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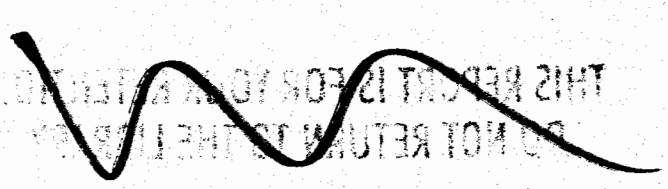

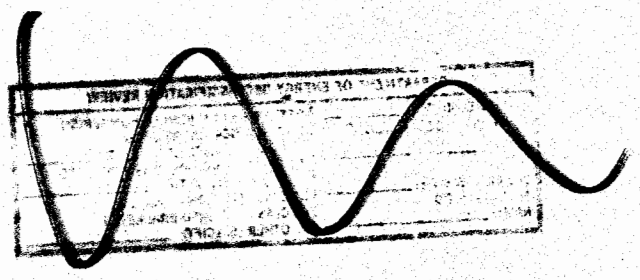

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The original design is shown in Figure 2 and the modified design is shown in Figure 3.

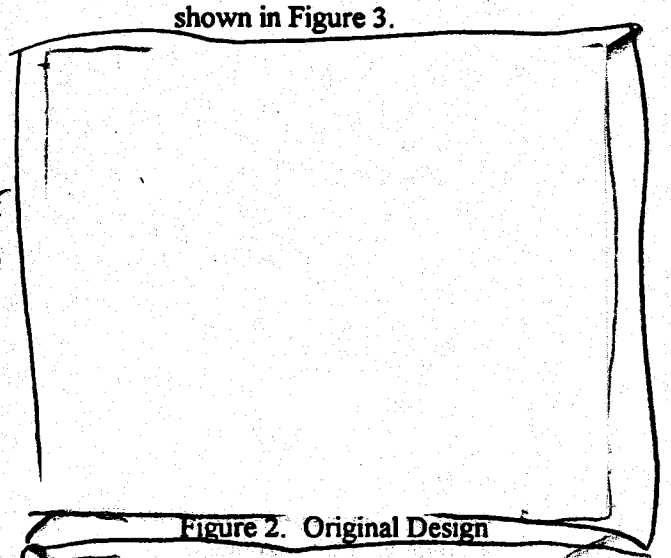

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Figure 2. Original Design

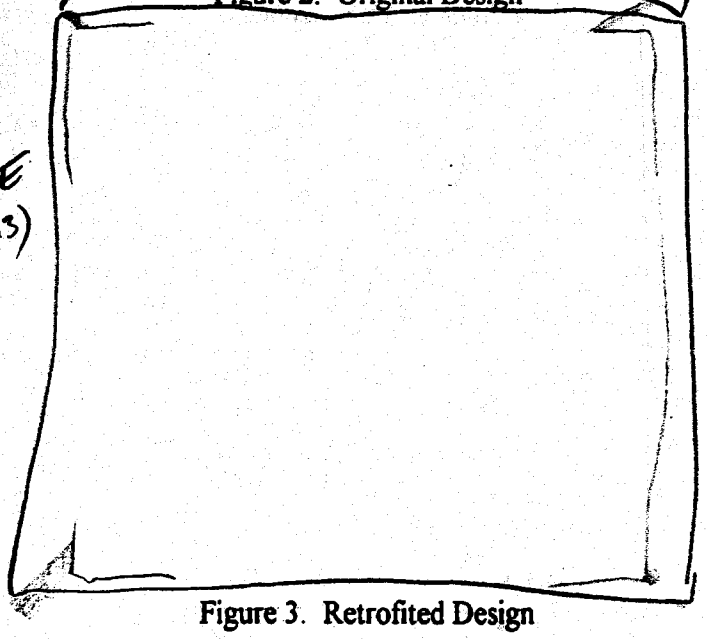

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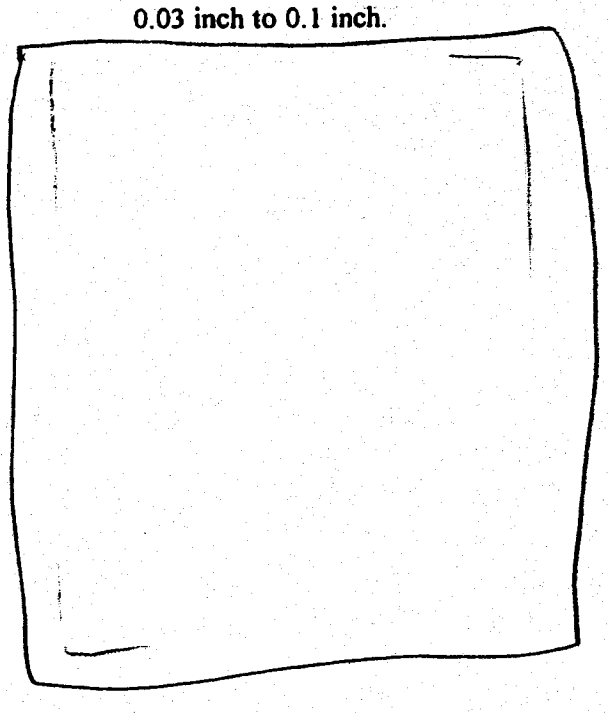
Figure 3. Retrofited Design

There are abnormal environments that will eventually defeat their isolation features. In the B53-1, the strong-link switch is located in relation to existing B53Y1-0 elements that have functions critical to system operation such that these vital elements become irreversibly inoperative before the isolation features of the strong-link switch are bypassed. The weak-links in the B53-1 system are the X-Unit capacitors and the nuclear system high explosive.

The power pack, which contains the strong-link switch is surrounded by the X-Unit capacitor bank. The power pack and the B53-1 system are divided into two zones:

A. Zone 1 contains the input circuits for the MC2969 and most of the B53Y1-0 carryover components.

B. Zone 2 is isolated from Zone 1 and external electrical sources by the MC2969 and the barriers. Zone 2 contains the power converter, the X-Unit capacitors, the trigger circuit, the detonator cables and the primary. The barriers between Zone 1 and Zone 2 are all steel material and varing from 0.03 inch to 0.1 inch.



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- Lightning protection is provided against inputs to the bomb that could result from lightning strikes by a Lightning Arrestor Connector (LAC) at the bomb/pull-out cable interface. All signals entering the bomb case are routed through the LAC and the shell of the LAC is electrically connected to the bomb outer case. The LAC is designed to

g el fg toT ldg cabb eakd pfr hr

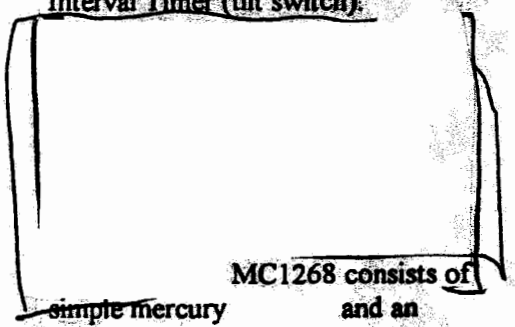
g T o d gn h gArresngArres l ng

explosive except when directed by competent authority."

The B53-1 does not include a PAL, but the design includes the following:

- The Aircraft Monitor and Control (AMAC) system includes a Bomber Coded Switch (BCS), similar to a PAL.

Arming cannot be completed until the Trajectory Sensing System has actuated. Trajectory arming is accomplished by the MC1268 Interval Timer (tilt switch).



MC1268 consists of simple mercury and an electrical therefore, its major contribution ground handling safety.

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Option #	Option Description	Relative Safety Improvement				Relative Increase In Time, Dollars, or People	Nuclear Detonation Safety And Scatter Effectiveness Ranking (1 = Best)		Weapon Security Improvement	New Equipment or Procedures	Ranking And Whether To Do or Not Do (1 = Best)		Comments
		During Transportation		During Storage									
		Nuclear Yield	Pu Scatter	Nuclear Yield	Pu Scatter		Trans.	Storage			Ranking	Do or Don't	
1	Remove D-T Gas Reservoir	None	N/A	None	N/A	Med	-	-	None	None	-	Do	Alt 916
2	Disconnect Input Cables to X-Unit	Med	N/A	Med	N/A	Med	5	3	Low	Low	4	-	Impractical
3	Provide TARC	Med	N/A	N/A	N/A	High	2	N/A	Low	High	5	Don't	No Pu, too big etc.
4	Use SST Only	Med	N/A	N/A	N/A	Low	1	N/A	High	None	1	Do	
5	Remove Thermal Batteries	Med	N/A	Med	N/A	Med	4	2	Low	Low	2		
6	"Spike" the X-Unit Capacitors	Med	N/A	Med	N/A	Med	3	1	Med	Med	3		

Chart 1. Retrograde Surety, B53-1 Safety Options

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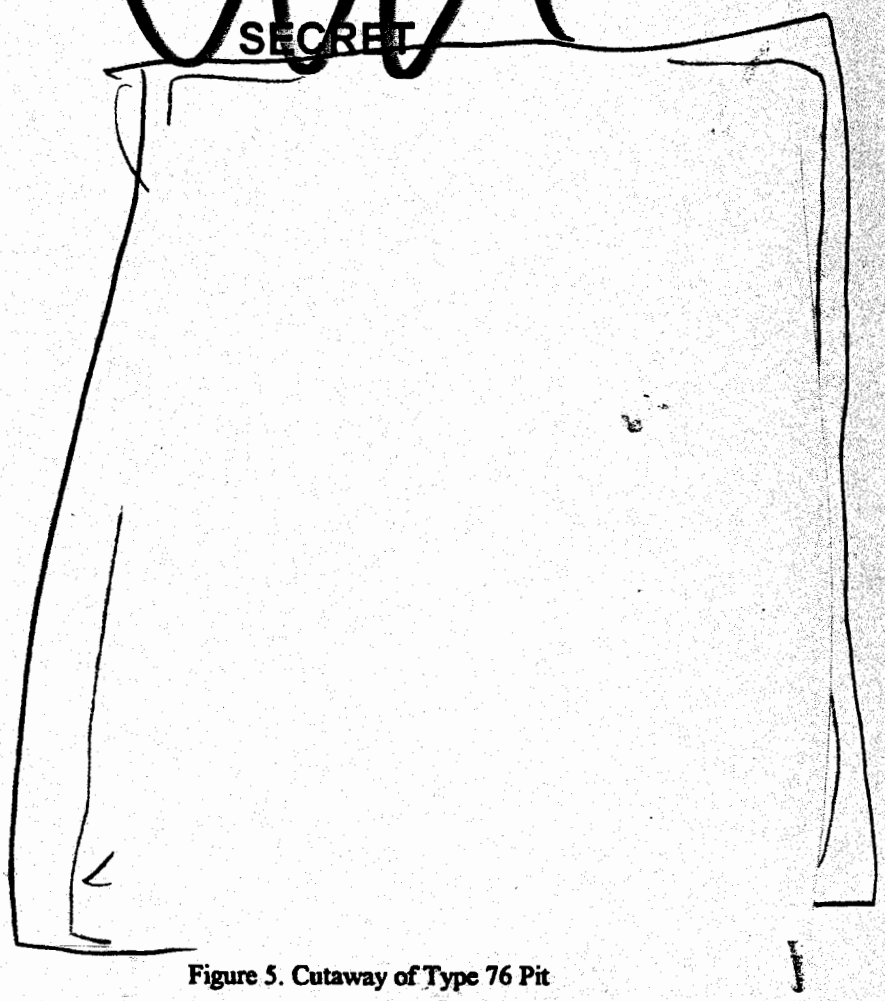

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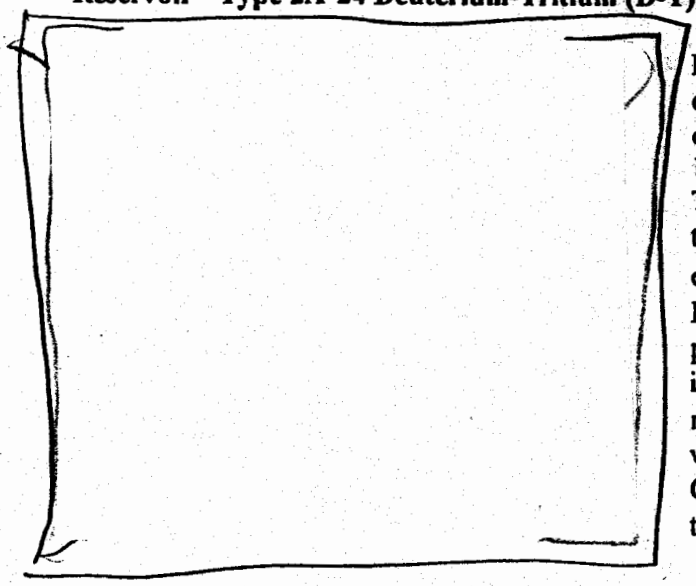
Figure 5. Cutaway of Type 76 Pit

Reservoir - Type 2A-24 Deuterium-Tritium (D-T) gas reservoir and valve assembly



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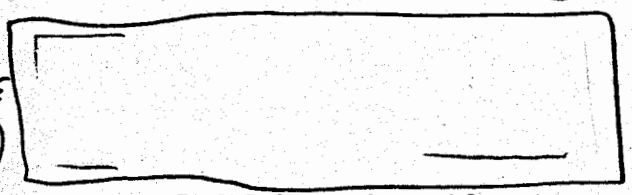
Each Type 1A squib contains an electro-exploding device (EED) that initiates 25 mg of lead styphnate, which in turn initiates 175 mg of Ball Powder (black powder). The Type 1A valve assembly contains a visible thermal plug that is designed to open in a fire environment (operating temperature 104°C). If the actuator squibs fire with the thermal plug open, the gas generated by the actuators is vented to the outside and the plunger will not be forced onto the reservoir and pit tubes with enough velocity to cut the tubes. Cutting these tubes is the only way of transferring the D-T gas to the pit.

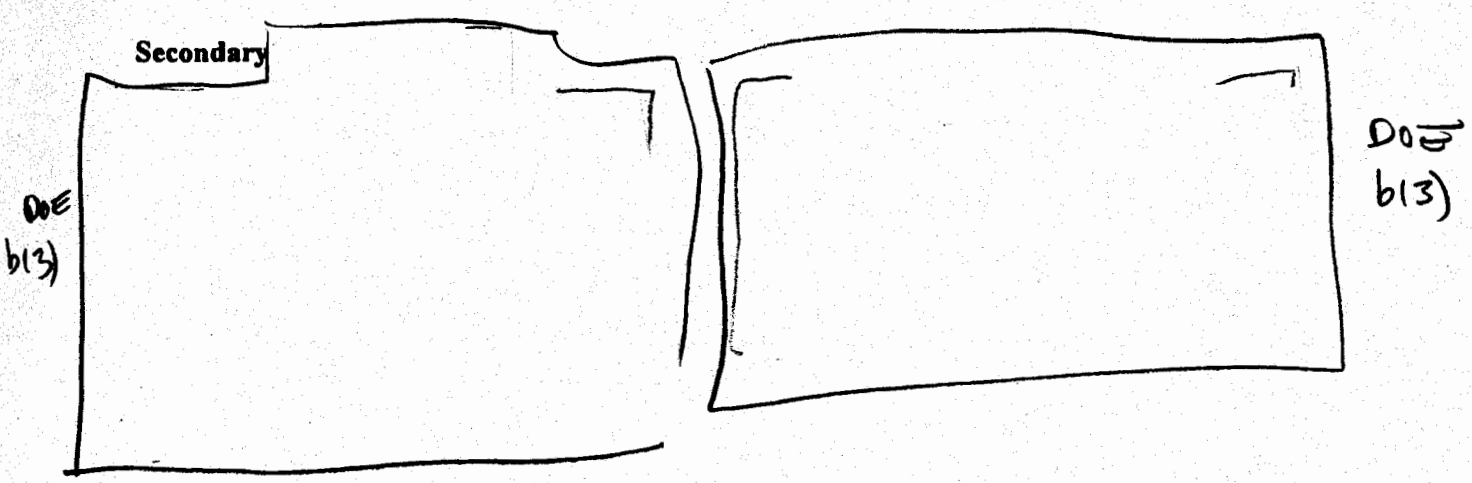


Cycle Life - The interval from the fill time to the time that the gas no longer meets the weapon yield certification because of Tritium decay. This life is used to determine the normal LLCE requirements.

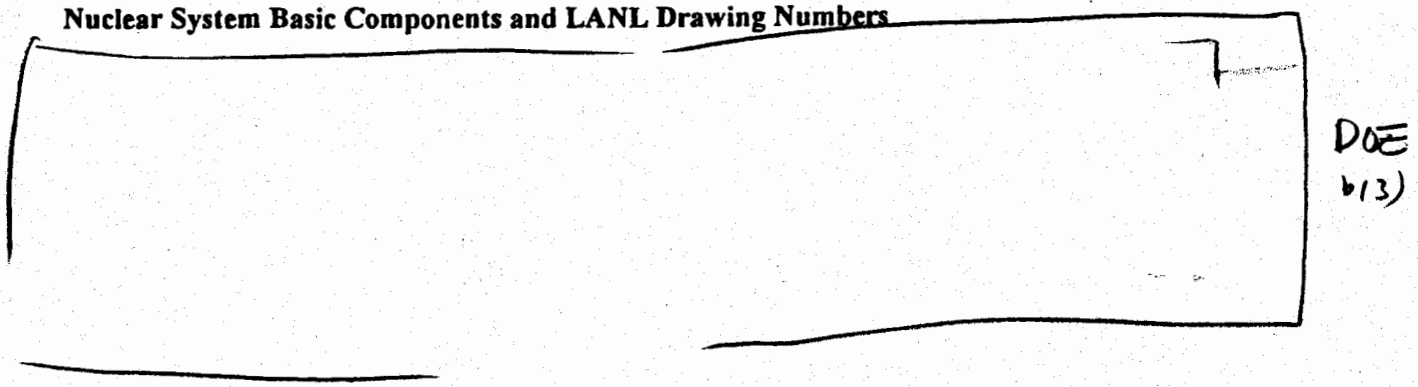
Extended Cycle Life - The interval from the fill time to the time that "unacceptable" yield degradation results from Tritium decay and helium generation. This time is greater than the cycle life and less than or equal to the limit life.

Limit Life - The interval from the fill time to the time that the structural integrity of the reservoir, including an appropriate factor of safety, may be compromised, resulting in an increased probability of a Tritium leak.

Stockpile Life - The total number of years that a reservoir can be exposed to a Tritium environment. It may limit the number of times a reservoir can be refilled.



Nuclear System Basic Components and LANL Drawing Numbers



2. Unique signal is provided by the AMAC to enable the MC2929 strong-link switch (requires approximately 25 seconds).

C. Weapon release:

1. Pullout rods are extracted from the MC1200A Fuzing System Control Selector:

   a. Pullout switches in the main thermal battery output lines closed.
   b. Pulse generators in the MC1200A are actuated initiating the MC1262 Thermal Battery Packs (fast-rise batteries) and MC1315 Sequential Timers (parachute timers).

2. MC1262 fast-rise batteries provide 12-volt power:

   a. T_0 contacts in MC1315 timers close.
   b. MC1315s initiate the MC1264 Thermal Batteries (main batteries).

3. 28-volt power is applied to contacts in the MC1268 Interval Timer.

4. [redacted]

   a. MC1315 parachute timer contacts close, completing circuits between the MC1262 fast-rise batteries and the MC1060 Electric Detonators in the automatic parachute deployment system.
   b. MC1315 provides a signal to cut the retardation parachute suspension lines, and the parachute deployment sequence occurs.

      (1) Automatic deployment cover is separated from the rear case section by mild detonating fuze (MDF) system.
      (2) Automatic deployment cover deploys the pilot parachute.
      (3) Pilot parachute deploys the retardation parachute.
      (4) [redacted]
      (5) [redacted]

5. Laydown parachute drag causes the MC1268 Interval Timer (trajectory sensing device) to operate toward the armed position [redacted]

APPENDIX C

INTERNAL STUDIES NARRATIVE

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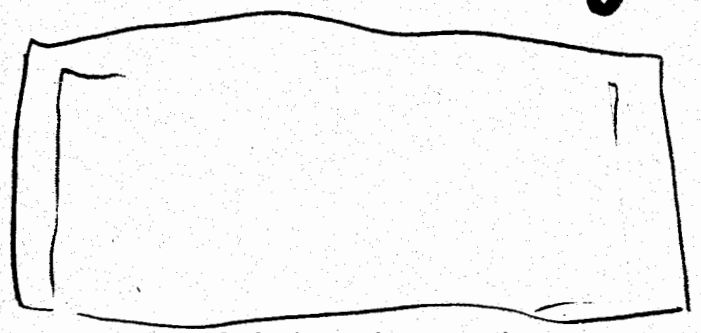
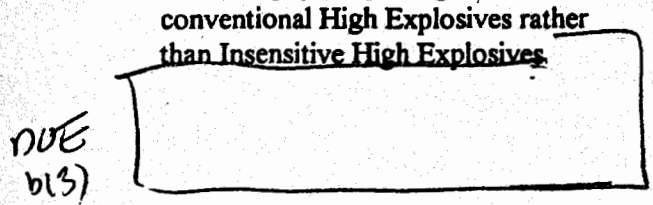
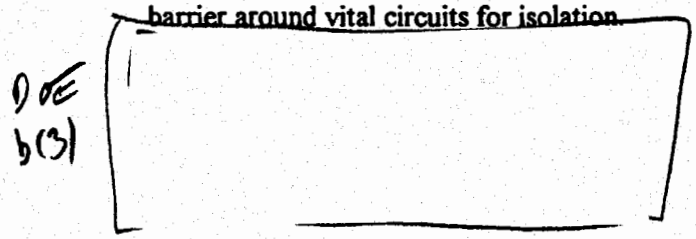


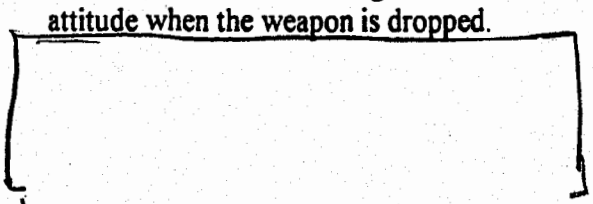
- The B53 physics package contains conventional High Explosives rather than Insensitive High Explosives.



- The B53 bomb was designed prior to the development of Enhanced Nuclear Detonation Safety (ENDS) concepts. The modification to the B53-1 utilizes a measure of ENDS, incorporating Power pack/shroud Zones and one hard-link (intent switch) and it does incorporate a barrier around vital circuits for isolation.



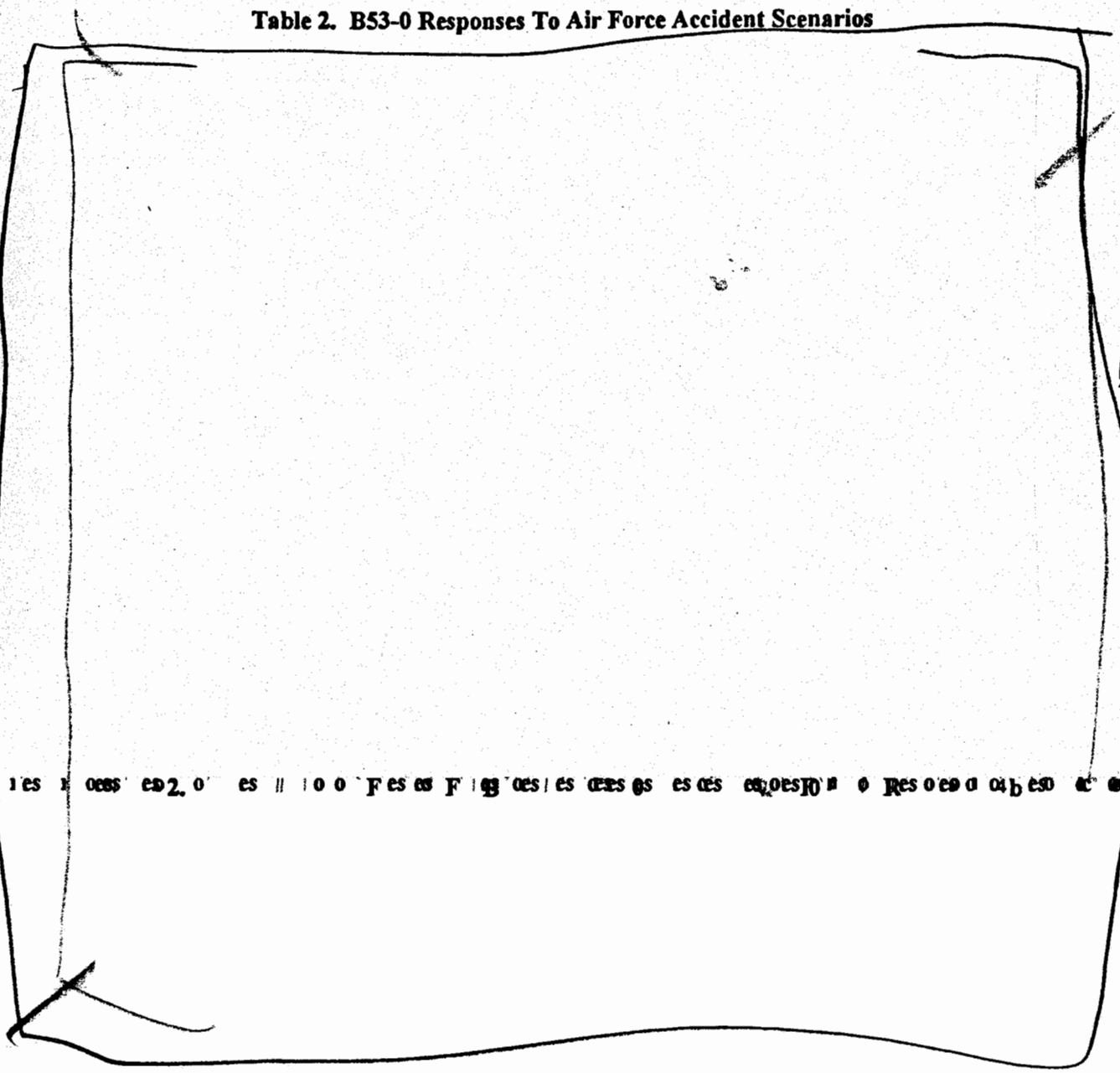
- The weapon contains an Environmental Sensing Device that is intended to block critical circuits until the intended use environment is sensed. The MC1268 interval timer senses a change in bomb attitude when the weapon is dropped.



APPENDIX D

TWG SUMMARY

Table 2. B53-0 Responses To Air Force Accident Scenarios



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