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UNCLASSIFIED (Ref. Sym. 1923-(265))

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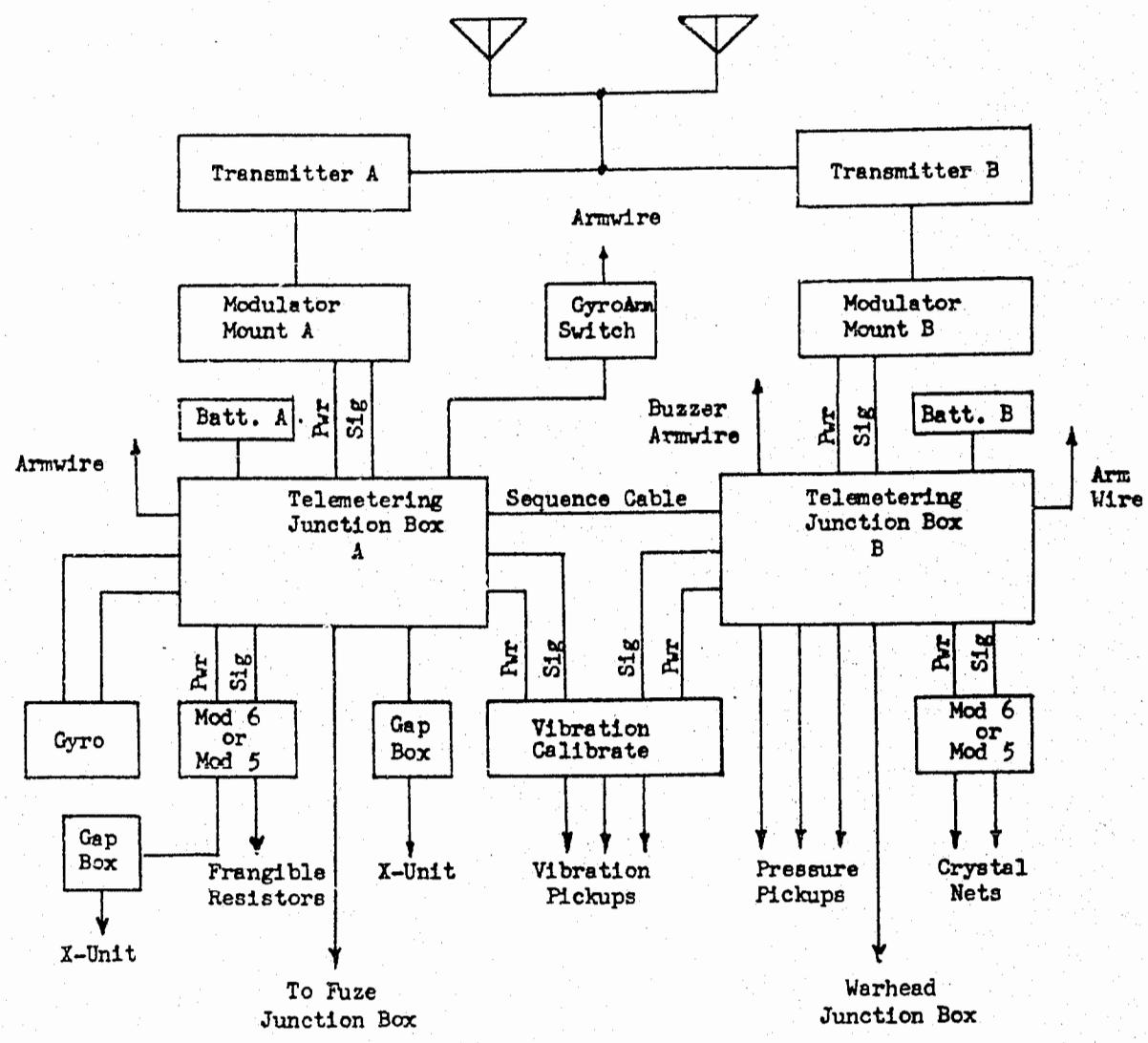


Figure 2 - Telemetering System Used on Drops 96-11 through 96-16

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was felt that sufficient information could be obtained from the final F&F drop series and from other weapons which use the same IFI.

Drop 96-11

All information indicates that the fuzing and firing system functioned properly, except one T-1 switch of the safe-separation timer chattered as it was closing.

Drop 96-12

This drop unit failed to fire at air burst but did fire at impact.

The most satisfactory explanation of this malfunction, as obtained from an analysis of the telemetry record is that the pull-out switch failed to close all contacts at pull-out.

The XMC-505 pull-out switch used on this unit was a shop-made prototype which was not moisture sealed as in the final design. It is postulated that the cause of the switch failure was condensation of the moisture in the switch during the first flight to Salton Sea - which was aborted. The next flight froze the moisture causing the switch to fail.

It is believed that with the proper sealing and the design changes incorporated in subsequent switches the cause of this failure will be eliminated.

Drops 96-13 and 96-14

All information indicates that the fuzing and firing system and the warhead functioned as intended in these two drops.

Drops 96-15 and 96-16

All components in these drops functioned as intended except one MC-3 radar, in each drop unit, which ranged prematurely.

The following two causes of these failures have been advanced:

1. That the forward end of the nose section served as a resonant cavity feeding the signal back into the antennae, ranging the radar.
2. That the radar connector seals leaked pressure causing internal arcing which prematured the radar.

Tests have been conducted verifying both the above suggested causes. As a result of the tests, a bulkhead is being placed behind the antennae. The MC-3's are being retrofitted with better connectors, and a leak test is being incorporated for field use.

A summary of all the radar firing information is shown in Table I. An average burst height error (\bar{X}) of -67 feet was obtained for the drop series. A standard deviation(s) of 27.2 feet was obtained. The value(s) is only an indication because the errors did not follow a symmetrical distribution.

A summary of all timer information is given in Table II for the drop series.

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TABLE II
96-11 Through 96-16 Safe-Separation Timer & Fire Timer Summary

Drop No.	Safe-Sep. Set-Sec		Chan.	Safe-Sep. Time Sec		Safe-Sep. Time Error-Sec		Fire Timer Set-Sec	Fire Timer Error-Sec	Fire**** Timer Error-Sec
	T1	T2		T1	T2	T1	T2			
96-11	17	26	1	16.146	27.262	-0.854	+ 1.262	33.00	33.410	+ 0.410
			2	17.047	28.292	+0.047	+ 2.292			
96-12	17	26	1	17.287	26.162	+0.287	+ 0.162	33.00	*	*
			2	17.664	*	+0.664	*			
96-13	17	26	1	18.15	25.81	+1.15	- 0.19	33.00	33.40	+ 0.40
			2	17.27	27.25	+0.27	+ 1.25			
96-14	17	26	1	**	26.002	**	+ 0.002	33.00	33.283	+ 0.283
			2	17.600	27.307	+0.600	+ 1.307			
96-15	17	26	1	17.138	27.113	+0.138	+ 1.113	33.00	33.467	+ 0.467
			2	17.418	27.401	+0.418	+ 1.401			
96-16	17	26	1	17.510	28.048	+0.510	+ 2.048	33.00	33.422	+ 0.422
			2	17.881	28.057	+0.881	+ 2.057			

Safe-Separation Timer - MC-348
Fire Timer MC-73

All Times from Release

* Full-out Switch failure caused loss

** Failure of Telemetering Channel caused loss

*** Fire Timer had Channel 1 and 2 tied together in fuze

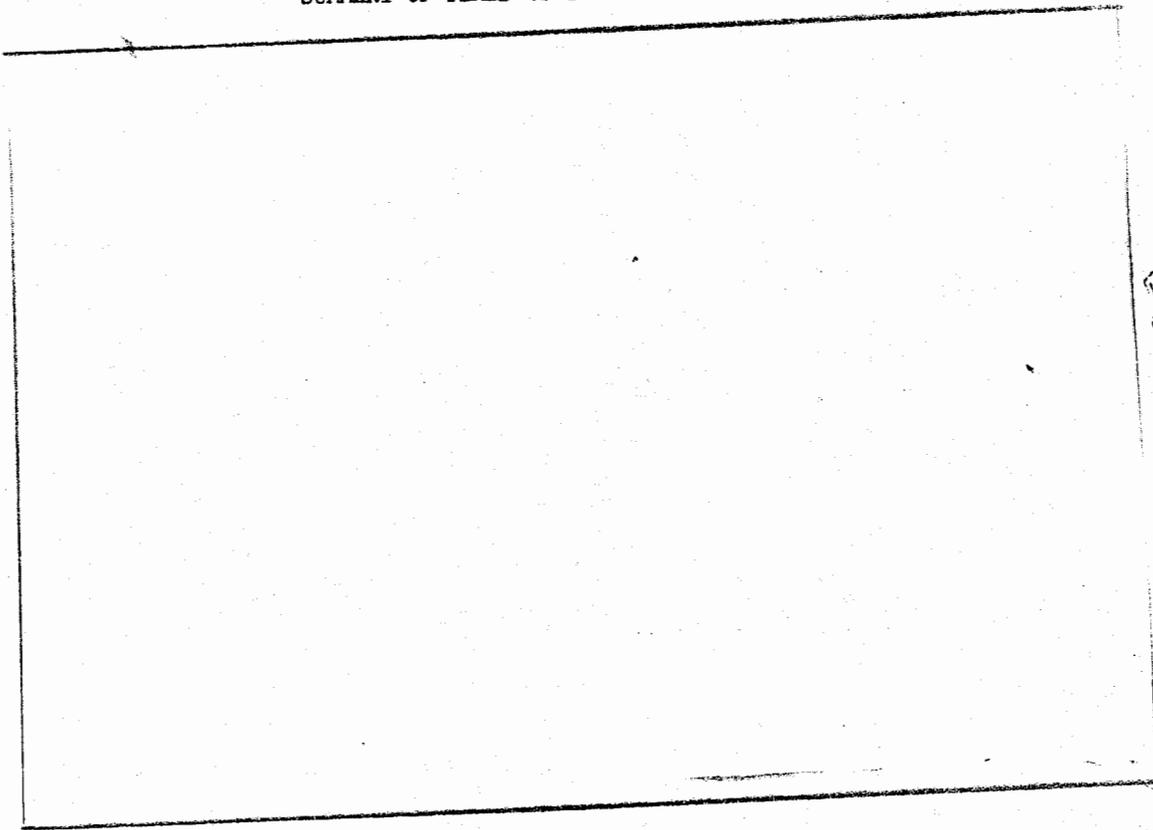
**** Error attributed to dial of setting equipment

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TABLE III
SUMMARY OF TIMES OF IMPACT FUNCTIONS



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APPENDIX A

Individual Drop Results	Page
96-11	18
96-12	22
96-13	26
96-14	30
96-15	34
96-16	38

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Ref. Sym: 1923-(265)
Drop Date: Nov. 4, 1954
Salton Sea Test Base

Drop No. 96-11

PHYSICAL CHARACTERISTICS

Weight 3750 pounds
Center of Gravity 163.8 inches
Moment of Inertia 12,596,000 lb in²

Fin Settings

<u>Fin</u>	<u>Actual</u>	<u>Requested</u>
Staggered (Top)	+ 15 min 22 sec	+ 12 min 0 sec
Left	+ 24 min 53 sec	+ 29 min 0 sec
Right	- 3 min 0 sec	- 5 min 0 sec
Algebraic Sum	+ 37 min 15 sec	+ 36 min 0 sec

RELEASE CCNDITIONS

	<u>Actual</u>	<u>Scheduled</u>
Aircraft	B-47 No. 12222	B-47 No. 12222
Bombing System	K-4	
Altitude MSL	39,644 ft	40,000 ft
Attitude	Level	Level
True Air Speed	414 K	Mach 0.75 (425 K)
Ground Speed	421 K	
Vertical Velocity	+ 4.222 fps	
Wind at Altitude	10 K @ 14°	
Plane True Course		

FUZE SETTINGS

Safe-Separation Timer T ₁	17 sec
Safe-Separation Timer T ₂	26 sec
Fire Timer Set	33 sec
Radar Set	Range 6

DROP DATA

Estimated Time of Fall	53.99 sec
Askania Time of Fall	54.928 sec
Telemetered Time of Fall	54.928 sec
Range	33,656 ft
Maximum Mach No.	1.109
Minimum Mach No.	0.726
Impact Velocity	1189 fps
Impact Angle	71°
Circular Error	325 ft, 325 ft over .4 ft left on 150° 36'

GROUND CAMERAS

- 6 - Askania Phototheodolites
- 4 - Mitchell Cameras
- 6 - Fastax Frame Cameras
- 3 - Fastax Ribbon Cameras
- 1 - 16mm B&H Color Camera

PLANE CAMERAS

Due to circuit failure, none of the aircraft cameras operated.

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Drop No. 96-11

Ref. Sym: 1923-(265)

CONTACT INFORMATION

[Redacted area]

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** Mod 6 did not receive fire signal due to discontinuity in the telemetering system. The Fastax film shows the photo flash from contact fire at about 18 inches penetration.

F&F CONCLUSIONS

[Redacted area]

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VIBRATION

The vibration pickups were mounted in a cluster on the right hand side of the forward warhead mounting flange. All vibration channels appear to have operated properly.

Since the amount of vibration recorded was slight during flight and drop and less than the accuracy of the system, it was not reduced. The vibration during fall was less than during flight prior to release.

The vibration data during take-off was not reduceable because the record was not calibrated.

PITCH, YAW AND ROLL SUMMARY

Pitch

The unit showed its characteristic upward pitch on release. This was about five degrees with a period of about two seconds. Initial pitch was damped out completely by six seconds.

From about 28 seconds to impact, the unit had angle of attack of about one degree. Pitch, yaw and roll were coupled from that time to impact.

Yaw

The unit yawed to the right about two degrees on release. After this initial yaw of one half cycle, no measurable yaw was recorded until 28 seconds, as indicated above.

Roll

Roll rates were as follows in the clockwise rotation:

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Drop No. 96-11

Ref. Sym: 1923-(265)

Time from Release (Sec)

Roll Rate rev/sec

3.8
10.0
20.0
30.0
40.0
50.0
53.0

(First 1/8 rev completed)
0.10
0.13
0.20
0.21
0.24
0.26

PRESSURE INFORMATION

Pressure information was lost. The subcommutating switch was rotating properly, but it appears that the pickup contacts were grounded. This may have been due to excessive wear on the switch contacts by the time of drop.

UNIT COMPONENT INVENTORY

Drop Unit 96-11

<u>QUANTITY</u>	<u>COMPONENT</u>	<u>SERIAL NUMBER</u>
1	MC-115	CO 167 F4
1	MC-134	Not Available
2	MC-251	AF 5783 C4 AF 6113 C4
1	MC-384	SC-0055 A4
1	MC-401	None
1	MC-73	CO 1284 E3
1	MC-348	GB 072 A4
1	MC-474	#6
1	MC-505	None
8	MC-300	None
2	MC-72	AA 3782 F2 AA 2911 D2
2	MC-3	R-1 AA1192 C3 R-2 AA1977 J3
2	MC-291	AK 7703 I3 AK 11714 K3
2	MC-193A	DG 17790 L3 DG 17616 L3

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Drop No. 96-12

Ref. Sym: 1923-(265)

F&F CONCLUSIONS

Reference: Hollingsworth to Distribution, Failure Analysis XW-5/F-101 Fuzing and Firing Drop 96-12; Ref. Sym: 1242 (814)

The above Reference concludes that one bank (S-1 through S-6) of the MC-505 pull-out switch failed to close at pull-out. The MC-505 used in the drop was a shop-made prototype which did not have the seals as in the final design. The exact cause of the switch failure is unknown and no evidence is available, but it is postulated that the cause was condensation of moisture in the switch during the first flight to Salton Sea - which was aborted. The next flight froze the moisture causing the switch to fail. It is felt that with design changes of subsequent switches this failure will not be repeated. The drop was partially successful in that the X-unit charged and the weapon fired properly on impact.

VIBRATION

Recorded vibration was of such a low level that the vibration channels will not be reduced. Vibration while the weapon was aboard the aircraft, while also at a very low level (less than 1 g), was greater than during free-fall. The vibration pickups were mounted on the sphere poker cap flange as in Drop 96-11. See Figure 8 and 9.

PITCH, YAW AND ROLL SUMMARY

Pitch

The unit pitched up about six degrees on release as usual. Initial pitch had damped out by five seconds. By 10 seconds the unit had taken a constant angle of attack of about 1-1/2 degrees with coupled yaw and roll to impact.

Roll

Roll rate as follows (clockwise throughout):

<u>Time From Release (Sec)</u>	<u>Roll Rate rev/sec</u>
1.75	(First 1/8 rev completed)
10.00	0.48
20.00	0.61
30.00	0.82
40.00	1.00
50.00	1.01
Impact	0.99

Yaw

Yaw was about 1-1/2 degrees as described above.

PRESSURE INFORMATION

The subcommutated pressure information was good. The internal pressure followed the external pressure closely. This was because of four ram holes in the nose aft of the radome to maintain internal pressure. The data is not of great value, since the warhead compartment will be enclosed and of different structure on the final weapon.

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Ref. Sym: 1923-(265)
Drop Date: Dec. 14, 1954
Salton Sea Test Base

Drop No. 96-14

PHYSICAL CHARACTERISTICS

Weight	3880 pounds
Center of Gravity	162.53 inches
Moment of Inertia	12,611,419 lb in ²

Fin Settings

<u>Fin</u>	<u>Actual</u>	<u>Requested</u>
Staggered (Top)	+ 12 min 30 sec	+ 12 min 0 sec
Left	+ 30 min 49 sec	+ 29 min 0 sec
Right	- 2 min 0 sec	- 5 min 0 sec
Algebraic Sum	+ 41 min 19 sec	+ 36 min 0 sec

RELEASE CONDITIONS

	<u>Actual</u>	<u>Scheduled</u>
Aircraft	B-47 No. 12222	B-47 No. 12222
Bombing System	K-4	K-4
Altitude MSL	29,558 ft	30,000 ft
Attitude	Level	Level
True Air Speed	429 K	440 K
Ground Speed	451 K	
Vertical Velocity	- 1.036 fps	
Wind at Altitude	41 K @ 279°	
Plane True Course	155° 19'	

FUZE SETTINGS

Safe-Separation Timer T ₁	17 sec
Safe-Separation Timer T ₂	26 sec
Fire Timer Set	33 sec
Radar Set	Range 6

DROP DATA

Estimated Time of Fall	46.72 sec
Askania Time of Fall	46.166 sec
Telemetered Time of Fall	46.168 sec
Range	31,177 ft
Maximum Mach No.	1.060
Minimum Mach No.	0.712
Impact Velocity	1169 fps
Impact Angle	66°
Circular Error	1013 ft, 1013 over 25 left on 155° 19'

GROUND CAMERAS

5 - Askania Phototheodolites
3 - Mitchell Cameras
6 - Fastax Frame Cameras
2 - Fastax Ribbon Cameras
1 - B&H 16mm Color Camera

All Camera Stations reported good operation.

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Ref. Sys: 1923-(265)
Drop Date: Jan. 13, 1955
Yucca Lake Range
Nevada Proving Grounds

Drop No. 96-16

PHYSICAL CHARACTERISTICS

Weight 3635 pounds
Center of Gravity 163.250 inches
Moment of Inertia 12,289,536 lb in²

Fin Settings

<u>Fin</u>	<u>Actual</u>	<u>Requested</u>
Staggered (Top)	3 min	20 min + 15 sec
Left	30 min	35 min + 15 sec
Right	10 min 45 sec	5 min + 15 sec
Algebraic Sum	43 min 45 sec	60 min + 45 sec

RELEASE CONDITIONS

	<u>Actual</u>	<u>Scheduled</u>
Aircraft	B-47 No. 12222	
Bombing System	K-4	
Altitude MSL	35,950 ft above Tgt. (Radar)	40,000
Attitude	Level	Level
True Air Speed	414 K	414 K
Ground Speed	410 K (Radar)	
Local Velocity	Not available	
Wind at Altitude	Not available	
Plane True Course	130°	

FUZE SETTINGS

Safe-Separation Timer T ₁	17 sec
Safe-Separation Timer T ₂	26 sec
Fire Timer Set	33.00 sec
Radar Set	Range 6

DROP DATA

Estimated Time of Fall	50.83
Askania Time of Fall	51.184
Telemetered Time of Fall	51.190
Maximum Mach No.	1.111
Minimum Mach No.	0.803
Impact Velocity	1199 fps
Impact Angle	70°
Circular Error	785 ft, 219 over 753 left on 130°

GROUND CAMERAS

- 4 - Askania Phototheodolites - Two stations did not track to impact
- 1 - Mitchell Camera 40" lens
- 1 - Bell & Howell 16mm documentary

PLANE CAMERAS

Good camera coverage showing clean separation.

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Drop No. 96-16

TELEMETERING RECORD

Good

SEQUENCE INFORMATION

Ref. Syr: 1923-(265)

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APPENDIX C

Photographs of Typical XW-5/F-101 Drop Units

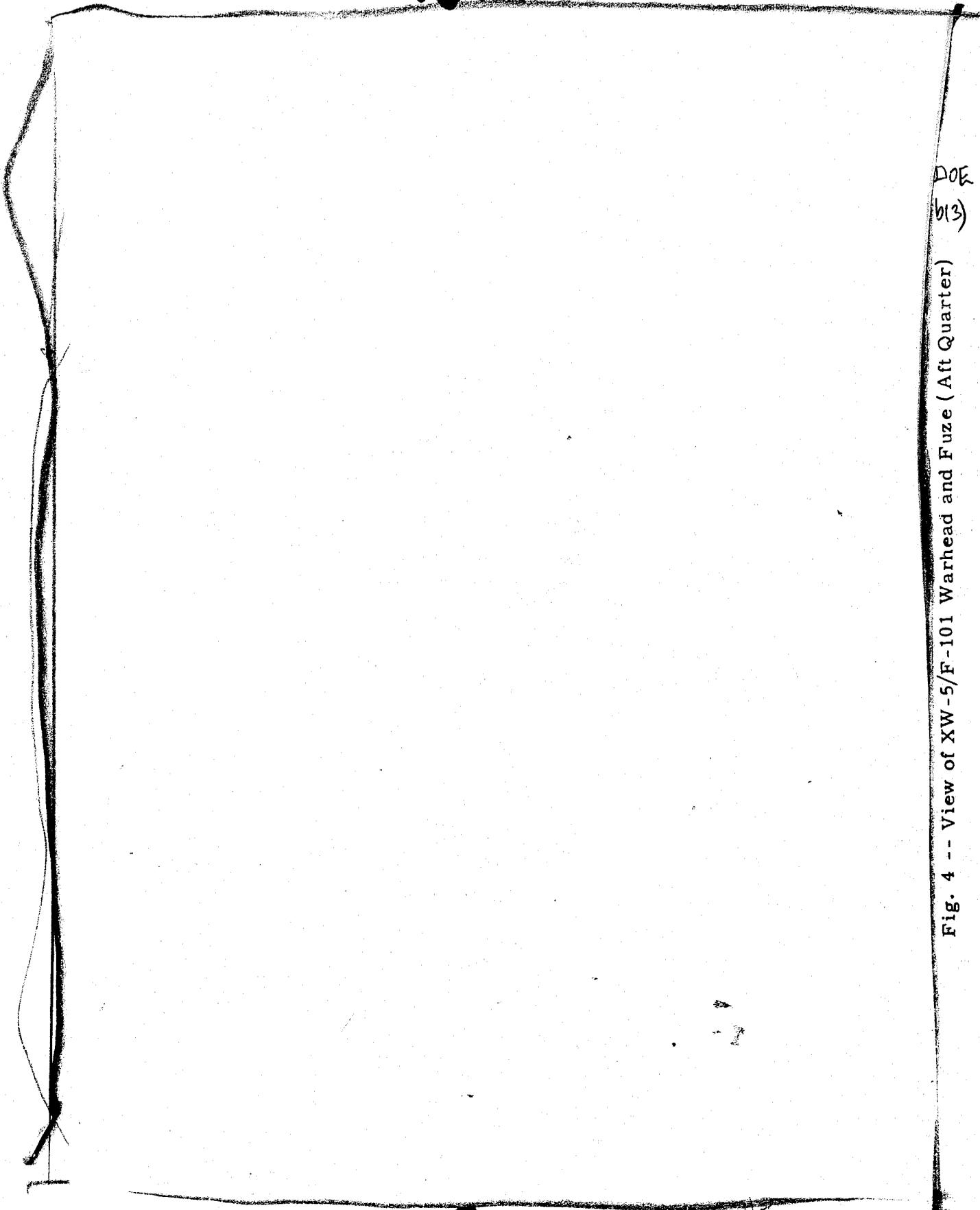
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Fig. 4 -- View of XW-5/F-101 Warhead and Fuze (Aft Quarter)

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Looking at Forward End of XW-5/F-101 Fuze and Warhead (Typical Drop Unit)
with Radars and Batteries Installed

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(S)

mmmm

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Fig. 8 - Vibration Pickups, Typical of Drops 96-11 and 12
(Looking Forward)

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mmmm

