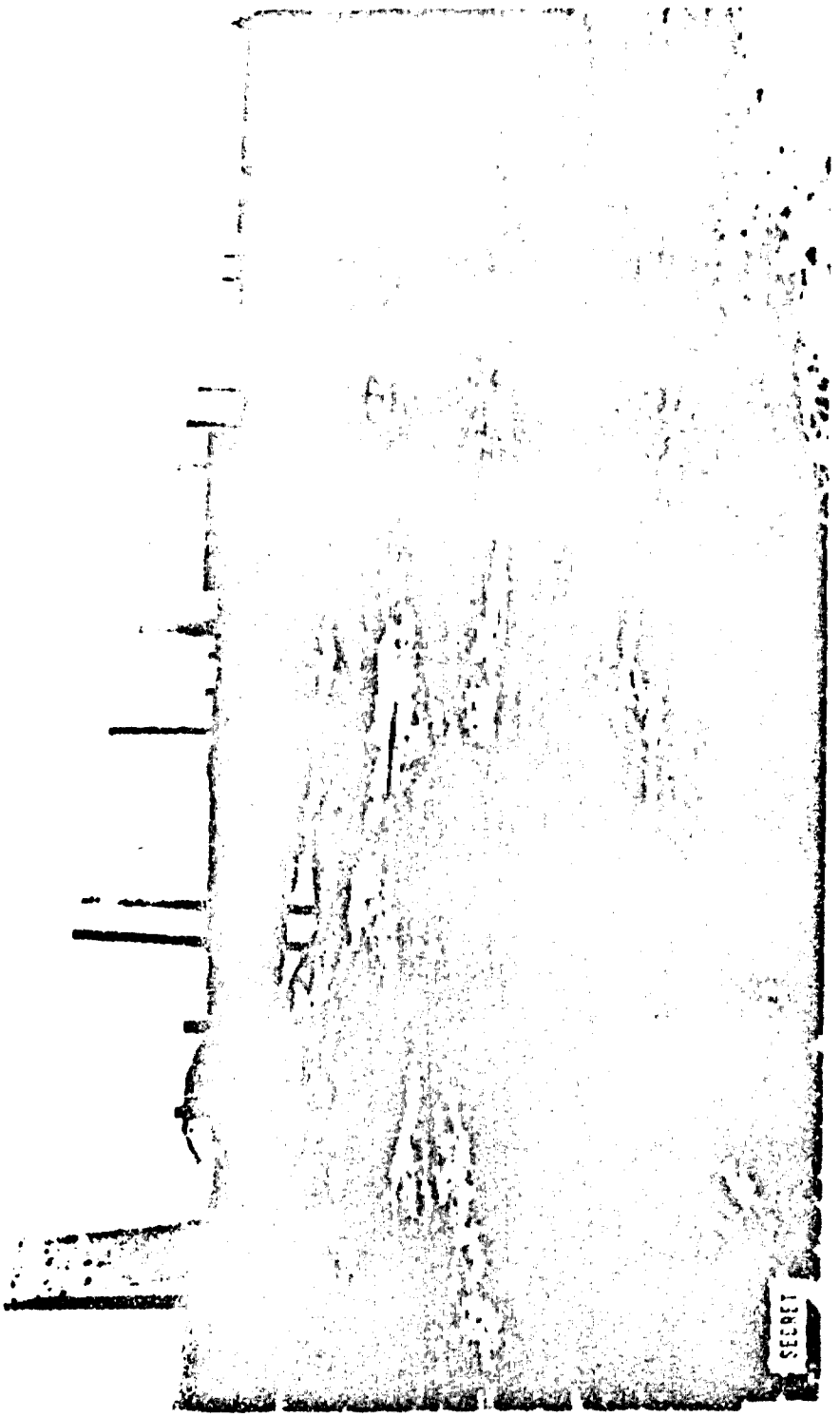


Figure VI-[illegible]. Witness panel at North End of the Area, Destroyed on Mission 22.

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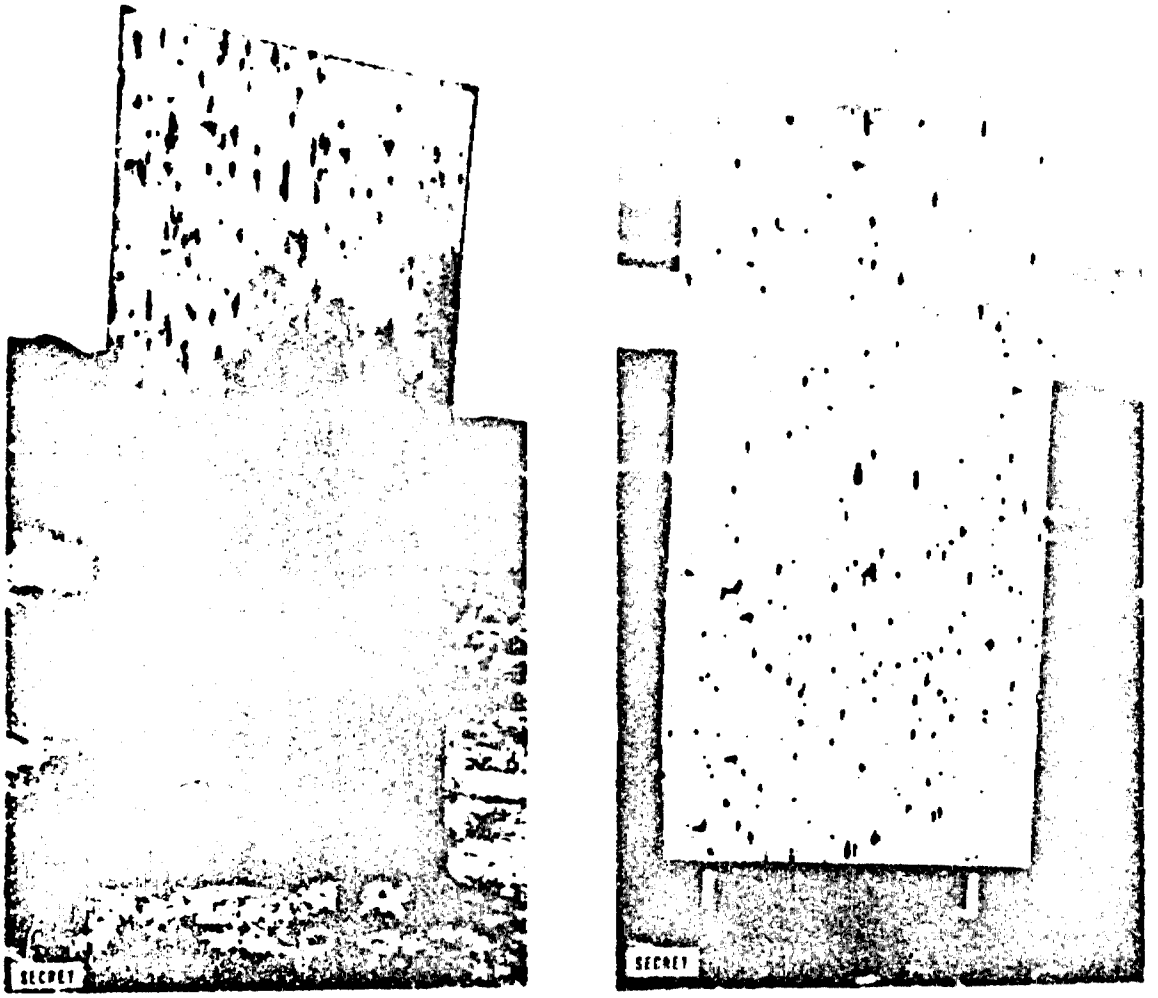


Figure VI-b-c. Typical Damage Inflicted on Witness Panels Near the Impact Pattern on Mission 22.

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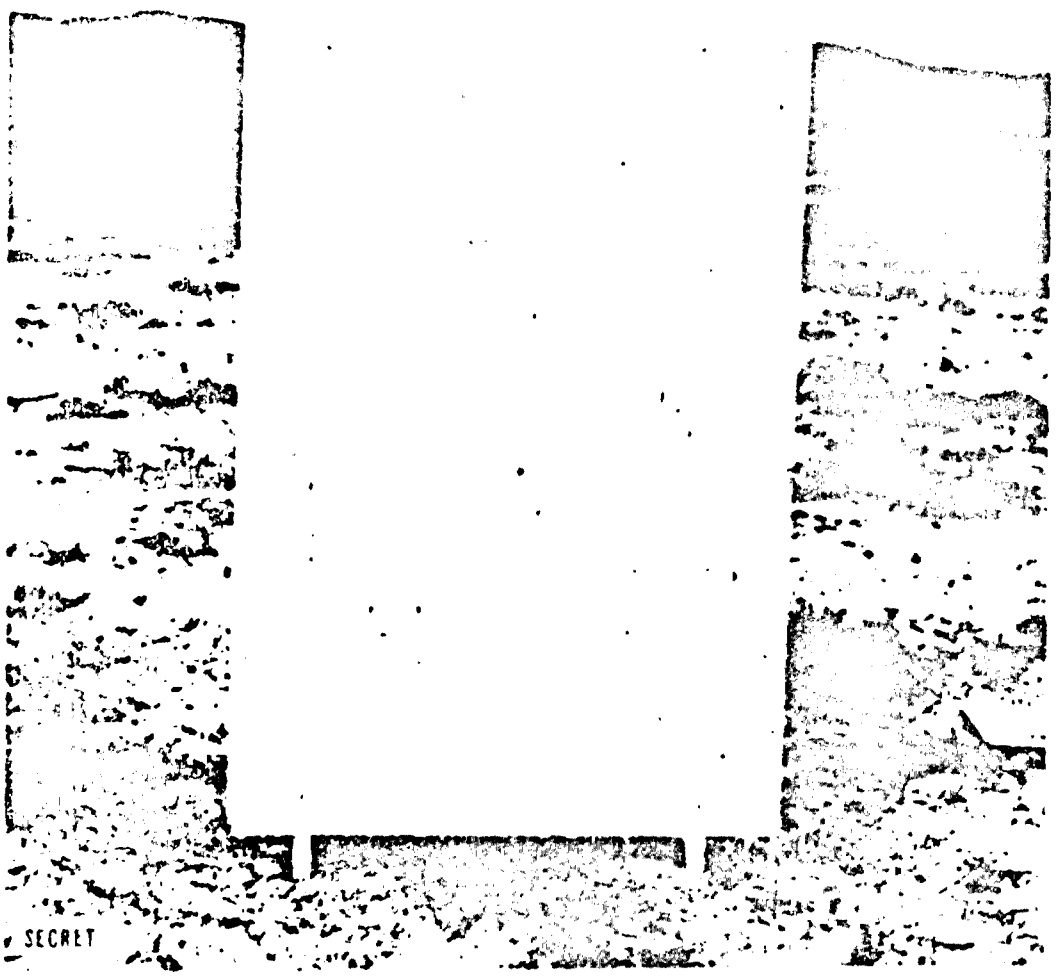


Figure VI-47. Typical Damage Inflicted on Witness Panels on Mission 22, Pass 2.

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Figure VI-. . . [illegible] on Mission 24.

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DOCUMENT UNCLASSIFIED JCP-I, DPG



Figure VI-9. Standing Manikin Killed in the F-[illegible] Revetment on Mission 22.

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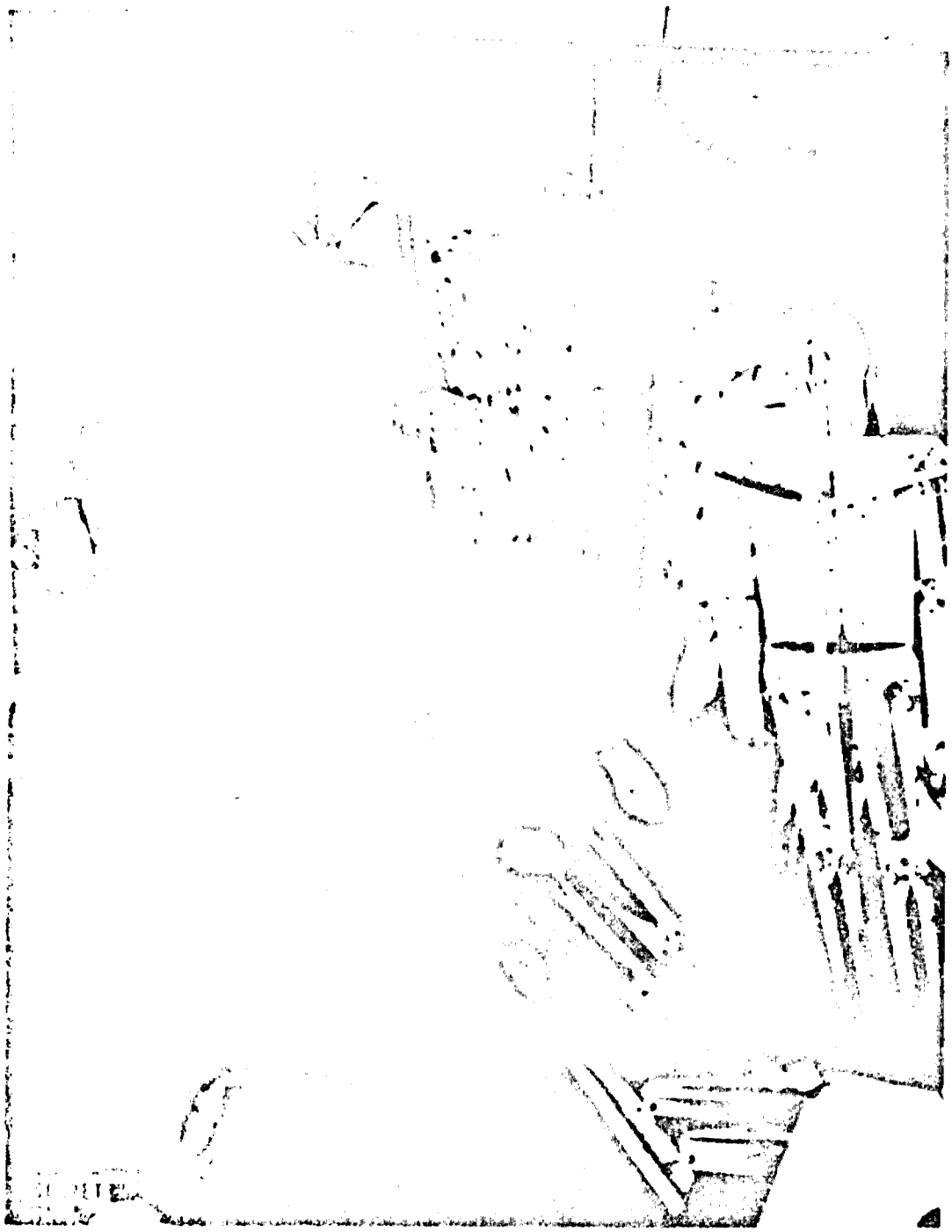


Figure VI-2. Maneuvers to Stop Van Hart or Killed on Mission 12.

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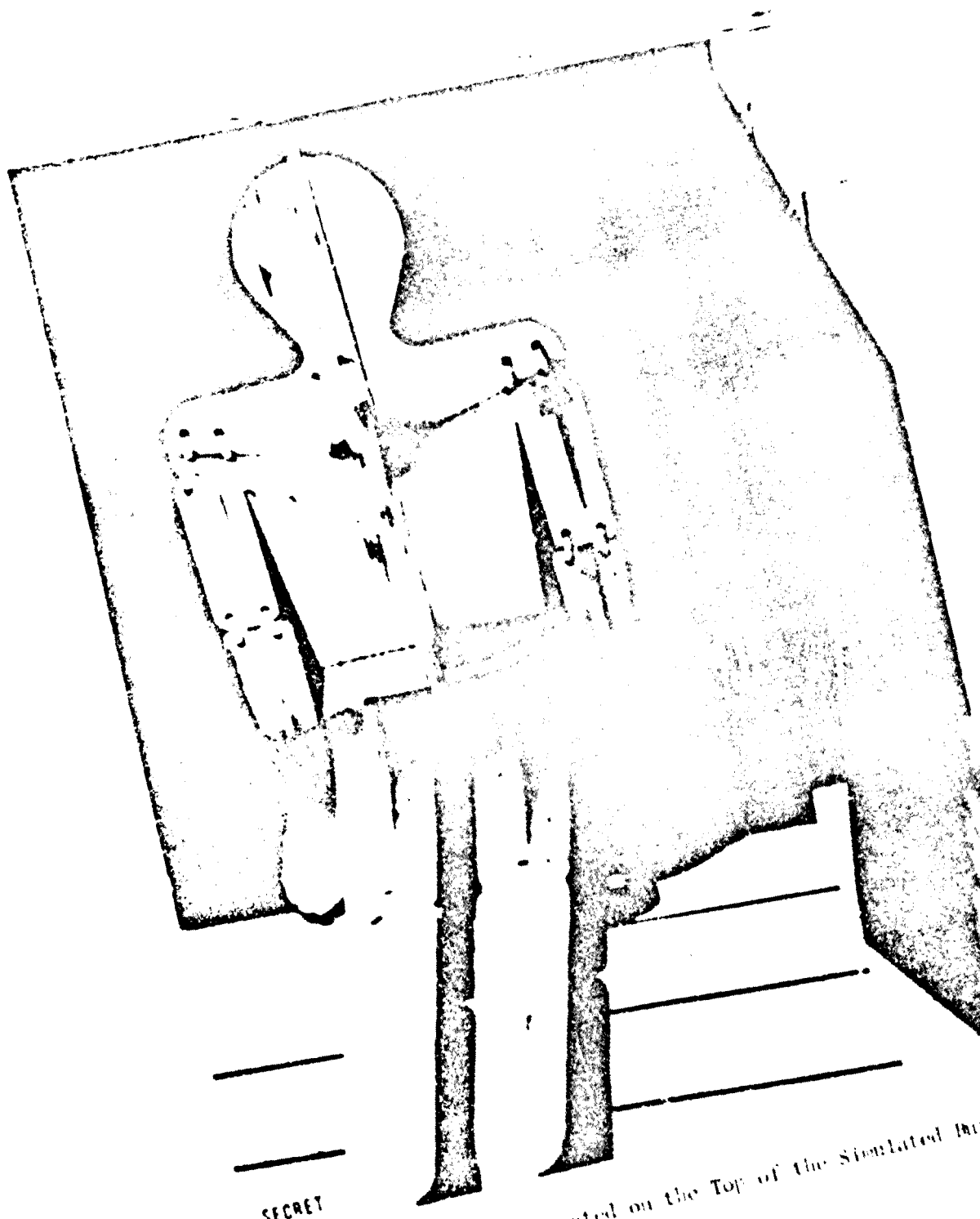


Figure VI-52. Stanislu Lowered on the Top of the Simulated Building Injured on Mission [illegible], Page [illegible].

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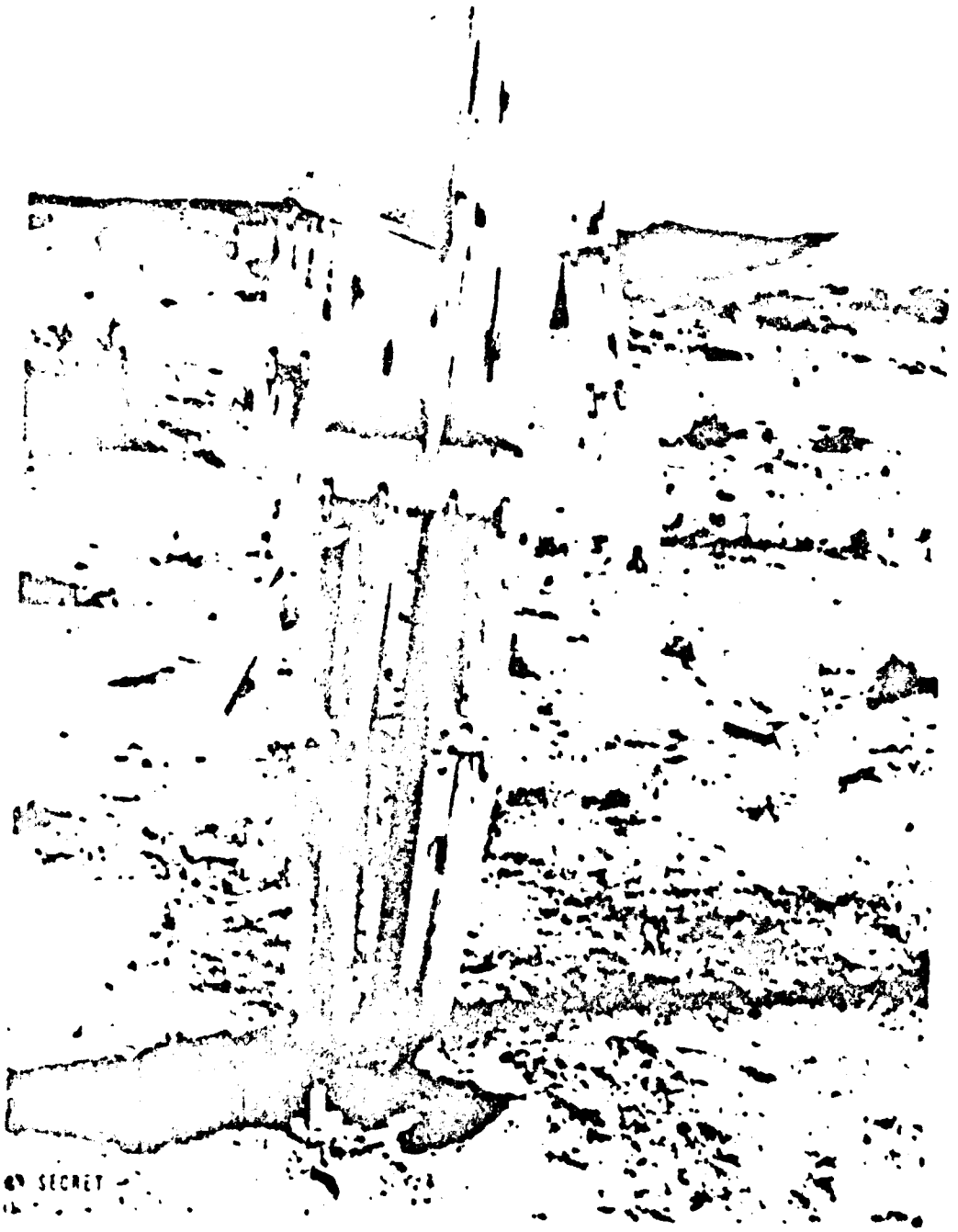


Figure VI-2. Exposed, Standing Manikin Damaged on Mission 22.

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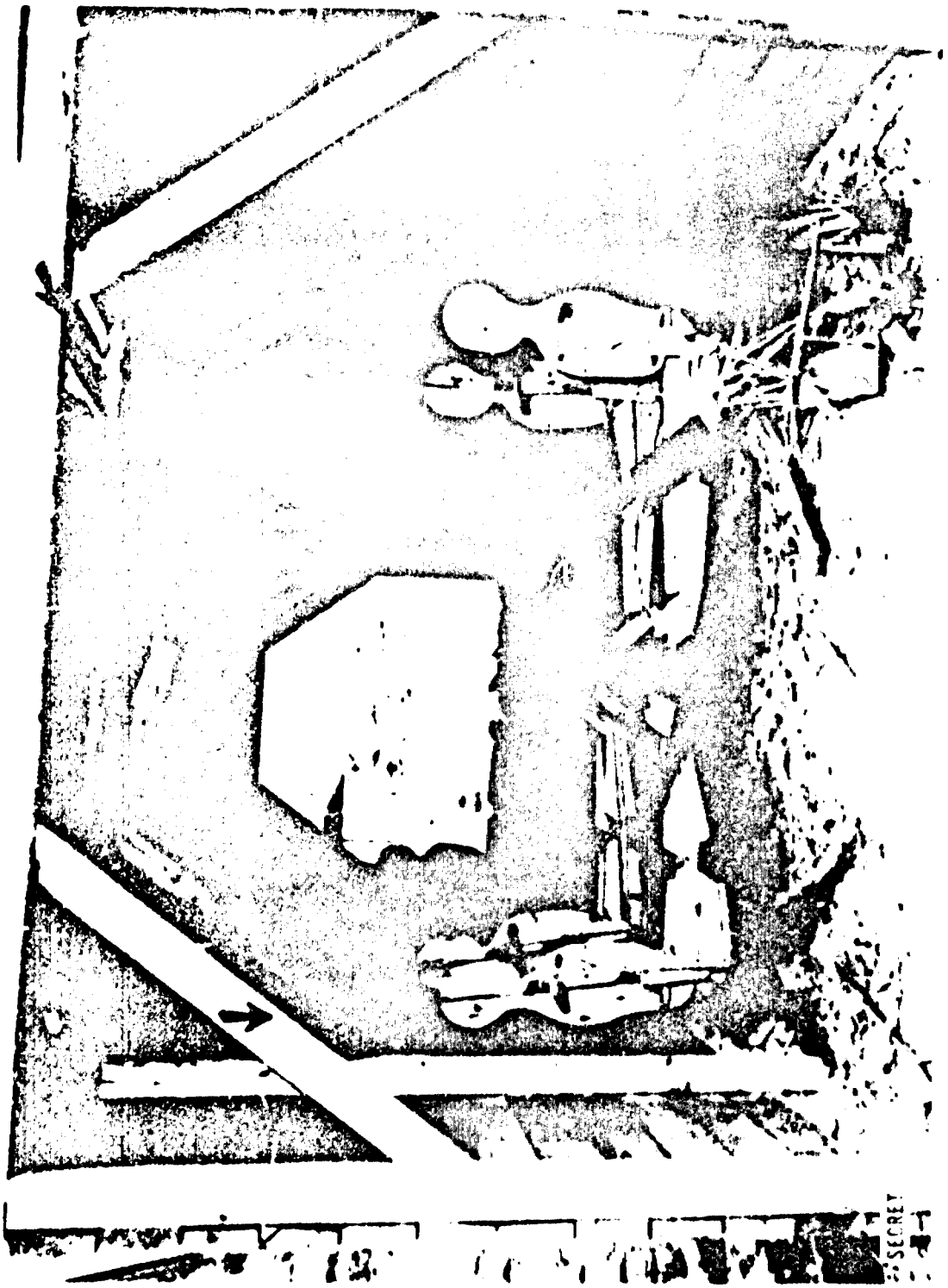


Figure VI-5a. Mannikins in Simulated Building Hurt or Killed on Mission 27, Pass 2. Arrows Point to Internal Effects of Direct Hits.

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APPENDIX VII

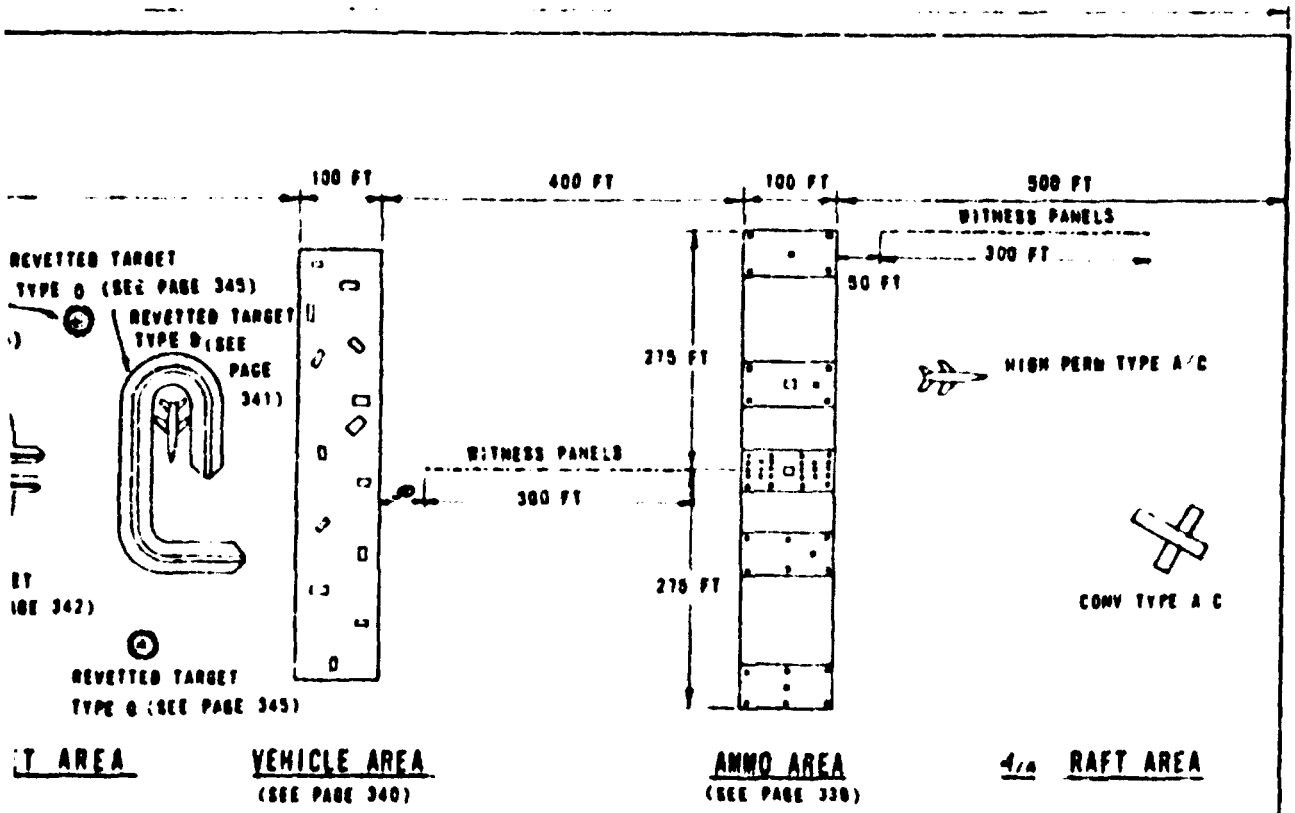
DETAILED DRAWINGS OF COMPOSITE TARGET ARRAY

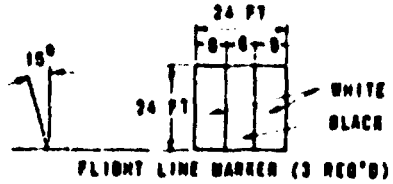
This appendix consists of detailed drawings for the composite target array constructed on the H U AF base bombing range.

The s mulated targets were designed to conform as closely as possible to the general characteristics for each type as determined from review of intelligence data available to th e Project Engineer and Mr. Martin Brown, the designer.

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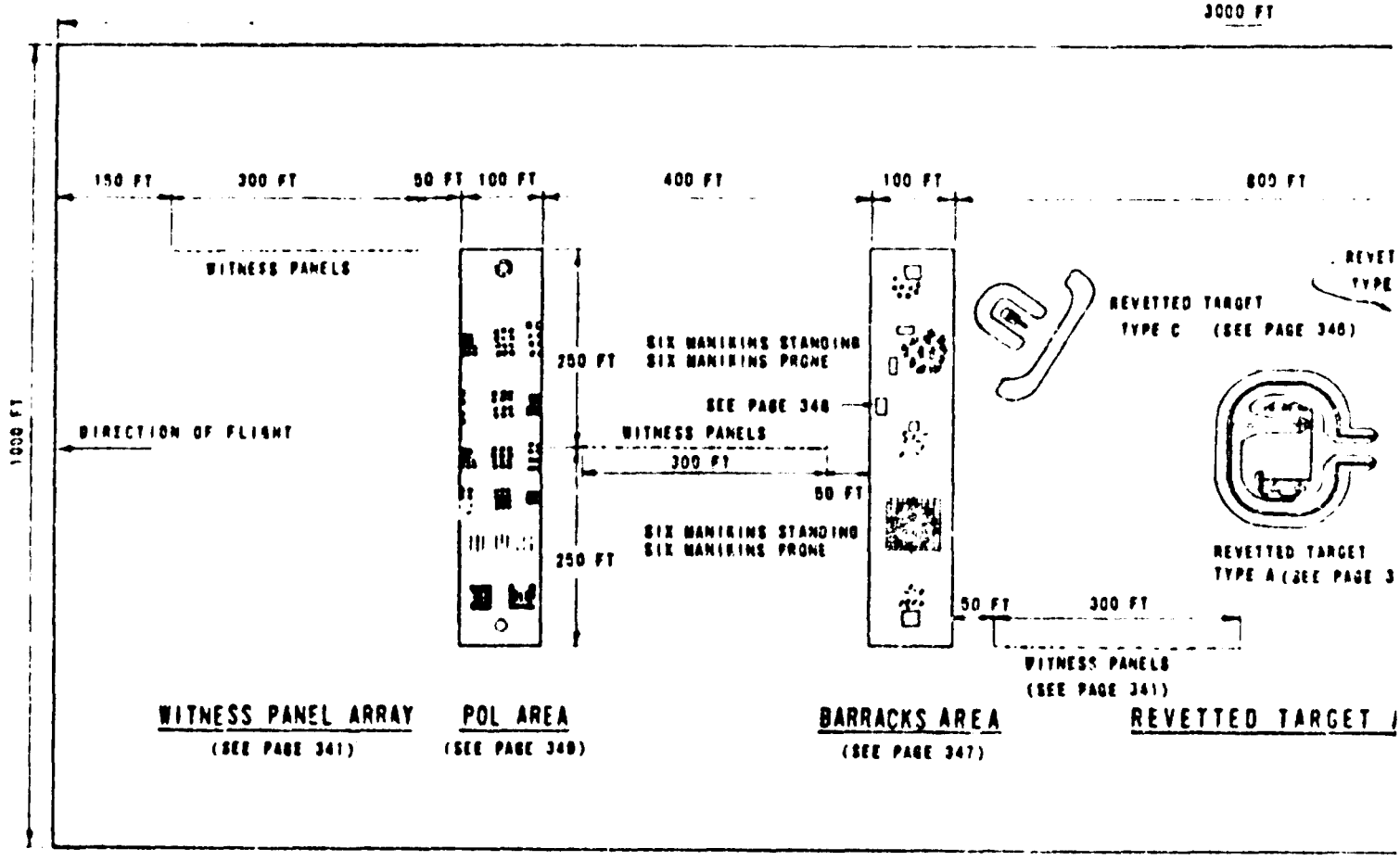
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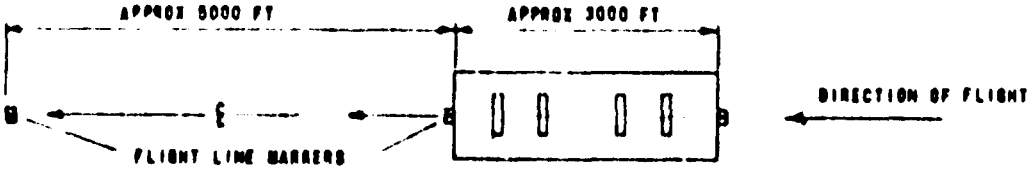




FLIGHT LINE MARKER (3 REQ'D)
INCLINE 15° FROM VERT

IUT

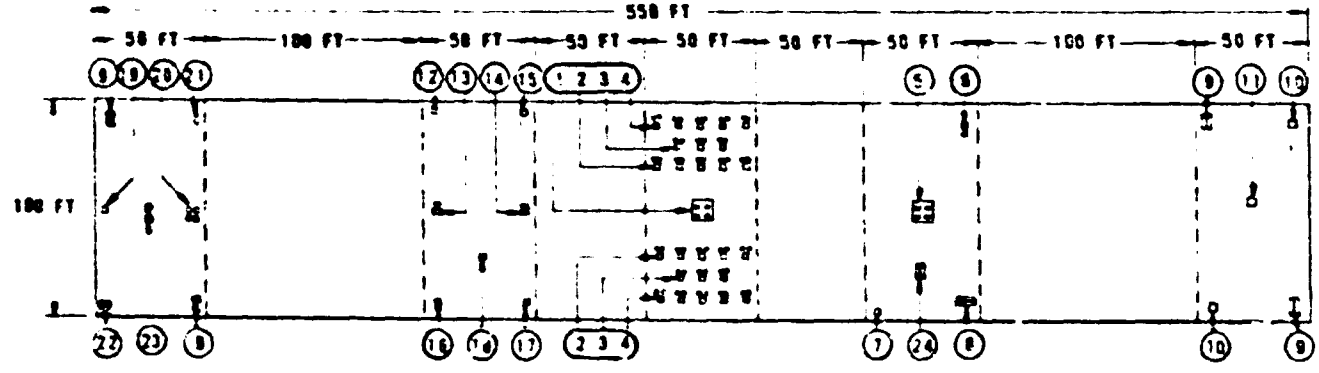




TARGET AREA

TARGET ARRAY LAYOUT

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NOTES:

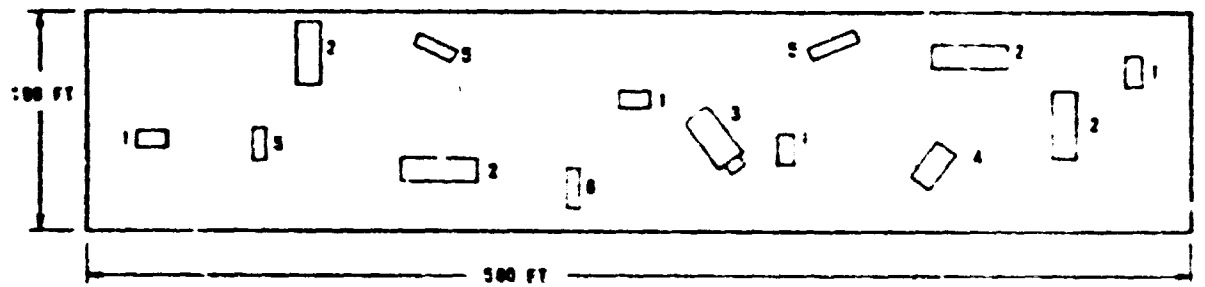
1. AMMO SHED - 2 IN. X 4 IN. STUDS, 1 IN. X 8 IN. SHEATHING (OR CANVAS COVER). 2 CASES 30 CAL BALL - 2 CASES HAND GRENADES.
2. 2 CASES 20MM HE I - 2 CASES 20 MM API - 2 CASES 50 CAL BALL 2 CASES 50 CAL TRACER - 2 CASES 30 CAL BALL.
3. 2 CASES MECH. BOMB FUZES, - 2 CASES WP GRENADES - 2 CASES HC GRENADES.
4. 2 CASES BLASTING CAPS, 2 CASES RIFLE GRENADES, 2 CASES HAND GRENADES, 2 CASES ANTIPERSONNEL MINES, 1 CASE OF PARACHUTE FLARES.
5. AMMO SHED 2 IN. X 4 IN. STUDS, 1 IN. X 8 IN. SHEATHING (OR CANVAS COVER). 1 CASE 2.75 IN. ROCKET MOTORS, 1 CASE 2.75 IN. HEAT HEADS 1 CASE BLASTING CAPS, 1 CASE MECH. BOMB FUZES.
6. 2 CASES 2.75 IN. ROCKET MOTORS.
7. 2 CASES 2.75 HEAT HEADS.
8. 8. 2 M35 INCENDIARY CLUSTER BOMBS.
9. 2 100 LB GP BOMBS.
10. 2 CASES COMP A EXPLOSIVE.
11. 2 CASES DYNAMITE.
12. 2 CASES 40 LB CRATERING CHARGES.
13. 2 CASES 4.2 IN. MORTAR SHELLS.
14. 2 CASES 81 MM MORTAR SHELLS.
15. 2 CASES 15 LB CRATERING CHARGES.
16. 2 CASES 60 MM MORTAR SHELLS.
17. 2 CASES BANGALORE TORPEDOES.
18. 2 CASES LAND MINES.
19. 2 CASES 57 MM SHELLS.
20. 4 ROUNDS 105 MM HE SHELLS.
21. 2 CASES 75 MM SHELLS.
22. 4 ROUNDS 155 MM HE SHELLS.
23. 2 M34 INCENDIARY CLUSTER BOMBS.
24. 2 BLU-VB FIRE BOMBS.

WHERE 2 CASES OF AMMUNITION ARE INDICATED THEY WILL BE STACKED VERTICALLY. THE TOP CASE WILL BE OPENED AND ONE OR TWO SUBCASES OR COMPONENTS WILL BE PLACED ON THE GROUND.

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AMMUNITION TARGET ARRAY

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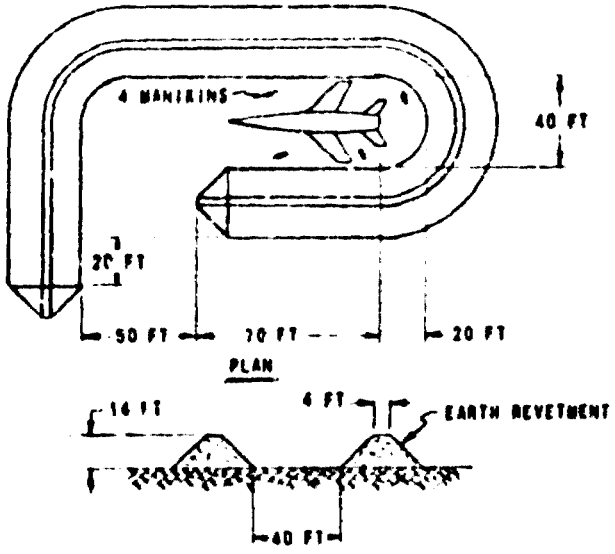
NOTES:

1. JEEP TYPE VEHICLE (4 REQUIRED)—2 MANIKINS IN EACH.
2. TRUCK 2½T TO 5T (4 REQUIRED)—6 MANIKINS IN EACH.
3. SHOP VAN—2 MANIKINS
4. ARMORED PERSONNEL CARRIER—8 MANIKINS.
5. MOTORIZED EQUIPMENT—MOTOR GRADER, BULLDOZER, FORKLIFT OR OTHER—ONE MANIKIN EACH.
6. STAFF CAR—

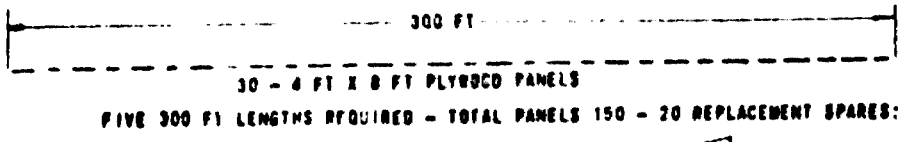
   ALL ITEMS TO BE OBSOLETE OR SALVAGED.

   GAS TANK TO BE ¼ TO ½ FULL.

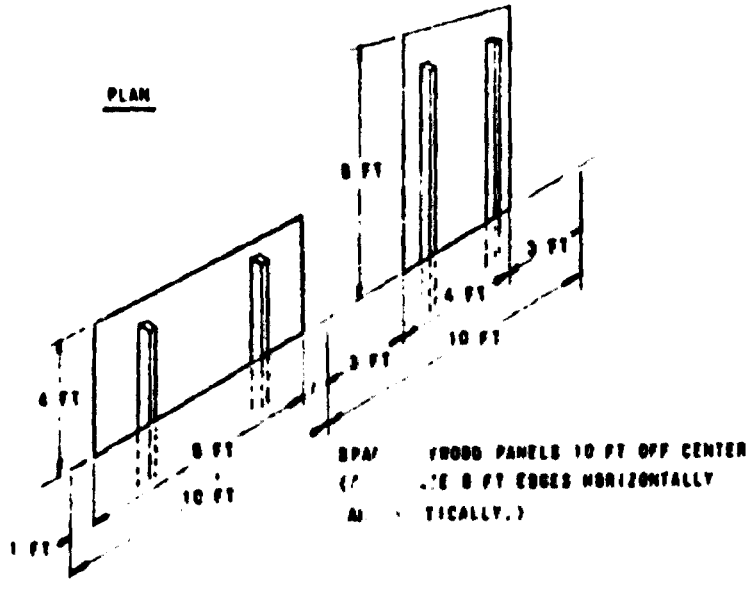
MOTOR VEHICLE TARGET ARRAY



REVETTED TARGET
TYPE D

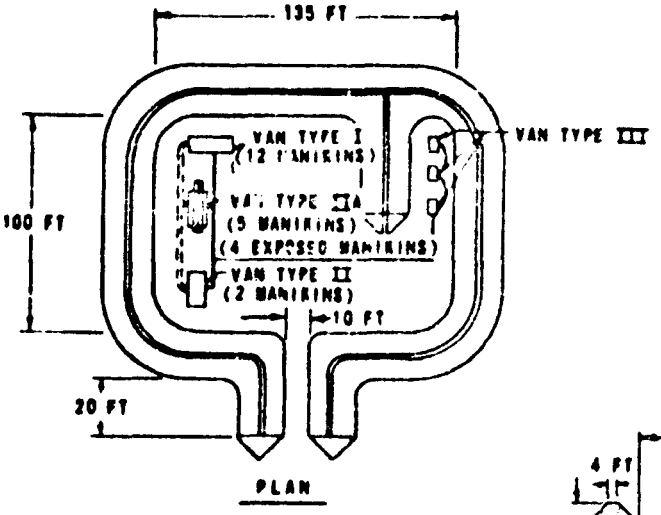


FIVE 300 FT LENGTHS REQUIRED - TOTAL PANELS 150 - 20 REPLACEMENT SPARES:

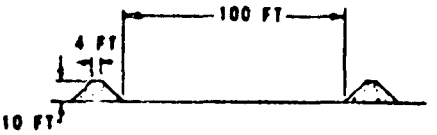


WITNESS ARRAY

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PLAN



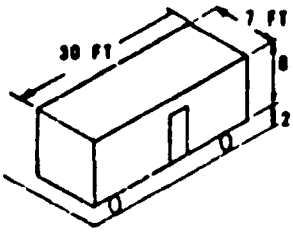
TYPICAL SECTION

REV. 1. SALVAGED CABLE ADDED

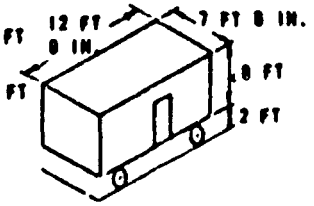
——— POWER CABLE-⅝ IN. TO 1 IN. DIAMETER RUBBER CASED.

– – – – DATA CABLE-APPROX. 1.25 IN. DIAMETER, MULTICONDUCTOR.

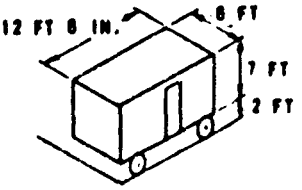
LAY CABLE ON GROUND.



TYPE I VAN



TYPE II VAN



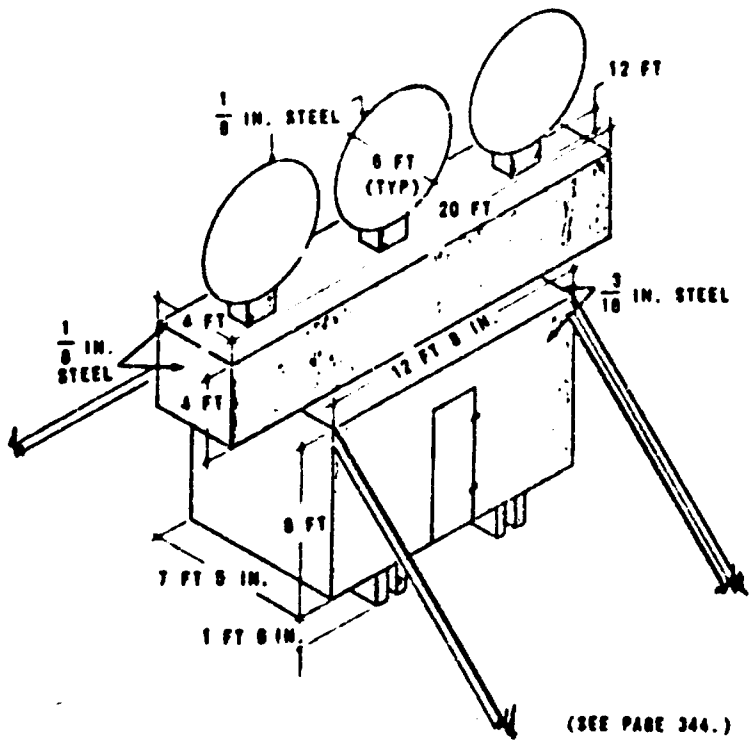
TYPE III VAN

NOTES:

1. VANS TO BE MADE OF $\frac{1}{16}$ IN. MILD STEEL. INTERIOR STEEL BRACING AS NECESSARY.
2. WOODEN STRUCTURAL SUPPORTS MAY BE USED IN LIEU OF WHEELS.

REVETTED TARGET
TYPE A

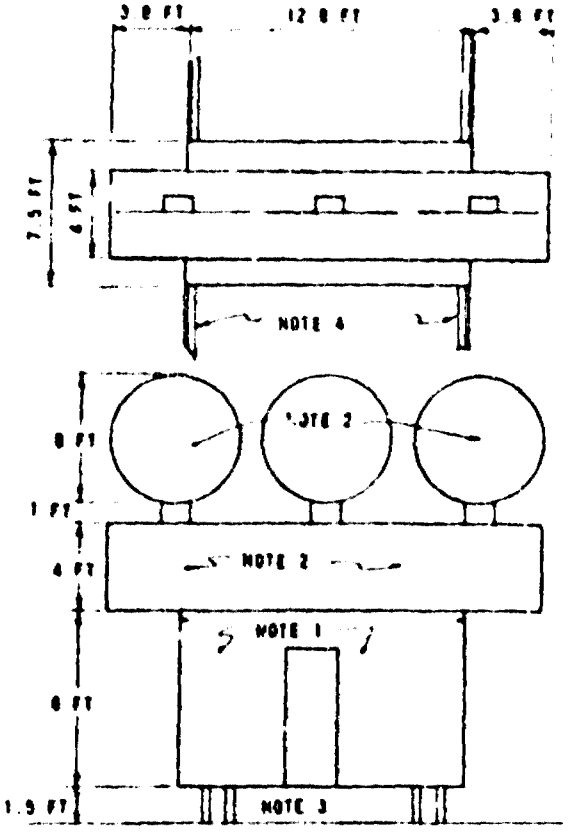
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(SEE PAGE 344.)

TYPE □A VAN

UNCLASSIFIED

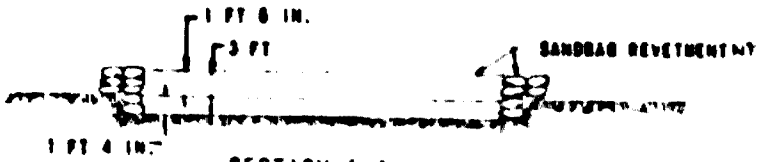


NOTES:

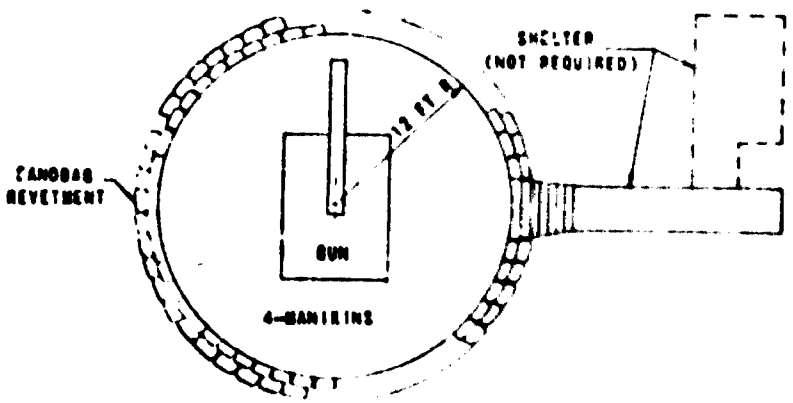
1. VAN TO BE MADE OF $\frac{3}{16}$ IN. MILD STEEL.
2. TO BE MADE OF $\frac{1}{8}$ IN. STEEL.
3. WOOD OR STEEL SUPPORT STRUCTURE.
4. STEEL ANGLE BRACING.
5. USE STEEL ANGLES AS NECESSARY TO STIFFEN STRUCTURE ON INSIDE.
6. PAINT G. S.
7. THREE MANIKINS IN VAN.

TYPE IIA VAN

UNCLASSIFIED



SECTION A-A

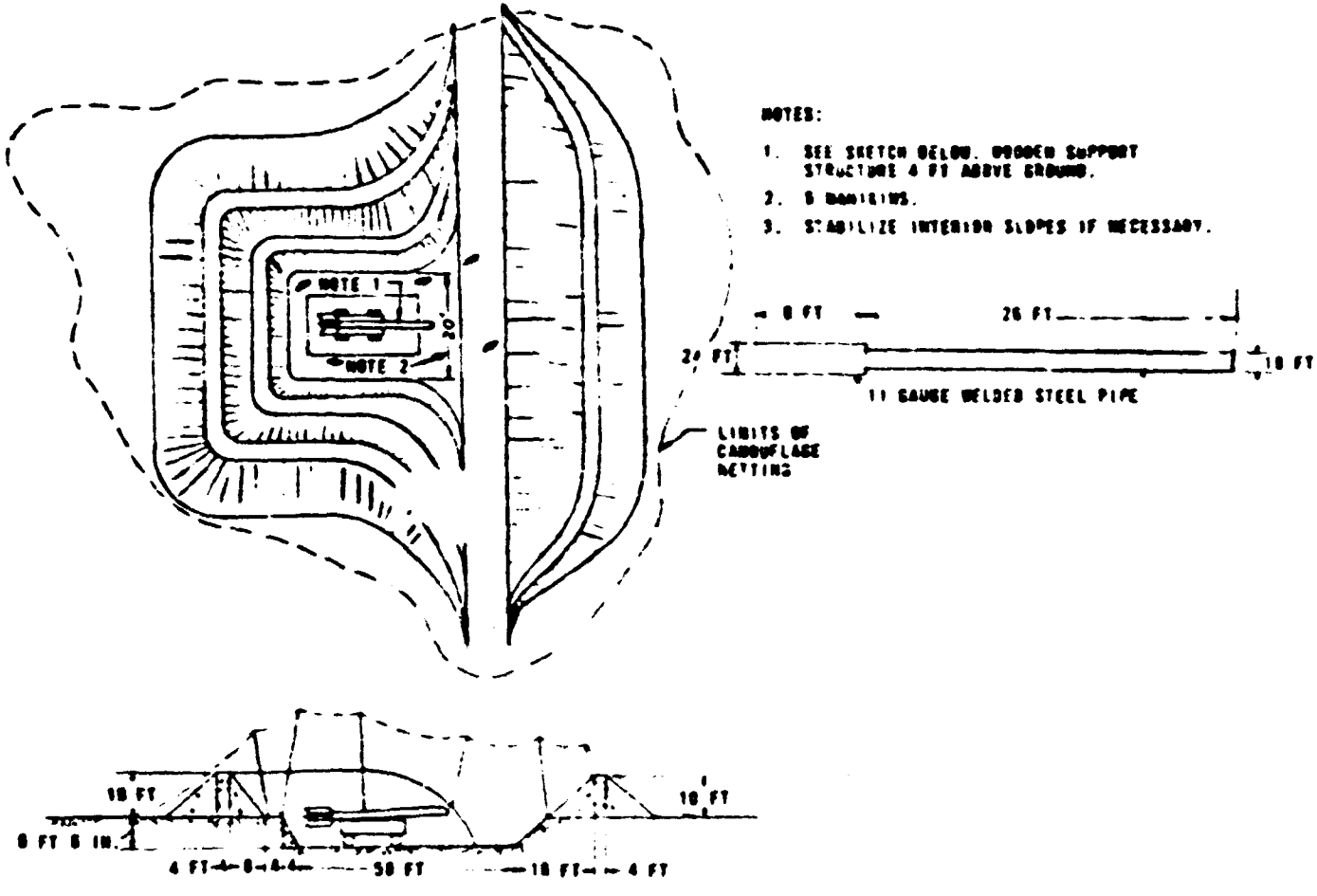


PLAN

REVETMENT 0

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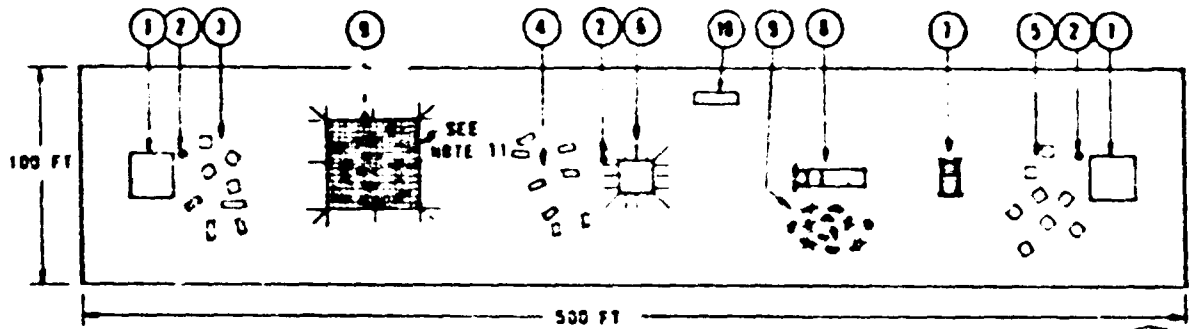
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REVETMENT P

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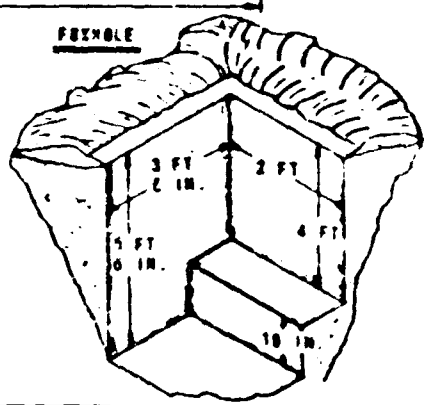
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NOTES:

1. BARRACKS-20 FT X 20 FT-2 X 4 STUDS- 1 X 6 WOOD SHEATHING - 2 WEDGIPER-WINDOW AND DOOR OPENINGS WITHOUT WINDOWS OR DOORS- 12 MANIKINS (4 STANDING, 4 PRONE, 4 SITTING.) IN EACH BARRACKS.
2. LISTER BAG FILLED WITH WATER.
3. GROUP OF 4 FOXHOLES AND 4 SLIT TRENCHES - ONE MANIKIN IN EACH.
4. GROUP OF 8 SLIT TRENCHES - ONE MANIKIN IN EACH.
5. GROUP OF 8 FOXHOLES - ONE MANIKIN IN EACH.
6. 16 FT X 16 FT PYRAMIDAL TENT - 8 MANIKINS - 2 IN EACH POSITION.
7. JEEP WITH 2 MANIKINS.
8. 2½T TRUCK - 2 MANIKINS IN FRONT, 4 IN REAR. MANIKINS TO BE OF PLYWOOD WITH ARTICULATED JOINTS PER EGLIN DESIGN- APPROXIMATE COST, $5.00 EACH.
9. 8 MANIKINS STANDING AND 6 PRONE.
10. WOOD FRAME TARGET
11. ERECT A DOUBLE THICKNESS OF 1½ IN. MESH CHICKEN WIRE 12 FT OVER THIS GROUP OF MANIKINS. USE 2 X 4 SUPPORTS AND NO. 18 GUY WIRES.

FOXHOLE

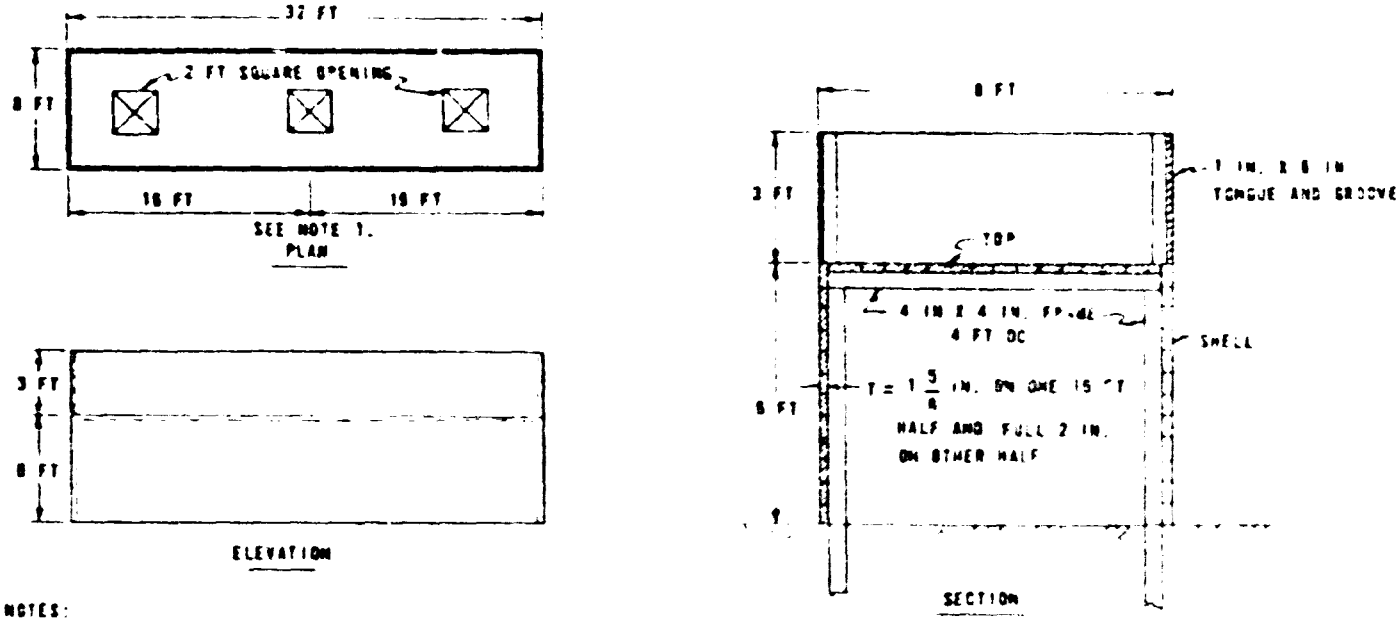


SLIT TRENCH DIMENSION
2 FT WIDE, 8 FT LONG, 2 FT DEEP

BARRACKS AREA TARGET ARRAY

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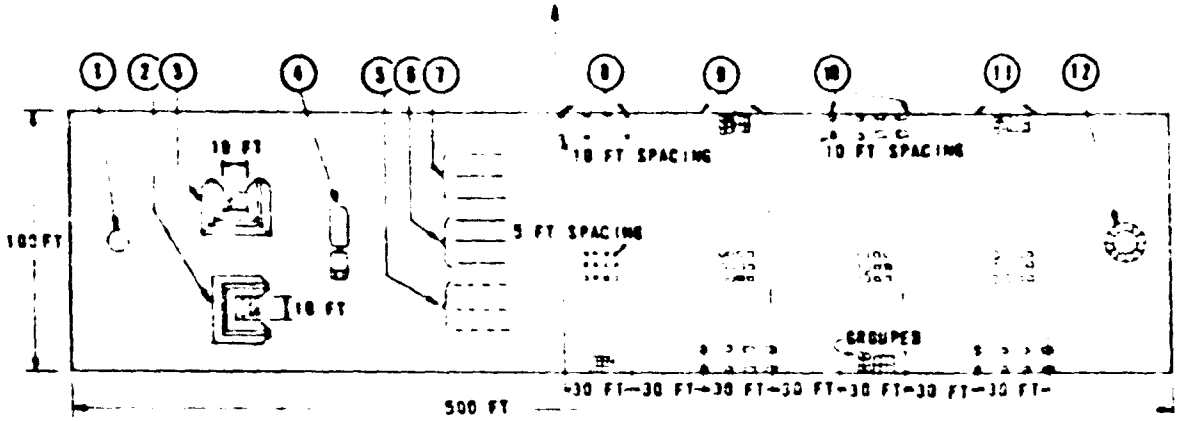
NOTES:

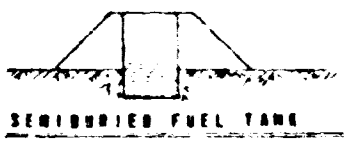
1. ONE HALF OF SHELL AND TOP TO BE 2 IN. X 8 IN. FINISHED PINE. THE OTHER HALF TO BE 2 IN. THICK PINE.
2. THE UPPER PORTION TO BE 1 IN. X 6 IN. TONGUE AND GROOVE.
3. PLACE 10 HANGERS IN SHELL AND 5 ON TOP.

SIMULATED FRAME TARGET

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NOTES:

1. FUEL STORAGE TANK 4 IN. DIA., 8 FT. HIGH OR LARGER-½ FULL AUTO GASOLINE
2. 4 FT. HIGH REVETMENT-9-55 GAL DRUMS JP-4
3. 4 FT HIGH REVETMENT-9-55 GAL DRUMS AV GAS.
4. OBSOLETE TANK TRAILER-½ FULL AV GAS.
5. 20 FT LENGTHS-2 IN., 4 IN. AND 6 IN. PIPES FILLED WITH AV GAS, CAPPED EACH END-BURIED 4 INCHES.
6. 20 FT LENGTHS-2 IN., 4 IN. AND 6 IN. PIPES FILLED WITH AV GAS—CAPPED EACH END-RESTING ON SURFACE.
7. 20 FT LENGTHS-2 IN., 4 IN. AND 6 IN. PIPES FILLED WITH AV GAS- CAPPED EACH END-SUPPORTED 12 IN. ABOVE SURFACE.
8. 32-5 GAL JEEP CANS- 15 FILLED WITH JP-4, 15 WITH AUTO GAS AND 15 WITH AV GAS
9. 32-55 GAL DRUMS-FILLED WITH JP-4-16 ON END-16 ON SIDE
10. 32-55 GAL DRUMS-FILLED WITH AV GAS-16 ON END-16 ON SIDE
11. 32-55 GAL DRUMS-FILLED WITH AUTO GAS-16 ON END-16 ON SIDE

(9, 10, 11: ½ OF DRUMS TO BE FULL AND THE REMAINDER TO BE ½ FULL.)

12. SEMIBURIED FUEL STORAGE TANK 4 FT DIAMETER 8 FT HIGH OR LARGER ½ FILLED WITH JP-4.

POL TARGET ARRAY DETAILS

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DOCUMENT CONTROL DATA - R&D

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4 DESCRIPTIVE NOTES (Type of report and inclusive dates)

Final Report (1 December 1964 - 30 December 1965)

5 AUTHOR(S) (Last name, first name, initial)

MacDonald, Michael J., 1st Lt, USAF

6 REPORT DATE April 1966	7a TOTAL NO OF PAGES 361	7b NO OF REFS
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11 SUPPLEMENTARY NOTES	12 SPONSORING MILITARY ACTIVITY Directorate of Armament Development (RTD) Air Force Systems Command Eglin Air Force Base, Florida

13 ABSTRACT

(C) This test consisted essentially of an evaluation of the SUU-24/A dispenser with BLU-3/B bombs to operationally qualify the weapon system on B-52 and B-47 aircraft for low altitude use. Special ground handling and loading equipment (AGE) for the weapon system was also evaluated. During the twenty-three flight test missions which were conducted, it was necessary to incorporate modifications to the test items, to qualify the final production version. Missions using live (HE) BLU-3/B bombs conducted against a composite target array of actual and simulated targets showed that the system was highly reliable and effective against most of the targets. The dispenser was found to be compatible with the B-52 aircraft with no modification to the aircraft required. Although the dispenser fitted the B-47 aircraft satisfactorily, its operational use in the B-47 is not recommended unless protection is provided to prevent aircraft damage from carton components released prematurely as a result of collisions among the cartons directly below the aircraft. The AGE was found to be satisfactory in all phases of loading, downloading, and handling of the dispensers and cartons.

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Security Classification

KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Bombs						
Bomb dispensers						
Bomb clusters						
Bombers						
Tactical bombing						
Tactical weapons						
Weapons effects						

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