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CHAPTER I -- DESIGN OBJECTIVES OF THE WEAPON PROGRAM

General

[redacted] The TX-53 bomb and basic assembly are intended for application in SAC bomber aircraft (B-47, B-52, B-58, and B-70*) in the following delivery options:

High altitude delivered free fall air burst

High altitude delivered free fall contact burst

High altitude delivered retard air burst (except B-58)

High altitude delivered retard contact burst (except B-58)

Low altitude laydown delivery delayed burst.

The requirements derived from the Military Characteristics, Stockpile-to-Target Sequence and Ordnance Characteristics established by Sandia Corporation which dictated or influenced weapon design are outlined below.

Environmental Requirements

The weapon shall not be limited to any special storage environment and shall withstand, without damage, functional impairment, or reduction in reliability, the environment expected in the stockpile-to-target sequence (see Appendix B) with the exception of carriage in the B-70 aircraft (see Reference 9). To obtain an indication of the capability of the weapon to withstand the stockpile-to-target sequence, the weapon is required to withstand the applicable environmental tests specified in SC-4259(TR), Environmental Guide for Nuclear Ordnance Development.

The use of materials sensitive to radiation damage has been avoided in all components wherever possible, without serious compromise to other design requirements.

*Because of the high cost of developing components compatible with the anticipated high temperature environment of the B-70, and because of the partial suspension and uncertainty of the B-70 program, development to thermally upgrade the TX-53 for B-70 application was discontinued as of January 1960. Sandia Corporation advised that the TX-53 thermal upgrading development could be resumed and completed on time scales compatible with the B-70 program if authorization is received on reasonable time scales.

In the design of the TX-53, vulnerability to blast or fragment damage shall be minimized, and maximum protection aginst tampering or sabotage shall be afforded.

To meet this requirement, the basic assembly must be watertight.

The weapon is required to survive the impact loads associated with laydown.

Structural Requirements

The TX-53 structure is required to withstand loads imposed during handling, transportation, and flight, while being carried by the proposed carriers shown in Table I. After release from the carrier, the structure must withstand the aerodynamic loads, retardation parachute, laydown parachute loads, and impact loads.

Electrical System Requirements

The TX-53 is required to supply air burst, ground burst, and laydown delayed burst. These options shall be selectable in flight.

Compatibility Requirements

The TX-53 shall be compatible with the B-47 and B-52 bomb bays, including dual carriage in the B-52.

Safety Requirements

The probability of premature nuclear detonation from random component failures alone, for the environment specified, shall be less than the following:

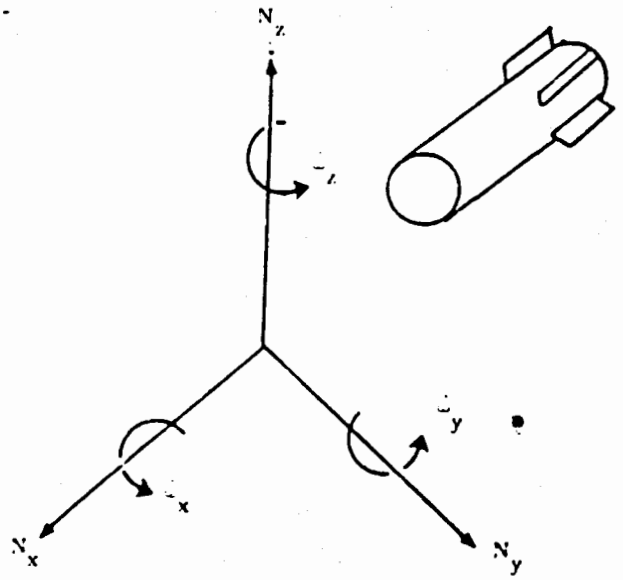
1. Storage, transportation, handling, and maintenance of the bomb and the basic assembly in a completely assembled condition, 1 in 10^6.
2. After drop, where a nuclear detonation might endanger aircraft or crew (exclusive of parachute failure), 1 in 2000.

Visual indication of a safe or unsafe condition shall be provided during ground handling. Release of the bomb in the unarmed condition must result in a nuclear dud. The bomb must be capable of remote arming and safing by the T-249, and provide positive indication of the armed or safe condition in the crew's compartment. Following a normal armed release, all accessible weapon safety devices shall have interlocks to prevent a simple means of disabling the weapon.

TABLE I

Design Loads

Condition	Inertia load factor (g) N_x	N_y	N_z	Angular acceleration (rad/sec^2) $\dot{\omega}_x$	$\dot{\omega}_y$	$\dot{\omega}_z$
B-47 and B-52 flight and landing (limit) (applied in combination)	±1.5	±1.5	+2.0 -5.0	0	±2.5	0
Hoisting (limit) (applied singly)	0	0	-4.0			
Transport (limit) (applied singly)	±6.0	±2.0	+3.5 -4.5			
Air transport emergency (ultimate) (applied singly)	±8.0	0	-6.7			
Laydown - initial impact (ultimate) (applied in combination)	+70	$\sqrt{N_y^2 + N_z^2} = 50$				
Laydown - secondary impact (ultimate) (applied in combination)	-50	0				
	0	$\sqrt{N_y^2 + N_z^2} = 100$				
	$\sqrt{N_x^2 + N_y^2 + N_z^2} = 100$					



Load factors and angular accelerations specified above are inertia load factors and angular accelerations acting at the CG of the weapon. The maximum value will be attained in not less than 0.03 second

Sign convention -- all load factors and angular acceleration are positive as shown.

Reliability Requirements

[redacted] Fuze functional reliability is assumed to mean reliability of the bomb at the target, excluding LASL nuclear components, but including the parachute system.

Continuity monitoring shall not be required immediately prior to takeoff. [redacted]

Logistic Requirements

The weapon shall be designed to be safe, easy to assemble, store, transport, and test.

CHAPTER II -- WEAPON DESCRIPTION

DOE (b)

General

[redacted] The complete bomb designed for B-47 and B-52 application weighs approximately 8850 pounds, is 50 inches in diameter, is 144 inches long (148 inches long at the peak of the automatic deployment closing cover).

The TX-53 bomb is composed of the TX-53 basic assembly and the TX-53 bomb shape components. T capability to assemble bomb shape components and the basic assembly into the bomb configuration and then to reconvert to the two previous configurations has been achieved in the design.

The TX-53 bomb (see Figure 1) consists of:

1. The TX-53 basic assembly.
2. The TX-53 bomb shape components.
   a. The automatic deployment cover.
   b. The rear case section.
   c. The parachute assembly with stowage can.
   d. The fins.
   e. The outer case segment system (cylindrical panels).
   f. The energy-absorbing nose assembly and nose fairing.
   g. The deformation switch.
   h. The cables and miscellaneous hardware.

TX-53 Basic Assembly

The TX-53 basic assembly consists of five principal items (see Figure 2):

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1. The basic subassembly.
2. The end cap [redacted]
3. The [redacted]
4. The electrical component mounting ring assembly.
5. The closing plate.

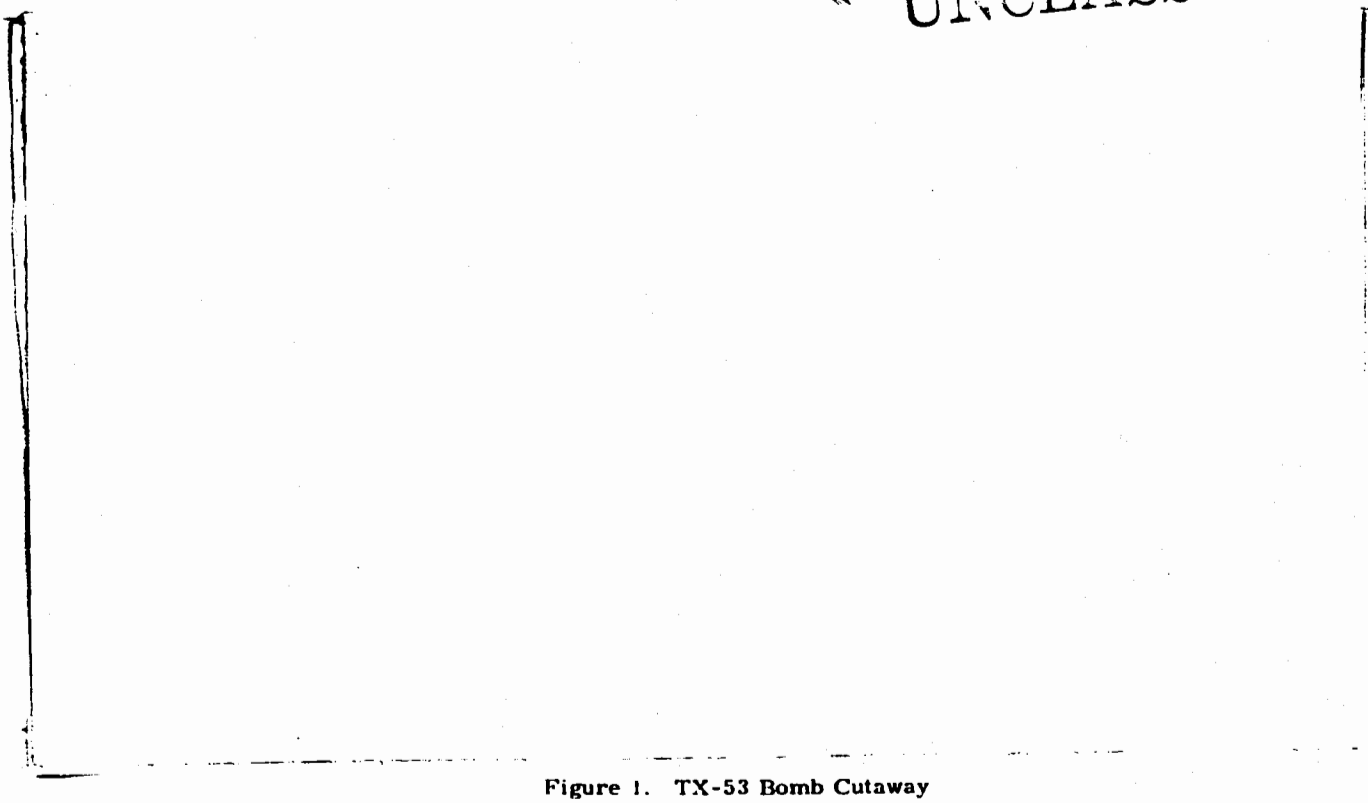

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Figure 1. TX-53 Bomb Cutaway

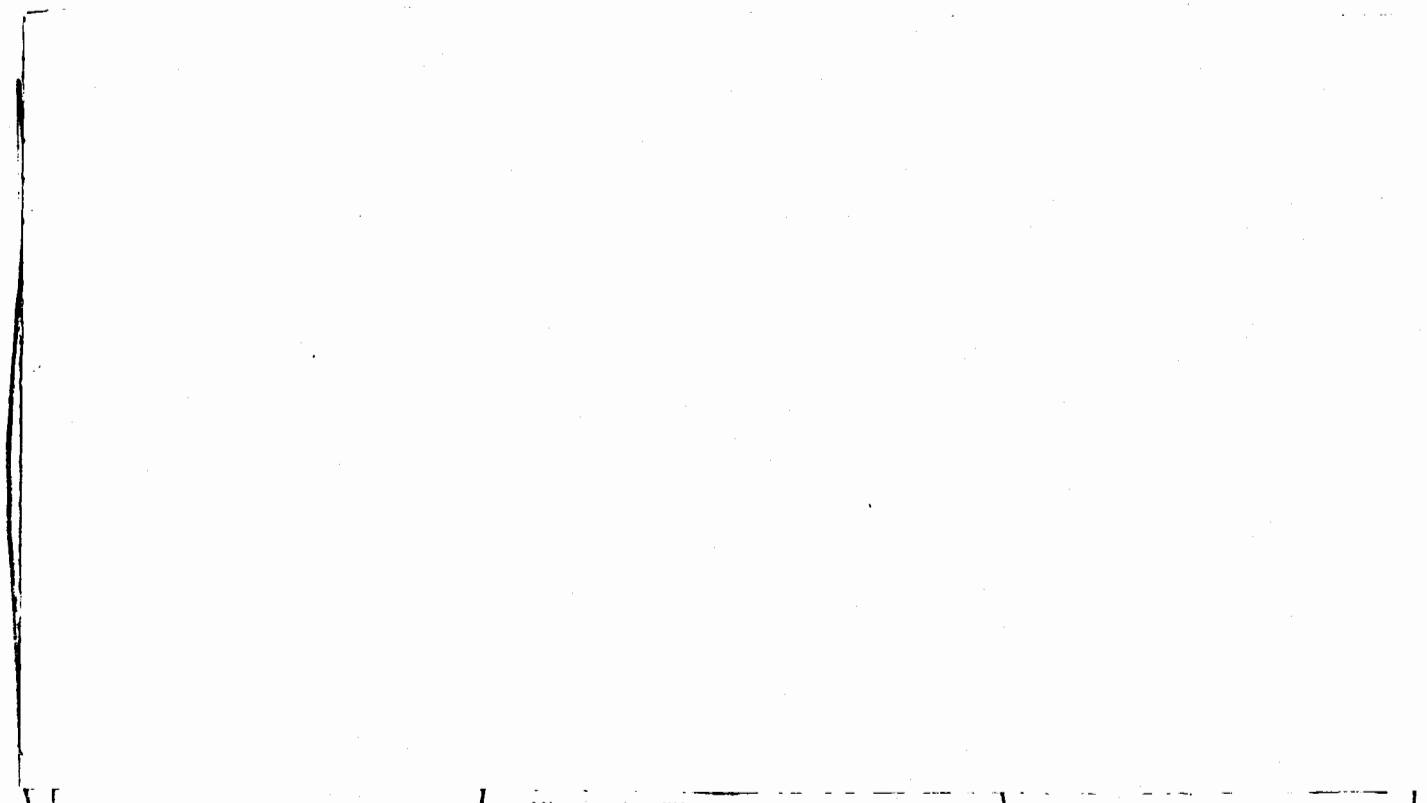

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Figure 2. TX-53 Basic Assembly

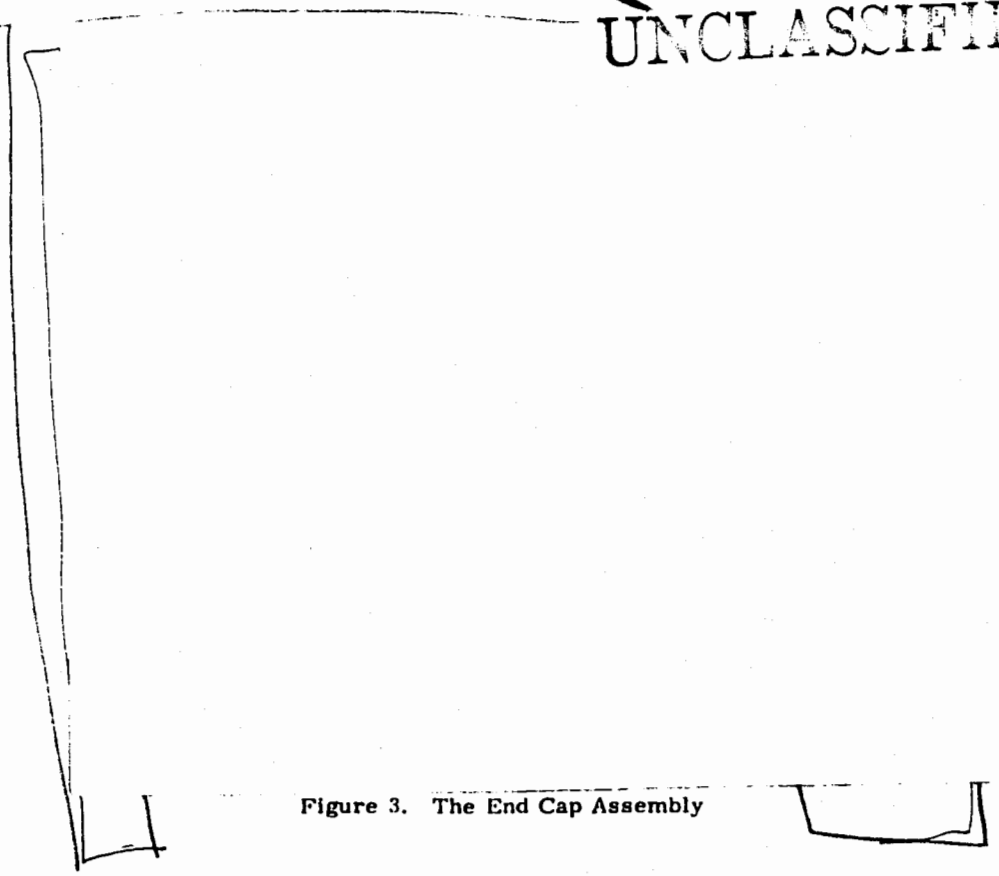

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Figure 3. The End Cap Assembly

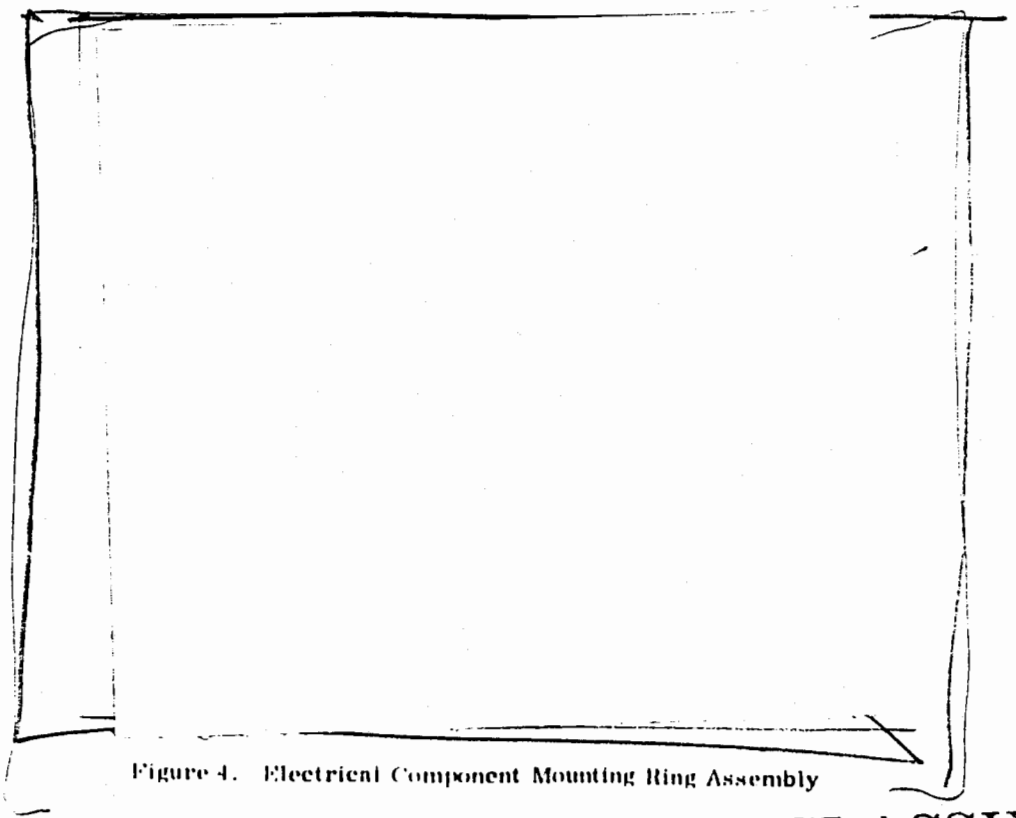

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Figure 4. Electrical Component Mounting Ring Assembly

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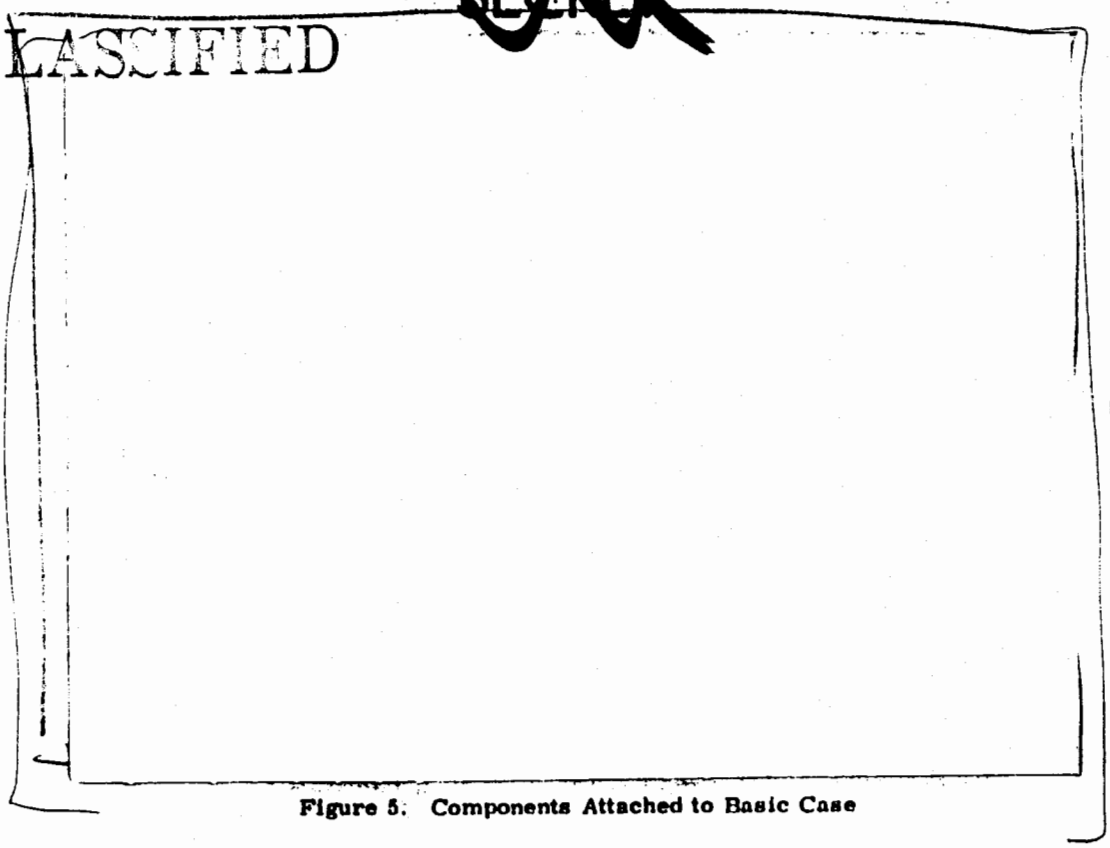

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Figure 5. Components Attached to Basic Case

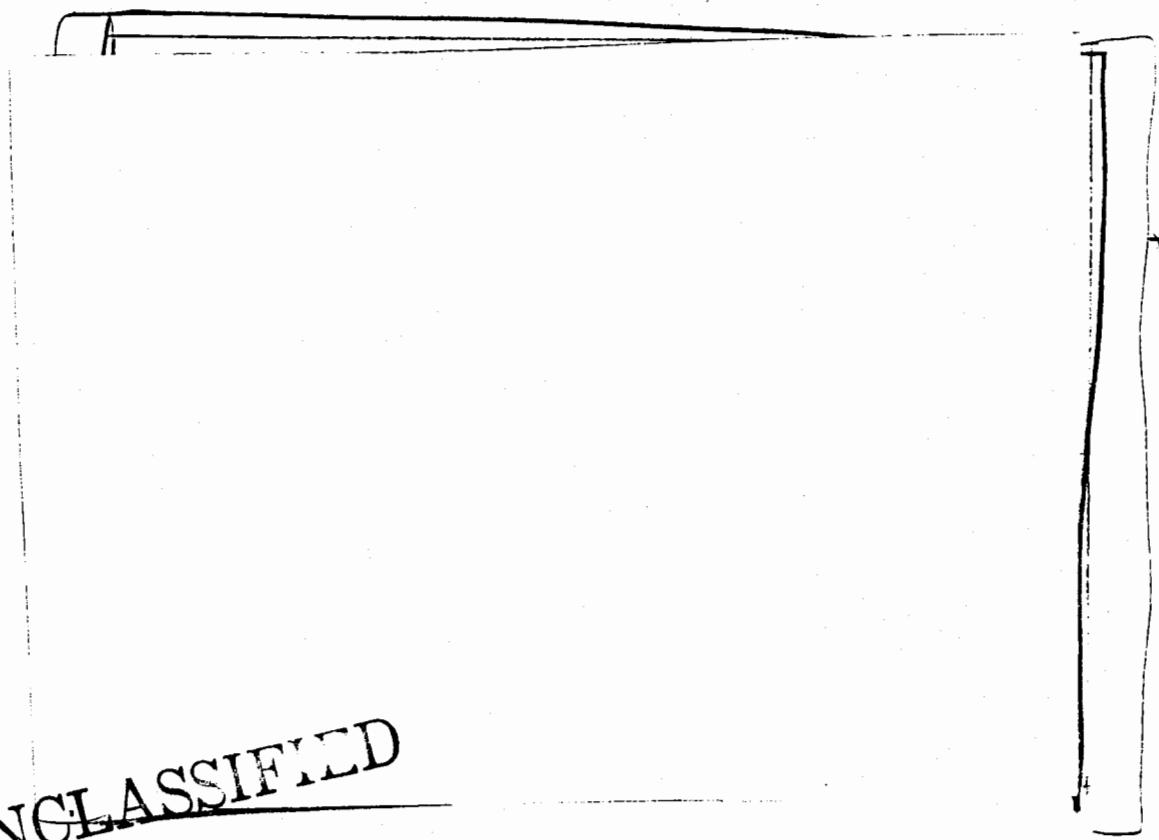

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Figure 6. Component Comartment

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Molded rubber cups are provided to cover, but not to seal off, the baro ports. The cups are bonded to brackets which are made of a leaf-spring material. These brackets are attached to the aft ring of the rear case section. The MDF system associated with automatic deployment removes the aft ring in every delivery option, thereby automatically uncovering the baro ports.

MC-1387 Parachute Assembly with Stowage Can

The parachute system, MC-1387 (see Figure 9) consists of an Air Force supplied parachute system and a stowage can (MC-1388). The parachute system includes a 4-foot pilot chute, a 16.5-foot ribbon type chute permanently reefed to 12 feet (retard chute), and three 48-foot ribbon type chutes (laydown chutes), each reefed to 22.5 feet for two seconds after line stretch. Each parachute is packed into its associated deployment bag before assembly into the parachute stowage can.

The parachute stowage can is a honeycomb structure that provides a parachute volume of 26 cubic feet and contains two suspension line lug systems. One of the lug systems is used to attach the laydown chutes, and to provide a load-carrying path to the rear case section. The other lug system is used to attach the retard chute. It contains a cutting anvil to be used, in conjunction with the associated shaped charge mild detonating fuse system (flexible linear shaped charge) in the rear case section, to cut the retard chute suspension lines when the laydown option has been selected. Thus the retard chute deploys the laydown chute.

Fins -- The fins (see Figure 10) are double-wedge honeycomb panel structures. Four fins per weapon are used and, when mounted on the rear case section, they will fit into a square box 38.3 inches to a side. The fins are attached to local strong areas on the rear case section by externally accessible cap screws.

DOE b(3)

Outer Case Segment System -- The outer case segment system (see Figure 11) consists principally of two 170-degree included-angle cylindrical segments and two 10-degree included-angle wedges. [redacted] The segments are positioned on the basic assembly and bolted together. The segments are tightened onto the basic case in a manner similar to a large two-piece clamp. The wedges, which are similar in construction to the segments, complete the encasement of the basic assembly within the outer case segment system. Cables from the deformation switch are routed beneath the wedges in the cable clamps shown in Figure 11. Each wedge is secured to the segments by attaching strips containing integral cam-lock-type fasteners.

Energy Absorbing Nose Assembly and Nose Fairing -- The energy absorbing nose assembly is an aluminum honeycomb sandwich structure which is contoured at the aft end to fit the hemispherical nose of the basic assembly (see Figure 12), and to accept a slip ring (see Figure 14) employed as a mounting ring. The forward end is configured to accept a nose fairing, which is an aerodynamic covering over the energy absorbing nose. Also, the energy absorbing nose accommodates attachment of a deformation switch in the shallow cylindrical well shown in Figure 13. The energy absorbing nose is designed to absorb the energy of impact resulting from a maximum velocity combination of 55 fps vertically and 51 fps horizontally and to limit longitudinal loading on the basic assembly to 70 g. The energy absorbing nose is attached to the basic assembly by 45 bolts and to the outer case segments through the slip ring (Figure 14) by 38 studs. Grooves and tunnels are provided for deformation switch cable routing.

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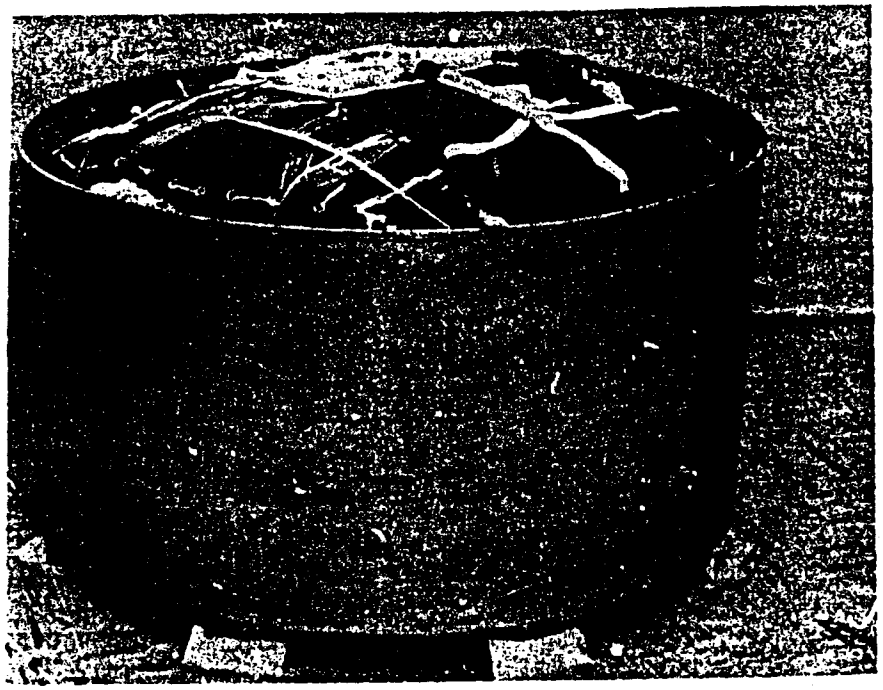

Figure 9. Parachute Assembly with Stowage Can

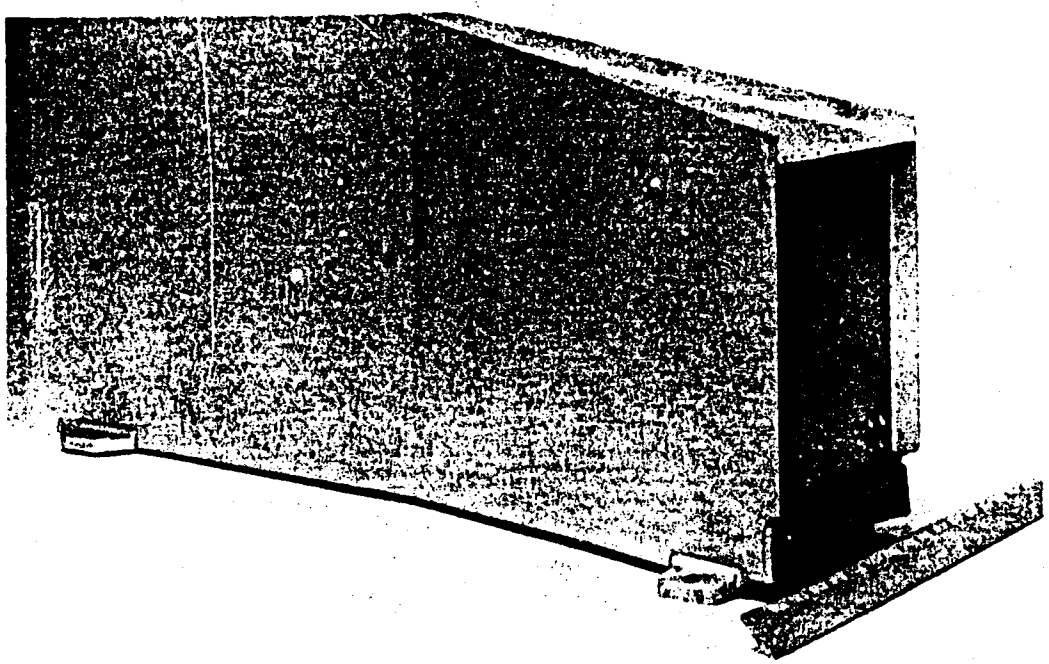

Figure 10. Fins

Figure 11. Outer Case Segment System

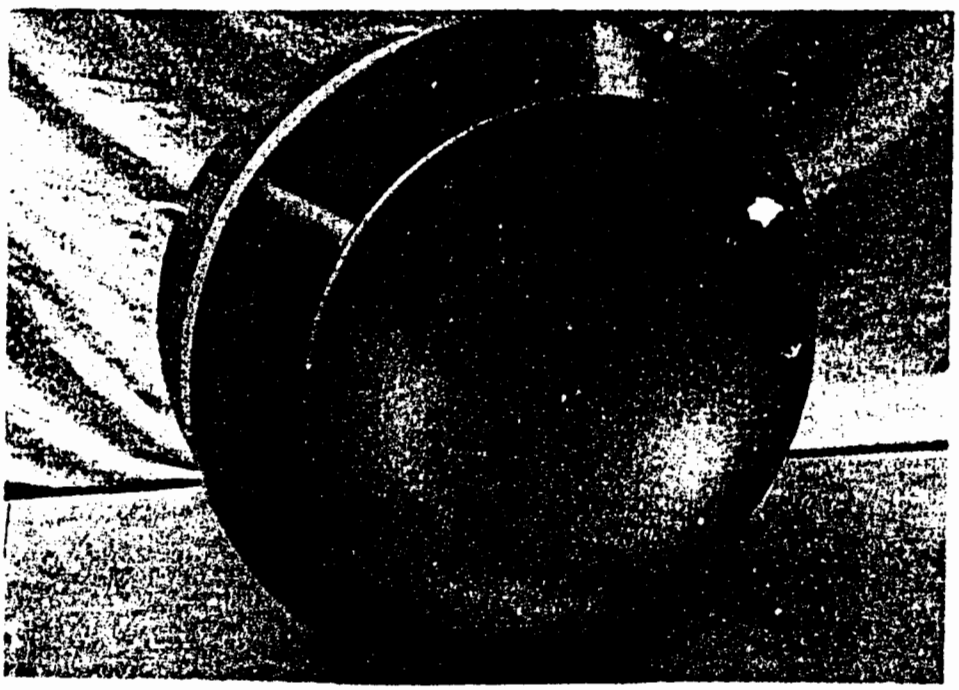

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Figure 12. Energy Absorbing Nose (Aft View)

MC-1204 Squib and Fuse Pack

The MC-1204 squib and fuse pack (Figure 21) is a single package containing all of the explosive switches and electrical fuses used in the TX-53.

Upon receipt of a signal through closure of the arming baro elements, two of these explosive switches are actuated and carry the chopper-converter surge and operating current. In the same manner at fire baro closure, or laydown timer fire signal, two other explosive switches provide contact closure for the firing set pulse transformer.

MC-1266 Arm/Fire Baro

The MC-1266 arm/fire baro (see Figure 22) in the MC-1204 when the weapon has been delivered from high altitude. Two of the elements, in conjunction with explosive switches, initiate X-unit charging when the MC-1266 senses a predetermined arming altitude. In the air-burst option, the other two elements in conjunction with explosive switches provide a signal to the MC-1343 firing pulse transformers when an altitude is sensed consistent with the baroswitch setting.

The MC-1266 is a repackaged, Army Ordnance Corps M-5 baro. The setting can be changed external to the basic assembly with a T-389 which operates a servo system built into the baro. The MC-1266 is mounted to the electrical component mounting ring.

MC-1199 Ground Safing and Retard/Free-Fall Switch

The MC-1199 has two separate functions:

1. In the safe position, it provides safety during handling and storage by preventing 28-volt thermal battery power from reaching the fuzing circuits.
2. In the armed position, it also selects between high altitude retarded and high-altitude free-fall deliveries.

The MC-1199 (see Figure 23) is manually operated external to the weapon. It has three control positions: safe, retard, and free-fall. The handle of the MC-1199 is mechanically locked in the safe position by a solenoid-operated pin until the following conditions are met:

1. The weapon must be electrically connected to the aircraft.
2. The T-249 aircraft monitor and control system must be in the safe position with the power turned on.
3. The MC-1200, as controlled by the T-249, must be in the safe position.

The MC-1199 may be operated to the safe position with or without aircraft power applied to the solenoid. The MC-1199 is also equipped with a squib-actuated lock which operates on a signal from the MC-1268 trajectory safing device when the MC-1268 senses a normal trajectory. This lock prevents manual switching of the MC-1199 to the safe position after laydown delivery has been executed.

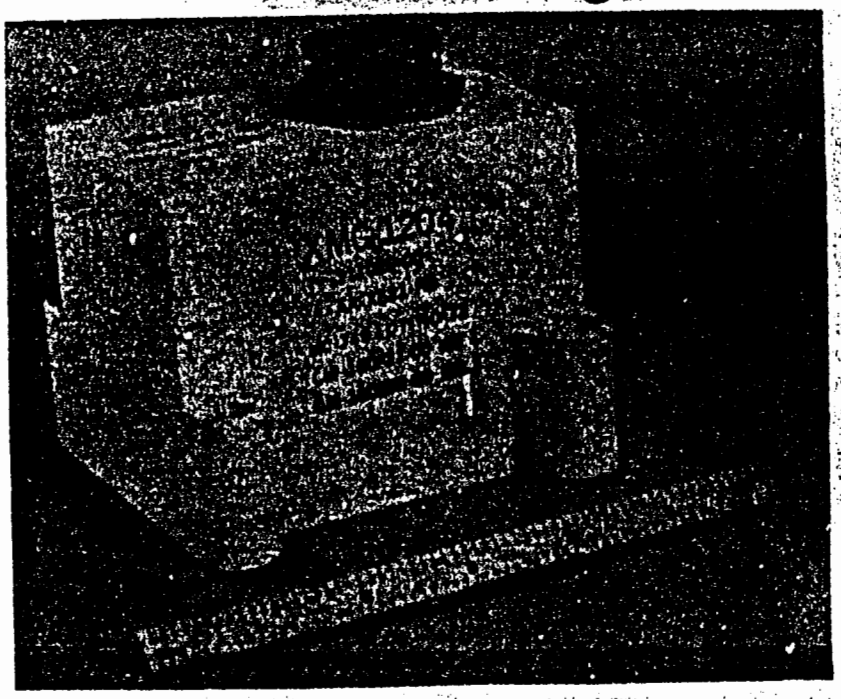

Figure 21. MC-1204 Squib and Fuse Pack

Figure 22. MC-1266 Arm/Fire Barr

The MC-1202 is a two-channel motor-driven switch housed in a sealed aluminum case. Each channel consists of a 12-volt DC motor which operates through a gearbox to drive an aluminum camshaft.

MC-1312 Option Baro

The MC-1312 option baro (see Figure 28) completes the circuits between the MC-1262 fast rise thermal batteries and the MC-1202 option switch motors.

The MC-1312 is a low-volume, four element baro.

MC-1315 Parachute Timer

Two MC-1315 timers (see Figure 29) are used to complete the circuits between the MC-1262 fast-rise batteries and the parachute deployment systems. These circuits are completed 1 to 1.14 seconds after the MC-1315 receives a pulse from the pulse generators in the MC-1200. The MC-1315 is a spring-wound escapement timer initiated by an MC-727 explosive motor. The MC-1315 has dual channel switching; therefore, each of the two MC-1315 timers connects both fast-rise batteries to the dual channel deployment systems.

MC-1262 Fast Rise Thermal Battery

Two MC-1262 fast rise thermal batteries (see Figure 30) are used in the TX-53 weapon system. The MC-1262 is a two-section thermal battery containing a 12-volt fast rise section and a 28-volt power section. Basically, it is two batteries in a single case with a common negative terminal.

Electrical connections to the MC-1262 are made through the SA-870-1 sealed connector. The 12-volt section of the battery is designed to activate quickly and furnish short duration pulse currents. The 28-volt section is designed for slower activation and delivery of a high current for a relatively longer time.

MC-1203 Interconnecting Box

The MC-1203 interconnecting box (see Figure 31) is a pigtail type interconnecting box which completes the circuits between components in the aircraft monitor and control system and the parachute deployment systems.

release, the MC-1315 timer contacts close, completing the circuits between the MC-1262 fast rise thermal battery and the appropriate MC-1060 detonators in the automatic parachute deployment systems. At the same time, a signal is provided from the MC-1315 through the MC-1202 to cut the retardation parachute suspension lines, and the following parachute deployment sequence occurs (see Figure 35).

1. The automatic deployment cover is separated from the rear case section by the MDF system.
2. The automatic deployment cover deploys the pilot chute.
3. The pilot chute deploys the retardation chute.
4. The retardation chute, which has been cut loose from the retardation chute lugs, deploys the laydown parachute system.

The laydown parachute system is required to decelerate the weapon to a vertical terminal velocity of 55 fps maximum and limits the attitude angle of the longitudinal axis of the weapon to within 10 degrees of vertical at the time of impact. Upon impact, the kinetic energy is converted into work when the aluminum honeycomb in the energy-absorbing nose is crushed at a uniform load of approximately 70 g's. If a windy condition exists at the target, the weapon will have horizontal velocity as well as vertical velocity. At impact the weapon will topple, causing a secondary impact to occur. The aluminum honeycomb components (fins, rear case section, parachute stowage can, and outer case segments) deform to absorb the secondary impact energy and limit the loads to no more than 100 g's laterally within the basic assembly. All of the fuzing and firing components employed in the laydown option are housed within the basic case and are designed to withstand the 100-g impact shock load.

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High Altitude Delivery

If the weapon has been delivered from above 22,000 feet mean sea level, the MC-1312 option baroswitch contacts are closed, completing the circuit between the MC-1262 fast rise battery and the MC-1202 option switch.

The 22,000-foot minimum altitude was established by adding the sum of the deviations caused by baro-sensing errors and meteorological prediction errors to the upper operational limit of the MC-1312 option baro. Less than one second after release of the weapon the MC-1202 option switch operates to the high-level option. One second after release, the MC-1315 timer completes the circuits between the MC-1262 fast rise

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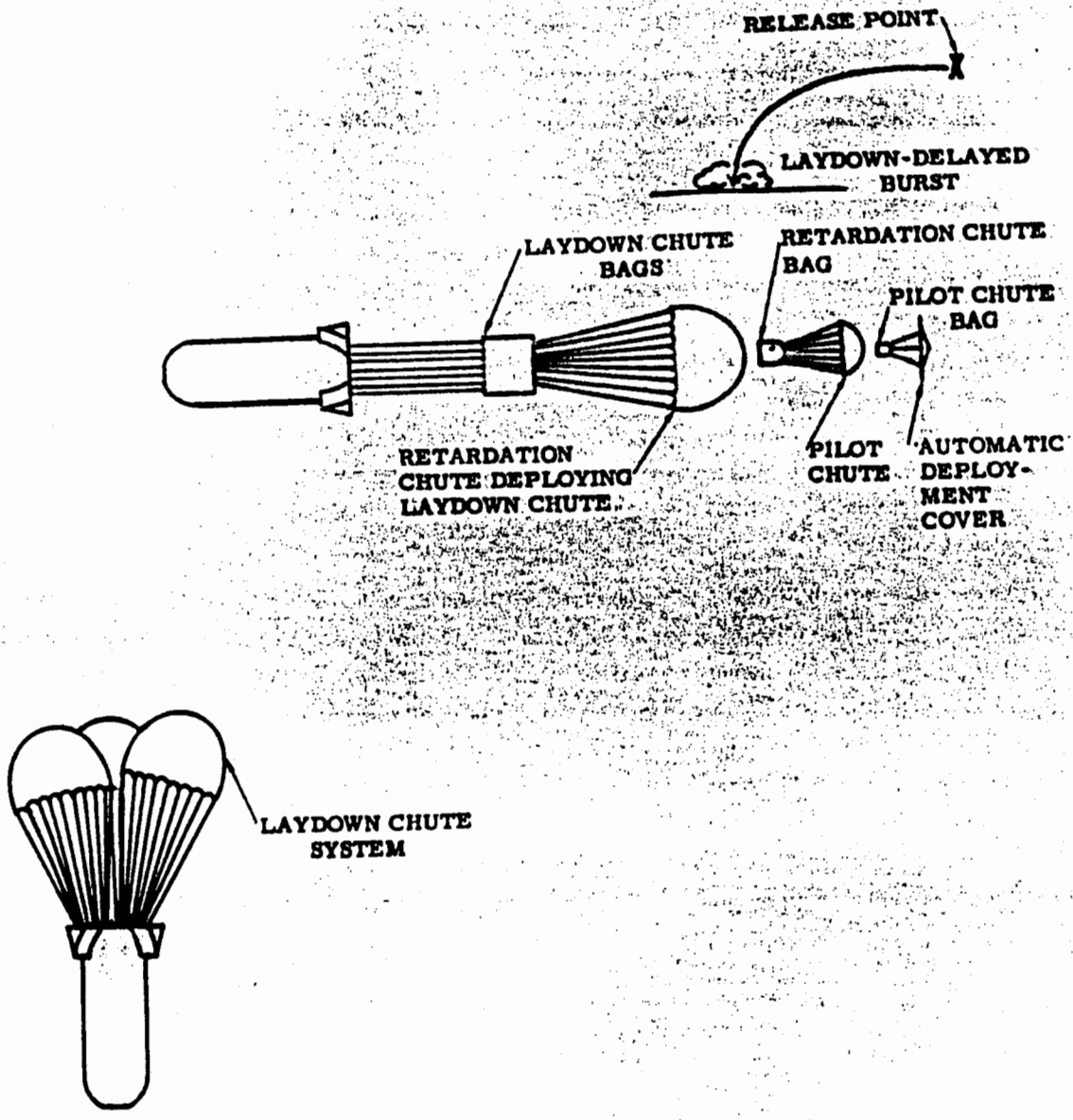

Figure 35. Laydown Option Deployment Sequence

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MHU-29/C Clip-In Subassembly

The aircraft presently designated as carriers for the TX-53 are the B-47 and B-52. At the time Phase 3 authorization was received, these airplanes were being fitted with clip-in suspension systems which consisted of a clip-in subassembly for the bomb and either the MAU-5/A aircraft adapter for the B-47 or the MAU-6/A aircraft adapter for the B-52.

A clip-in subassembly was being developed for an existing weapon which is 50 inches in diameter but which has a substantially different center of gravity and a hard outer case. The method used in the design of this clip-in subassembly to transmit longitudinal flight loads was friction between the bands of the clip-in subassembly and the hard case of the weapon. This approach requires substantial tightening of the bands around the weapon. Since the outer case segment system of the TX-53 is a thin sheet metal skin backed up by aluminum honeycomb (for laydown energy absorbtion), it was evident that a new clip-in subassembly was required. The MHU-29/C, clip-in subassembly was developed concurrently with the TX-53. A thrust pad on the bomb engages the clip-in subassembly for transmission of longitudinal flight loads. The MHU-29/C is shown attached to the TX-53 stowed in the H-794/H-795 hand truck in Figure 38.

Two fit tests have been conducted, the first resulted in several changes to the MHU-29/C and the TX-53. The last test revealed the lack of adequate clearance between the hand truck and the clip-in subassembly. Modification to the MHU-29/C has been requested to eliminate this interference. A prototype MHU-29/C was used in the test aircraft to accomplish eleven laydown and three high-altitude test drops as reported in Chapter III. A structural test of the MHU-29/C was conducted using a TX-53 basic assembly and an outer case segment system. At design ultimate load, structural compatibility was demonstrated.

In a later test in which a MHU-29/C was used with a TX-53 bomb, structural adequacy was demonstrated; however, excessive deflection of the clip-in subassembly necessitated a subsequent MHU-29/C–TX-53 flyaround test (not yet completed) to monitor bomb to bomb bay clearance.

Transportation and Hoisting

Figure 39 shows the weapon ready for loading into a B-52 bomb bay where the MHU-7/M trailer is employed. Clearance has been demonstrated with the minimum clearance encountered with low B-47 landing gear struts and irregular loading area surface (ice).

B-47 Aircraft

Figure 40 illustrates the TX-53 in the B-47 bomb bay. The TX-53 is compatible with the B-47 for both high and low altitude releases if the bomb bay spoiler doors on the aircraft are retracted to prevent adverse weapon pitch-down.

Compatibility of the TX-53 with the B-47 test aircraft has been demonstrated by 20 laydown and 9 high altitude drop test operations. A flyaround test is scheduled to investigate clearances between the bomb fins and the bomb bay with the bomb bay doors both open and closed.

B-52 Aircraft

Figure 41 illustrates the TX-53 (dual carriage) in the B-52 aircraft. The TX-53 is compatible with the B-52 for either a high altitude or a low altitude release. Single carriage in either bomb bay location or

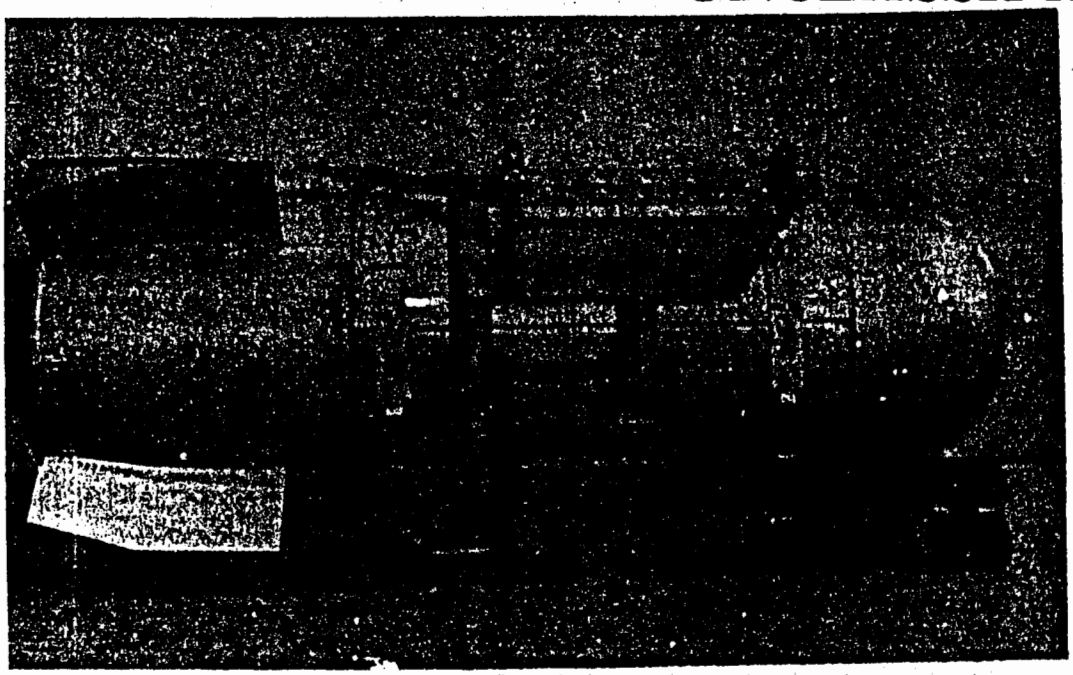

Figure 38. MHU-29C used with the H-794/H-795 Hand Truck

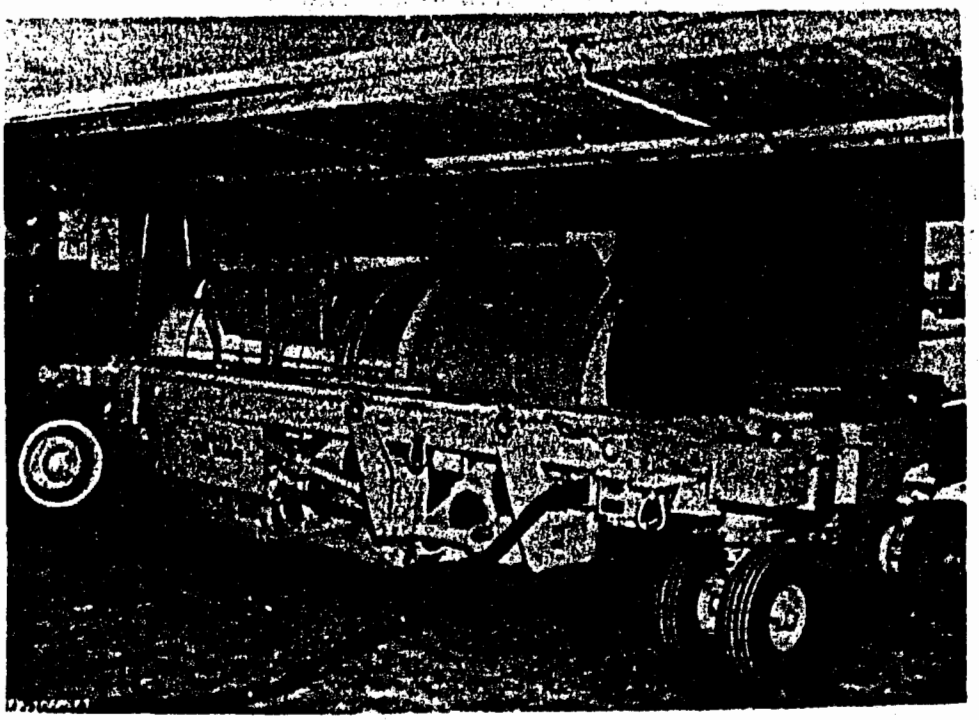

Figure 39. MHU-7/M Trailer

Figure 40.

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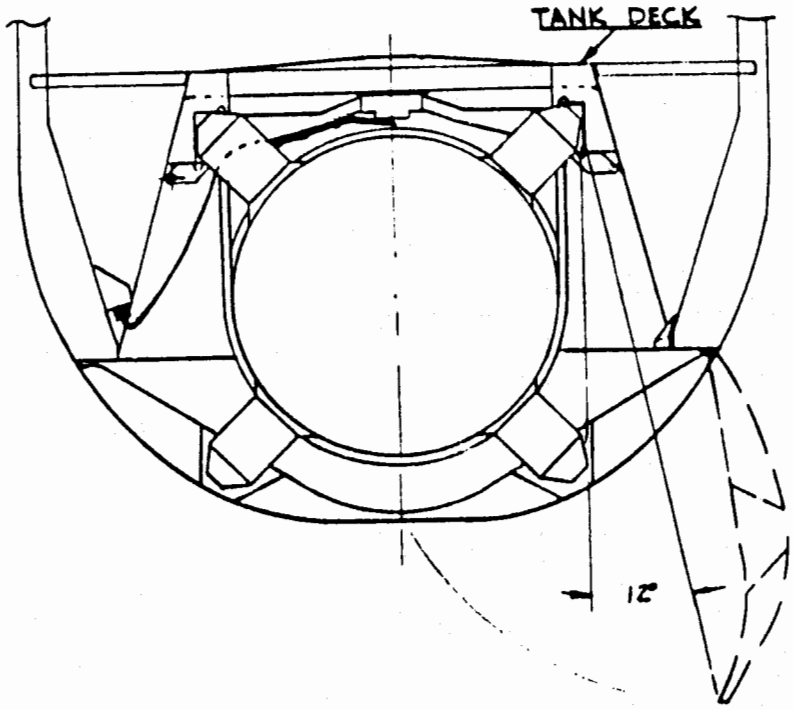

3 in B-47 Bomb Bay

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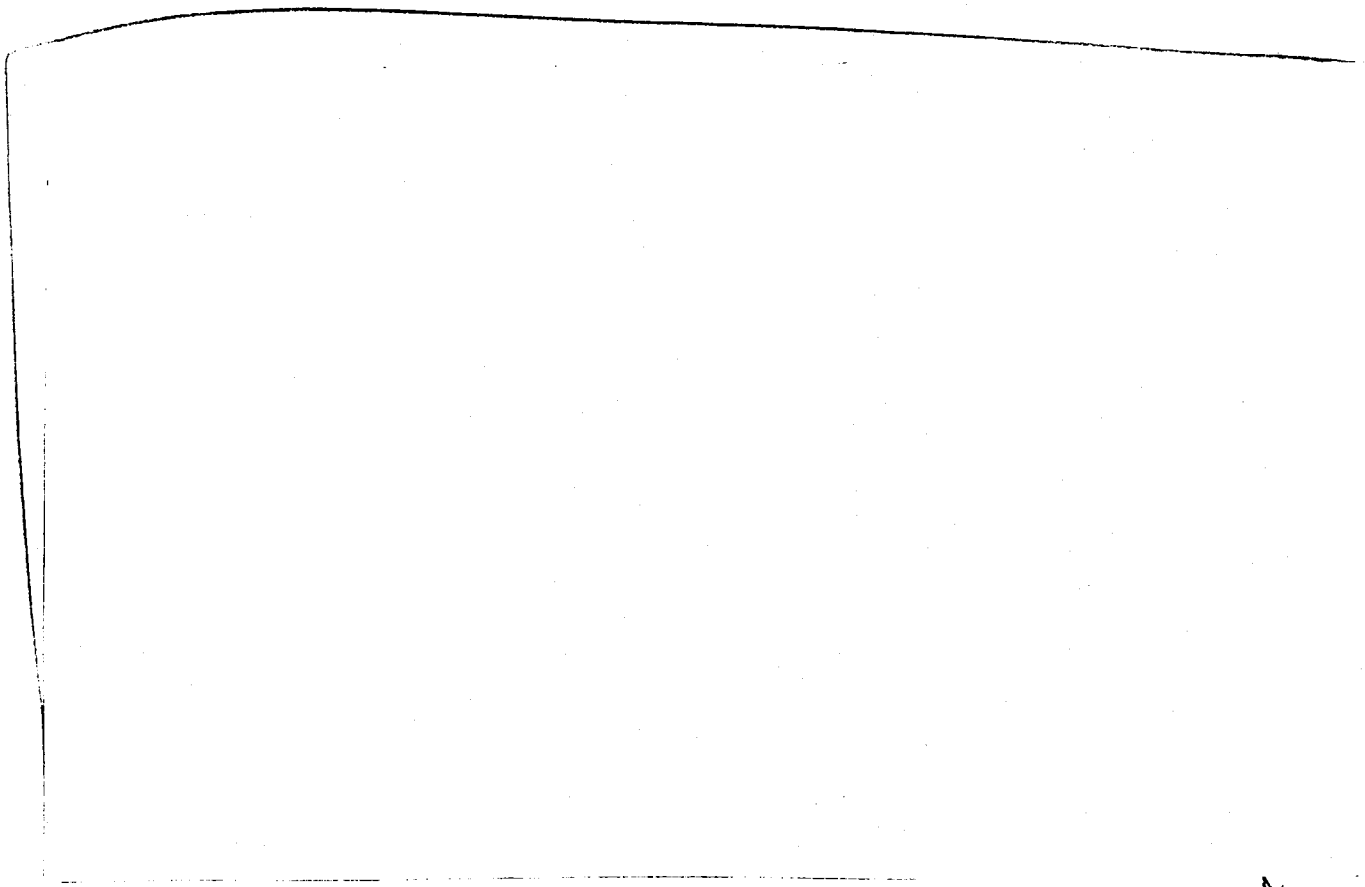

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Figure 4

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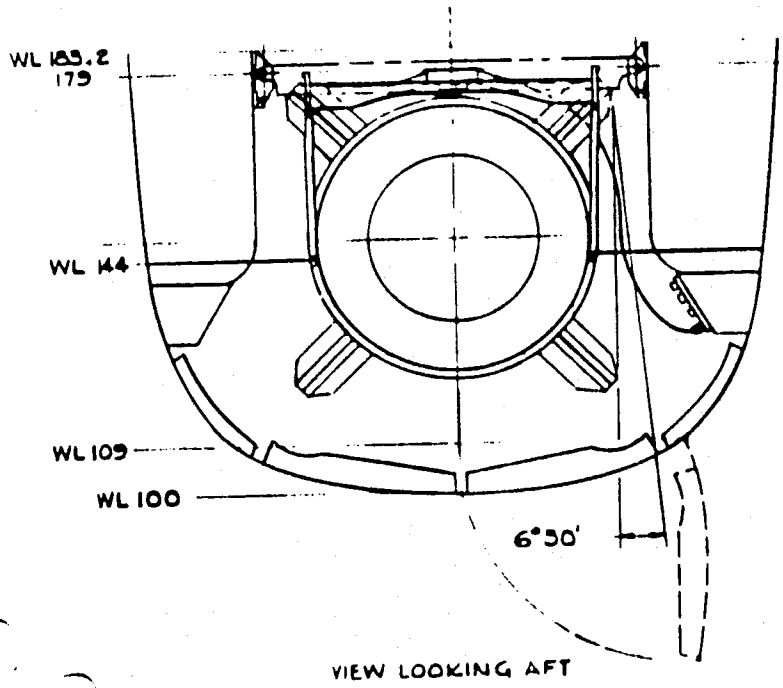

TX-53 in B-52 Bomb Bay

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dual carriage is permissible. Either bomb may be released first. As illustrated in Figure 41, adequate fall clearances have been preserved and maximum parachute volume has been attained by the design of the tent-shaped automatic deployment cover. Dual carriage and fall clearance of the TX-53 from either B-52 bomb bay dictated the shape of the automatic deployment cover. Other weapon types have been dual-carried with the TX-53 in the B-52 during the development drop test program.

An extensive fly-around test is scheduled to demonstrate the compatibility of the TX-53 with the B-52H aircraft. Compatibility of the TX-53 with the B-52 test aircraft has been demonstrated by two laydown and sixteen high altitude drop test operations.

Aircraft Monitor and Control System

The TX-53 is compatible with the T-249 or T-249A aircraft monitor and control system and the T-380 peace/readiness switch used in the B-47 and B-52 aircraft. Compatibility has been demonstrated by the fuzing and firing drop tests reported in Chapter III conducted with T-249 or T-249A equipped aircraft.

Safety

Accidental detonation of the TX-53 is prevented by a series of safing devices which can be categorized as follows:

1. Manually set
2. Remotely set
3. Environment sensing

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The standard visual safety check to determine the condition of the TX-53 (safe or unsafe) consists of checking that the MC-1100 ground handling safety switch is in the safe position.

Reliability

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Although the TX-53 bomb is easy to store, handle, and transport with the designated handling equipment, the energy-absorption system and rear case section, which completely surround the basic assembly, are susceptible to damage from sharp objects or concentrated loads. Honeycomb repair procedures are being provided to permit limited field repairs of these components in the event of accidental damage.

Testing

Safety Testing -- The TX-53 [redacted]

Baro Setting -- [redacted] It is unlikely that this setting will ever be changed; however, the T-389 has been developed so that fire-baro setting can be changed at depot level if war plans make a new air-burst altitude necessary.

Continuity Testing -- The Military Characteristics for the TX-53 require that the reliability of the TX-53 shall not be dependent upon continuity monitoring immediately prior to take-off. The TX-53 does not require a continuity test immediately prior to take-off; however, continuity testing is required after initial assembly and following any operation in which a cable (other than the pullout cable or a tester cable) has been disconnected or connected. This includes retrofits and field conversions. Since continuity testing and pressure testing are accomplished simultaneously with the same test equipment, continuity test intervals in the field are determined by pressure testing criteria (see the Pressure Testing for continuity test intervals and continuity test equipment).

Wherever practical, the continuity loops are designed to be incomplete electrically until the following conditions are satisfied:

1. All cables must be connected.
2. Each cable must be connected to the correct component.
3. All squib operated devices must be in the unfired condition.
4. All motor-driven devices must be in the reset position.

Following are the actions that should be followed if an open electrical continuity loop is discovered:

1. Since an open continuity loop may indicate some loss of safety, the ground handling safety switch must be in the safe position and the arming rods must be checked to assure that they have not been extracted before any movement of the weapon is attempted.
2. If the arming rods have been extracted or the ground handling safety switch cannot be safed, the weapon should be treated as dangerous. Disposition should be referred to IOD procedures.
3. If an open continuity loop is detected and if the safety checks of (1) above have been successfully accomplished, the weapon will be rejected and its disposition determined jointly by the IOD and AEC.

Pressure Testing -- The TX-53 basic assembly is designed to be sealed and pressurized at the time of assembly, and pressure monitoring will be required at intervals not exceeding 1 month. Considerable

development testing is being done to prove the integrity of the weapon seal. Results of these tests and initi stockpile pressure monitor data will be analyzed in an effort to increase the stockpile pressure monitor interval.

Case pressurization is monitored by means of two pressure switches set to operate at different pressure levels. They are located inside the basic assembly. These pressure switches and the electrical continuity loops (see continuity test above) are monitored with the T-304B or T-304C continuity tester used in conjunction with the T-392 adapter cable kit. The adapter cables connect the T-304 to the continuity connector located on the outside of the basic assembly case. The T-304 has two indicating lamps (DS1 and DS2 and the T-392 has two cables (CT-1360 and CT-1361). The table below describes the meanings of the indication on the T-304 when using the different tester cables:

	DS 1 Lamp Lights	DS 2 Lamp Lights
Cable CT-1360	Pressure above 22 psi absolute	Pressure above 18 psi absolute and good continuity loops.
Cable CT-1361	Pressure above 18 psi absolute	Good continuity loops.

Possible pressurization and continuity indications (as obtained with the T-304 test) and the resulting actions are listed below:

1. If case pressure is above 22 psi absolute and the electrical continuity is complete, the unit is satisfactory.
2. If case pressure is between 22 psi absolute and 18 psi absolute and the electrical continuity loop is complete, the unit can be used but should be repressurized before further storage.
3. If case pressurization is lost and the electrical continuity loop is complete, the unit may or may not have to be rejected depending on its pressure history:
   (a) If the pressure history is unknown or indicates loss of pressure more than once in a 6-month period, rejection of the unit is mandatory. Disposition is determined jointly by the DOD and the AEC.
   (b) If the pressure history indicates that a previous loss of pressurization has not occurred within a 6-month period, the unit may be repressurized in the field.
4. If the electrical continuity loop is not complete, the unit must be rejected. Disposition is determined jointly by the DOD and the AEC.

Stockpile Sampling Program -- New materials system test (NMST) and quality evaluation system test (QEST) programs will be conducted. Stockpile sampling for the QEST program will continue through the stockpile life.

Capability to Meet MC's

The test program as of July 1, 1961 is approximately 75 percent complete. Test data received thus far indicate that, in general, the Military Characteristics have been complied with. Exceptions are as follows:

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1. [redacted] Tests to demonstrate laydown delivery compatibility with minimum aircraft release speed have not been accomplished.

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2. [redacted]

DOE b(3)

3. [redacted]

4. The Military Characteristics specify separate reliability requirements for the "warhead" and for the "fuze." Since both TX-53 configurations, one for the B-58 aircraft and one for the B-47 and B-52 aircraft, contain fuzing and warhead components, no clear-cut distinction exists between warhead and fuze. As a result, reliability estimates have been made only on the complete bomb. Analysis indicates that the TX-53 design can meet a functional reliability in each option (air burst, ground burst, and laydown delayed burst) of [redacted] In making the analysis it was assumed that the weapon would impact on a reasonably smooth surface. Laydown reliability has not been evaluated for targets such as railroad yards or cities.

DOE b(3)

5. The TX-53 is not compatible with the B-70 aircraft because of direction from the MLC through AEC to suspend development efforts on the B-70 application of the TX-53. The B-70 application problems requiring special weapon development efforts were (1) high temperature bomb bay environment, (2) bomb suspension system, (3) a major electrical power difference from that available in the B-47, B-52, and B-58 aircraft, and (4) high speed release conditions.

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6. The requirement for maintaining the weapon in a completely assembled condition ready for immediate employment [redacted]

For complete information about compliance with the Military Characteristics and the Stockpile-to-Target Sequence, see Appendixes B and C, respectively.

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TABLE II (cont)

Type of test*	No. planned	No. complete	Percentage complete
High-altitude free-fall			
Air-drop tests			
Ballistic	8	8	100
Ballistic with F&F	5	3	60
High-altitude retarded			
Air-drop tests			
Ballistic	9	9	100
Ballistic with F&F	5	3	60
Low-altitude laydown			
Air-drop tests			
Ballistic	6	6	100
Ballistic with F&F	2	2	100
[redacted]	12	4	33
TRM less F&F	6	3	50
Special tests			
Sled test (nose)	10	5	50
75-mm cannon tests (nose)	14	9	64
Preproduction tests	3	0	0
Fly around tests	3	1	33
Environmental tests			
Complete bomb	3	1	33

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*The following definitions apply to vehicles used in the TX-53 test program. Exceptions are noted in the text.

	Case	Energy absorption system	[redacted]	Fuzing and firing
TRM (trial run model)	Cast, forged, or extruded aluminum	Complete		Complete
Ballistic	Steel or modified TX-46 aluminum case	Simulated		None

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TABLE III

Summary of Results of Full-Scale Tower Drop-Test Program
Tests to Design Conditions, for the TX-53

Test No.	Date	Description of Test Unit: Case	Description of Test Unit: Fuzing & Firing System	Impact Velocity (ft/sec): Vertical	Impact Velocity (ft/sec): Lateral	Impact Acceleration (g's): Vertical: Measured	Impact Acceleration (g's): Vertical: Design Maximum	Impact Acceleration (g's): Lateral "Slapdown" (Design maximum is 100g's)	Impact Attitude (Degrees): From the Horizontal	Impact Attitude (Degrees): From the Vertical	Remarks
53-53L	9-23-60	Cast A1	None	54	19	65	50 (toroidal nose)	20	89.5	0	
53-54L	10-6-60	Cast A1	None	54	24	55	50 (toroidal nose)	15	95.4	0	
53-55L	11-19-60	Forged A1	None	53	30	53	50 (toroidal nose)	75	82.6	-7.0	
53-56L	12-3-60	Forged A1	None	55	36	90	85 (solid nose)	80	89.4	0	
53-57L	12-23-60	Forged A1	None	51	43	87	85 (solid nose)	51	86.0	-1.8	
53-63L	2-4-61	Forged A1	Complete	65	54	93	85 (solid nose)	27	95.0	0	
53-61L	2-16-61	Forged A1	Complete	26	63	83	85 (solid nose)	>125g's, off-scale	89.7	Did not release	
53-67L	3-29-61	Forged A1	Complete	52	0	3.2	85 (solid nose)	No slapdown	89.9	0	
53-59L	3-4-61	Forged A1	None	55	49	72	70 (solid nose)	28	89.0	0	
53-60L	3-11-61	Extruded A1	None	55	45	86	70 (solid nose)	68	102.0	-3.1	
53-65L	4-26-61	Cast A1	None	55	40	64	70 (solid nose)	36	Data unavailable	Data unavailable	
53-58L	4-10-61	Forged A1	None	55	45	74	70 (solid nose)	22	Data unavailable	Data unavailable	

NOTES:

Tests are grouped by type of nose used.
All target surfaces are flat concrete, 24 inches thick, unless noted otherwise.
Accelerations listed are faired values of instruments giving highest reading. See SC-4452 for definition of faired value.
Lateral accelerations are vector sums of horizontal and vertical accelerations at slapdown.

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TABLE VI

Summary of Results of High-Altitude, Free-Fall Air-Drop Tests of the TX-53

Test No.	Date	Delivery Information: A/C	Delivery Information: Bomb Bay (unit location)	Delivery Information: Suspension System	Description of Test Unit		Description of Parachute System	Option Selected	Release Conditions: Altitude (ft above terrain)	Release Conditions: True Air Speed (knots)	Release Conditions: Dynamic Pressure "Q" (lbs/ft^2)	Stability During Fall	Impact Velocity (fps)	Remarks
53-3	8-26-59	B-52	Rear (front empty)	MHU-25C (TX-41)	Ballistic		None used		39,788	459		Severe pitch at release; unit tumbled	763	
53-5	9-3-59	B-47		AFSWC interim design	Ballistic		None used		37,740	457		Severe pitch at release; unit stable before impact	1011	
53-8	3-31-60	B-52	Front (rear empty)	AFSWC interim design	Ballistic		None used		40,479	534		Unstable trajectory	971	
53-10	4-1-60	B-52	Rear (TX-53 shape in front)	AFSWC interim design	Ballistic		None used		40,586	510		Some pitch at release; stable trajectory	972	
53-18	10-12-60	B-52	Rear (front empty)	AFSWC interim design	Ballistic	Simulated X-unit for deformation-switch study	16-1/2' reefed to 12'		44,451	412		Stable	990	
53-23	10-28-60	B-52	Rear (front empty)	AFSWC interim design	Ballistic	Simulated X-unit for deformation-switch study	16-1/2' reefed to 12'		45,153	467		Stable	988	
53-25	10-28-60	B-47		AFSWC interim design	Ballistic	Simulated X-unit for deformation-switch study	16-1/2' reefed to 12'		39,626	414		Stable; first time bomb-bay spoilers disabled	997	
53-26	12-8-60	B-47		AFSWC interim design	Ballistic	Simulated X-unit for deformation-switch study	16-1/2' reefed to 12'		17,101	517		Stable	932	
53-29	12-9-60	B-52	Rear (front empty)	AFSWC interim design	Ballistic w/F&P		16-1/2' reefed to 12'	Contact	44,570	466		Somewhat unstable because parachute container not extracted	991	
53-32	2-14-61	B-52	Rear (TX-28-X2 in front)	AFSWC interim design	Ballistic w/F&P		16-1/2' reefed to 12'	Air	44,813	TAS Unavailable; Ground speed 386 knots		Stable	98	
53-36	2-28-61	B-52	Rear (SAMOS in front)	MHU-28C	Ballistic w/F&P		16-1/2' reefed to 12'	Air	13,992	521		Stable	421	
53-45					Ballistic w/F&P		16-1/2' reefed to 12'	Contact						
53-46					Ballistic w/F&P		16-1/2' reefed to 12'	Contact						

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Summary of Results of High-Altitu

Test No.	Date	Delivery Information A/C	Bomb Bay (unit location)	Suspension System	Description of Test Unit		Description of Retard Parachute System Dia (ft)	Line Length (ft)	Option Selected	A (f t
53-1R	7-28-59	B-47	--	AFSWC interim design	Ballistic	Static line deployed	12	40	--	
53-4R	8-20-59	B-52	Rear, front empty	MHU-23C (TX-41)	Ballistic	--	12	40	--	
53-7R	11-5-59	B-47	--	AFSWC interim design	Ballistic	Simulated X-unit for deformation-switch study	12	40	--	
53-2R	12-11-59	B-52	Rear, front empty	MHU-23C (TX-41)	Ballistic	Simulated X-unit for deformation-switch study	11 (apex line)	16	--	
53-9R	1-13-60	B-52		AFSWC interim design	Ballistic	Simulated X-unit for deformation-switch study	12	40	--	
53-13R	4-13-60	B-52	Rear, front empty	AFSWC interim design	Ballistic	--	12	20	--	
53-16R	5-25-60	B-52	Rear, front empty	AFSWC interim design	Ballistic	--	16.5 reefed to 12	20	--	
53-21R	10-12-60	B-47	--	AFSWC interim design	Ballistic	Simulated X-unit for deformation-switch study	16.5 reefed to 12	21	--	
53-24R	11-10-60	B-47	--	AFSWC interim design	Ballistic	Simulated X-unit for deformation-switch study	16.5 reefed to 12	20	--	
53-27R	12-13-60	B-47	--	AFSWC interim design	Ballistic w/F&F	Simulated X-unit for deformation-switch study	16.5 reefed to 12	20	Air	
53-28R	1-26-61	B-52	Front, rear empty	MHU-20C	Ballistic w/F&F	Simulated X-unit for deformation-switch study	16.5 reefed to 12	20	Air	
53-37R	4-8-61	B-47	--	MHU-20C	Ballistic w/F&F	Simulated X-unit for deformation-switch study	16.5 reefed to 12	20	Ground	
53-33R					Ballistic w/F&F	Simulated X-unit for deformation-switch study				
53-39R					Ballistic w/F&F	Simulated X-unit for deformation-switch study				

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TABLE VIII

Summary of Results of Low-Altitude, Laydown

Test No.	Date	Delivery Information A/C	Bomb Bay (unit location)	Suspension System	Description of Test Unit Bomb	Laydown Parachute Type	Reef Length (ft)	Reef Time (sec)	Release Conditions Altitude (ft above Terrain)	True Air Speed (knots)	Dynamic Pressure "Q" (lbs/ft²) Actual	% Design Maximum	Required Vertical Velocity (fps) Distance (ft)	Design Max. Vel.	Perfo Fall Distance to Tra A
53-61L	9-12-59	B-47		AFSWC interim design	Ballistic	3-44[1]	16	4	1185	325 (indicated air speed)	No test		No test	70	No
53-111L	10-10-59	B-47		AFSWC interim design	Ballistic	3-44[1]	16	2	1283	393	435	71	No test	70	No
53-151L	11-6-59	B-47		AFSWC interim design	Ballistic	3-44[1]	16	2	1247	431	538	87	800	70	
53-201L	12-9-59	B-47		AFSWC interim design	Ballistic	3-44[1]	16	2	~1200	48[illegible]	635	103	Not attained	70	Not a
53-101L	1-8-60	B-52	Rear (front empty)	AFSWC interim design	Ballistic	3-44[1]	16	2	1134	317	384	48	988	70	
53-481L	4-27-60	B-52	Rear (1139-1 in front)	AFSWC interim design	TRM less F&F	3-44[1]	None	None	987	340	337	54	460	70	
53-141L	6-2-60	B-47		AFSWC interim design	Ballistic with F&F	3-44[1]	None	None	1012	356	381	57	490	70	
53-401L	6-3-60	B-47		AFSWC interim design	TRM less F&F	3-44[1]	None	None	1119	399	419	68	670	70	
53-171L	8-17-60	B-47		AFSWC interim design	Ballistic with F&F	3-44[1]	None	None	982	356	336	55	634	42	
53-501L	8-10-60	B-47		AFSWC interim design	TRM less F&F	3-44[1]	None	None	~1000	~235	310	51	No test	62	No
53-221L	10-26-60	B-47		MHU-20C	Ballistic	3-48[1]	None	None	1002	475	605	96	Not attained	62	
53-341L	2-6-60	B-47		AFSWC interim design		1-78[1] (Sandia design)	30	1	1072	459	562	95	500	55	
53-311L	3-2-61	B-47		MHU-20C		3-48[1]	22.5	1	1567	381	No test		No test	55	No
53-301L	3-10-61	B-47		MHU-20C		3-48[1]	22.5	1	2024	388	385	59	No data	55	No
53-351L	4-21-61	B-47		MHU-20C		3-48[1]	25.0	1	966	470 (B-47 Max.)	632	103	Not attained	55	Not a
53-381L														55	
53-431L														55	
53-401L														55	
53-411L														55	
53-421L														55	
53-711L														55	
53-441L														55	
53-721L														55	
53-521L														55	
53-471L														55	
53-731L														55	

NOTES: 1. Tests 53-61L to 53-171L, inclusive, were conducted at Dalhart Test Range, Texas. All other tests at Tonopah Test Range, Nevada.

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TABLE IX (cont)

Delivery

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TABLE XII

Summary of Results of the Sled Test and 75-mm Cannon Test Programs for the Deformation Switch used in the TX-53

Test No.	Type test	Impact velocity (fps)	Type target	Electrical closure	Timing	Remarks
1E	Sled	1252	25° steel		8' premature	Test not valid*
2E	Sled	300	40° steel		Satisfactory	Test not valid*
3E	Sled	1200	6° steel		8' premature	Test not valid*
4E	Sled	310	Flat concrete	Satisfactory	Satisfactory	Successful
5E	Sled	1200	Flat concrete	Satisfactory	Probably satisfactory	Part of data lost
6E	Sled		Water			Test not completed
7E	Sled		Angled concrete			Test not completed
8E	Sled		Angled concrete			Test not completed
9E	Sled		Not determined			Test not completed
10E	Sled		Not determined			Test not completed
1	75 mm	980	Not applicable	Satisfactory	Not applicable	Successful
2	75 mm	370	Not applicable	Probably satisfactory	Not applicable	Part of data lost
3	75 mm	370	Not applicable		Not applicable	All of data lost
4	75 mm	370	Not applicable	Probably satisfactory	Not applicable	Part of data lost
5	75 mm	370	Not applicable	Satisfactory	Not applicable	Successful
6	75 mm	388	Not applicable	Satisfactory	Not applicable	Successful
7	75 mm	946	Not applicable		Not applicable	All of data lost
8	75 mm	940	Not applicable	Satisfactory	Not applicable	Successful
9	75 mm	940	Not applicable	Satisfactory	Not applicable	Successful
10	75 mm					Test not completed
11	75 mm					Test not completed
12	75 mm					Test not completed
13	75 mm					Test not completed
14	75 mm					Test not completed

See text for explanation.

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Nine of the fourteen 75-mm cannon tests have been conducted, four at velocities less than that anticipated in weapon applications and five at velocities greater than that anticipated. Five tests indicated acceptable closure based on complete data, two tests indicated acceptable closure based on partial data, and two tests yielded no data. The program is temporarily suspended pending the development of more reliable instrumentation.

Wind Tunnel Tests

Three basic series of wind tunnel tests were conducted during the TX-53 development. The tests were as follows:

1. Original series to check aerodynamic characteristics of the bomb and to determine the suitability of various extendable fins for stability at a 55 percent CG location.
2. Because of a design change which allowed a 45 percent CG position, a second series of tests to determine the new aerodynamic characteristics was conducted with fixed fins of a 6- to 26-degree double wedge design.
3. Additional tests to seek a solution to the unique high angle "pitch-down" encountered with high "q" releases from the B-47.

All these tests were successful.

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As a result of these wind tunnel tests and the full-scale drop tests, the TX-53 is determined to have a predictable and repeatable trajectory when delivered in the free-fall option. In addition, the ballistic dispersion is [redacted] when delivered from an altitude of 10,000 feet or more.

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Static force tests show that the TX-53 with a 45-percent CG has a static margin of approximately 6 percent. The free-fall version has aerodynamic drag properties consistent with the required degree of stability to assure repeatable trajectories.

The third series of wind tunnel tests indicated, and full-scale tests have proven, that the "pitch-down" of the TX-53 upon separation from the B-47 bomb bay under high "q" conditions will not exceed 25 degrees if the aircraft spoiler doors are retracted.

Ancillary Equipment Tests

Because of the nature of the equipment and its similarity to previously tested equipment, environmental testing was considered unnecessary. The emphasis of this program was on mechanical strength and functional tests. Unless otherwise noted, one item was tested.

The status and description of testing is as follows:

Item	Functional test completed	Structural test
H-794 hand truck	1. Use with the TX-53 bomb and H-795.	Complete cargo aircraft tiedown test. Hail bump test at 11 mph.
	2. Use with the TX-53 basic assembly and H-796.	

Item	Functional test completed	Structural test
H-794 hand truck (cont)	3. Use with straddle carrier and fork lift. 4. Use for bomber aircraft (B-47 and B-52) loading with MHU/7M trailer 5. Use with clip-in subassembly (MHU/29C) 6. Use with ATMX 600 Series railcar with appropriate shock absorbing support.	The following items of the H-794 have been static tested to six times the working load: 1. Overhead hoistings attaching points. 2. Outrigger bars 3. Outrigger tubes
H-795 hand truck adapter kit	Use with H-794 and TX-53, and clip-in subassembly.	Static test with H-794.
H-796 hand truck adapter kit	Use with H-794 and TX-53 basic assembly	Static test with H-794
H-797 security cover frame	Use with bomb, H-794 and clip-in assembly.	Tested with H-794 during rail humping.
H-798 security cover	Use with bomb, H-794 and clip-in subassembly.	Not applicable.
H-799 bomb sling	Use with bomb on H-794 and H-806.	Has been static tested to six times the working load.
H-800 parachute shipping and storage container	Use with MC-1387, H-801, and H-811.	Ramp test to simulate 11 mph railroad hump; 12-inch drop test; cargo aircraft tiedown tests; and vibration test. Static test to four times working load on hoisting fittings.
H-801 parachute protective cover	Use with MC-1387, H-800, and H-309.	Static test to six times working load. Vibration and drop test with the H-800.
H-802 bomb sub-assembly sling	Use with H-804, H-813, and H-946.	Static test to six times working load.
H-804 parachute hoisting adapter	Use with the MC-1387 and rear case section.	Static test to six times the working load in horizontal and vertical operating positions.

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Item	Functional test completed	Structural test
H-805 shipping and storage container	Use with the rear case subassembly	Ramp test to simulate 11 mph railroad hump; 12-inch drop test; cargo aircraft tiedown; and vibration test. Static test of the hoisting fittings to six times the working load.
H-806 bomb stand	Use with the bomb, outer case segment and H-796.	Not applicable.
H-807 closing plate handle	Use with the closing plate with or without the rear case section installed on the bomb.	Not applicable.
H-808 locating fixture	Use with the outer case segment, basic assembly, and H-806.	Not applicable.
H-809 shipping and storage container	Use with the nose, nose fairing, and slip ring.	Ramp test to simulate 11 mph railroad hump; 12-inch drop test; cargo aircraft tiedown test; vibration test; and static tests of the hoisting fitting to six times working load.
H-810 shipping and storage container	Use with the outer case segment, wedge segment and attaching strips.	Ramp test to simulate 11 mph railroad hump; 12-inch drop test; cargo aircraft tiedown test; vibration test; and static tests of the hoisting fitting to six times the working load.
H-811 parachute protector	Use with the MC-1387 and H-800.	Vibration tests and drop tests with the H-800.
H-813 adapter nose hoisting	Use with the nose fairing, H-902 and H-971.	Tested to six times working load.
H-825 security cover frame	Use with the basic assembly, H-794 and H-796.	Not applicable.
H-826 security cover	Use with the basic assembly, H-825, H-794, and H-796.	Not applicable.
H-836 beam sling	Use with basic assembly, H-962 and H-993.	Static tested to six times the working load
H-900 MDF protector ring	Use with the rear case section.	Not applicable
H-946 rear bomb subassembly hoisting adapter	Use with the rear case section and H-802.	Static tested to six times the working load

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Item	Functional tests completed	Structural test
H-962 hoisting adapter	Use with the basic assembly with nose attached and with the H-836.	Static tested to six times the working load.
H-971 nose hoisting adapter	Use with the nose, H-802, and H-813.	Static tested to six times the working load.
H-993 hoisting adapter	Use with the outer case segment, the nose, and the H-810 and H-836.	Static tested to six times the working load.
H-995 protective ring	Use with the basic assembly when the closing plate is removed.	Not applicable.
H-989 removal and installing tool	Use with electrical component assembly and TX-53 basic assembly.	Tests not completed.
	Tests on Carry-Over Items used on this Program	
H-309 sling, warhead and container	Use with H-801.	Static tested to six times the working load.
H-563 bomb hand truck sling	Use with the H-800.	Static tested to six times the working load.
H-639 bomb hand truck sling	Use with the bomb, H-794, H-797, H-798, a commercial hook, and the ATMX 600 Series railcar. Use with the basic assembly, H-794, H-825, and H-826.	Static tested to six times the working load.
H-690 and H-691 spanner wrench	Test not required.	Not applicable.
H-762 caster tool	Use with H-794.	Not applicable.
H-772 hoisting beam	Use with bomb and clip-in subassembly.	Static tested to six times the working load.
H-876 socket wrench	Use for removing and replacing torque of the gland nut.	Not applicable.
H-935 screw thread cleaning tool	Use for cleaning the gland nut.	Not applicable.
836656-00 swivel hook	Use with the bomb, H-794, H-797, and H-798.	Static tested to six times the working load.

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Figure 45. H-794 with H-795

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H-796 Hand Truck Adapter Kit

The H-796 (Figure 46) is composed of two steel bands, one steel shear pin, and two aluminum chocks. The two bands attach to the H-794 hand truck with quick-release pins. The two chocks adapt the H-794 hand truck to the smaller diameter of the basic assembly (Figure 47). Also the chocks are used to adapt the H-806 bomb stand to the diameter of the basic assembly for use during conversion or maintenance. The bands and shear pin with the two aluminum chocks hold the basic assembly on the H-794 during transportation.

H-797 Security Cover Frame

The H-797 which supports the H-798 security cover for the bomb is a one-piece welded structure of round steel tubing. The frame mounts on top of the bomb with clearance for the clip-in subassembly and is held in place by four nylon straps which attach to the frame of the H-794 (Figure 48).

H-798 Security Cover

The H-798 (Figure 49) provides visual security during shipping or storage of the bomb. The H-798 is fabricated from 16-ounce waterproof nylon fabric, in one-piece construction. The cover is held in place by nylon straps which attach it to the frame of the H-794. The part of the H-798 which covers the lower two fins can be folded up to reveal the fins. This should facilitate loading of the bomb into the MHU-7/M trailer and prevent fin damage during this operation. The cover fits with or without the clip-in subassembly installed on the bomb.

H-799 Bomb Sling

The H-799 (Figure 50) is a short aluminum strongback with two aluminum bands at each end and is used to adapt the bomb to overhead hoisting. Each band is composed of three segments which are joined and fastened to the turnbuckles on the strongback by quick-release pins. The H-799 is employed by placing the strongback longitudinally on the top of the bomb at approximately the weapon's center of gravity. The bands are then placed around the bomb and are drawn tight by the four turnbuckles.

H-800 Parachute Shipping and Storage Container

The H-800 (Figure 51) is a round steel container used for storage and shipment of the following items:

1. MC-1388 (bomb parachute stowage can) with H-801 and H-811 assembled.

2. MC-1387 (parachute assembly) with H-801 and H-811 assembled.

Shipment may be made by rail, cargo aircraft, and truck provided the following modes of restraining the H-800 are used:

Cargo aircraft - four large pear-shaped links

Rail - shoring only

Truck - shoring or four large pear-shaped links.

Local handling can be accomplished by fork lift or with overhead hoisting equipment. If overhead equipment is used the H-563 sling is also used with the four links on the H-800 cover. The H-800 may be stacked during storage, but stacking is not permitted during shipment.

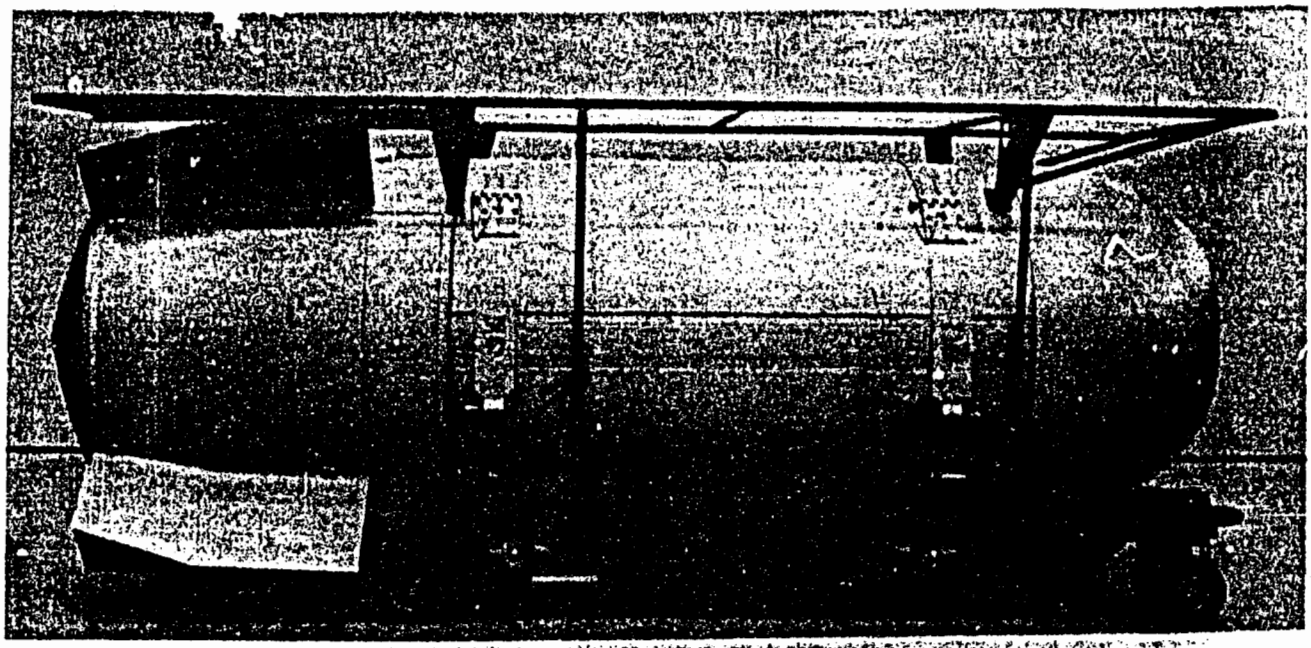

Figure 48. H-707 Security Cover Frame (Installed)

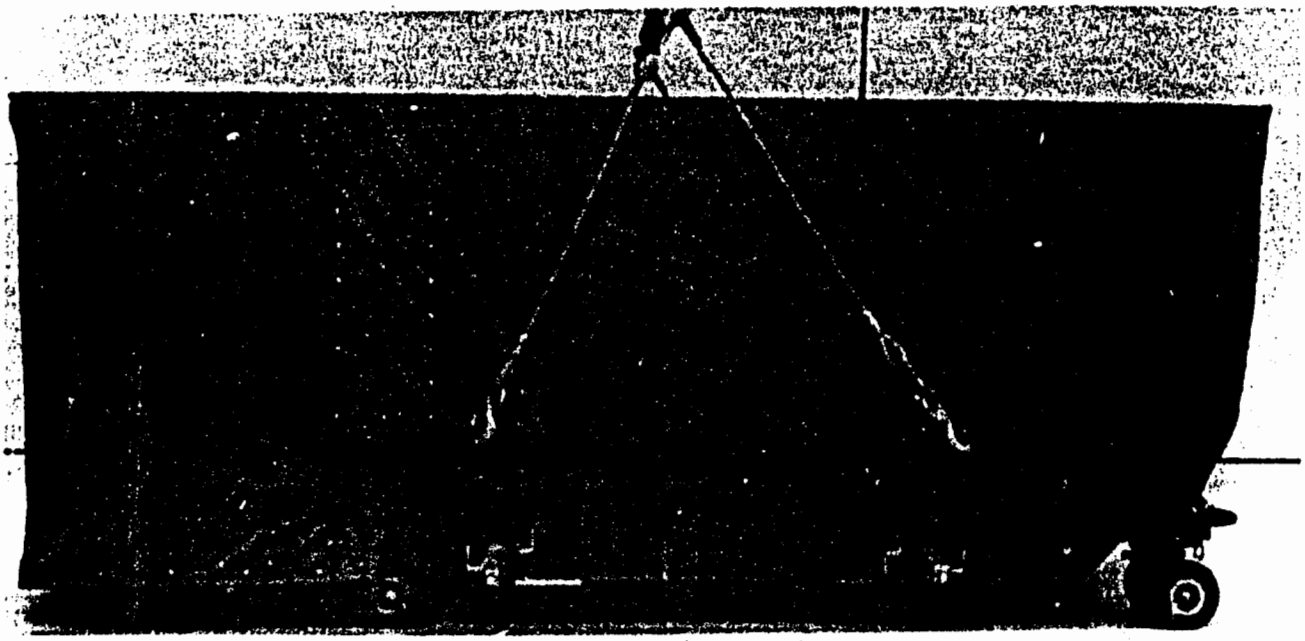

Figure 49. H-708 Security Cover (Installed)

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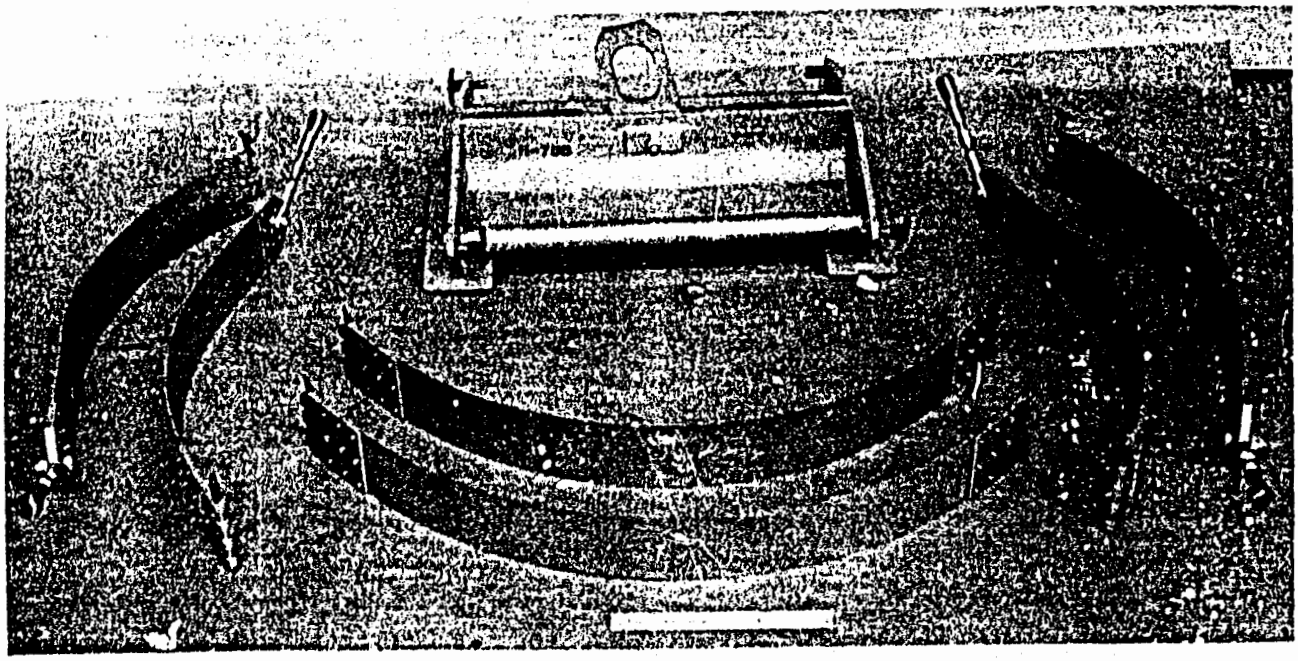

Figure 50. H-799 Bomb Sling

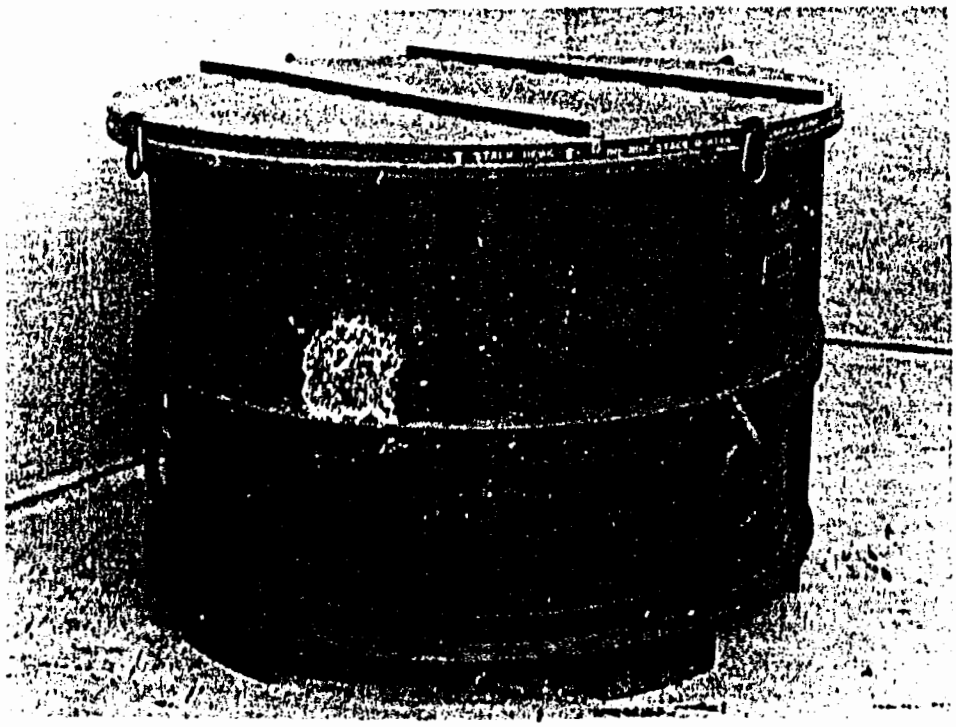

Figure 51. [illegible]-800 Parachute Shipping and Storage Container

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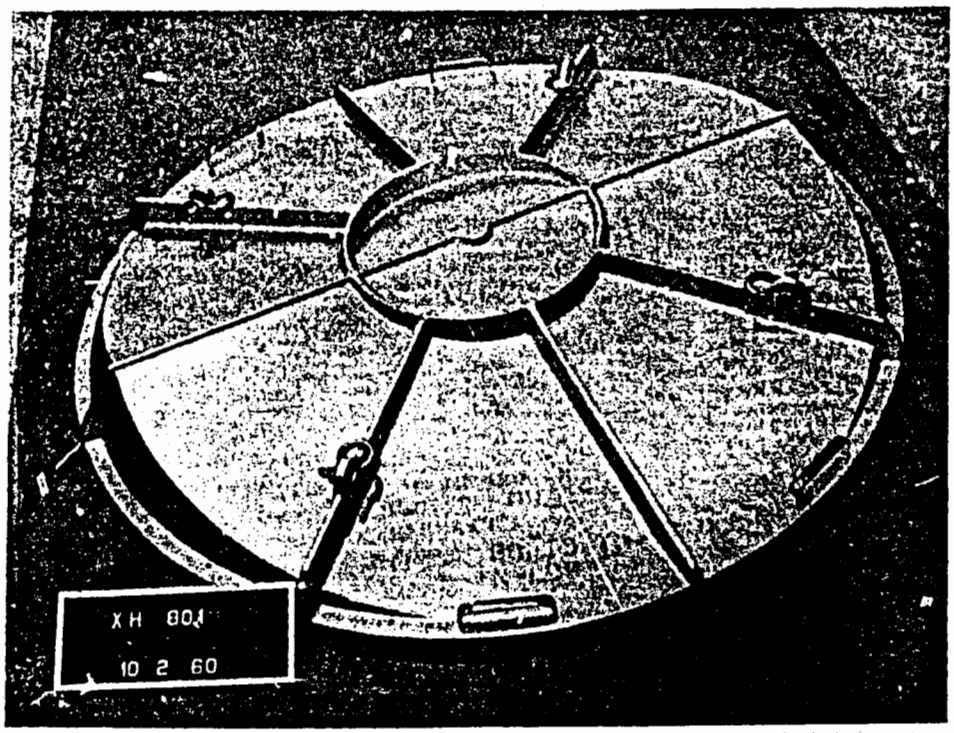

Figure 52. H-801 Parachute Protective Cover

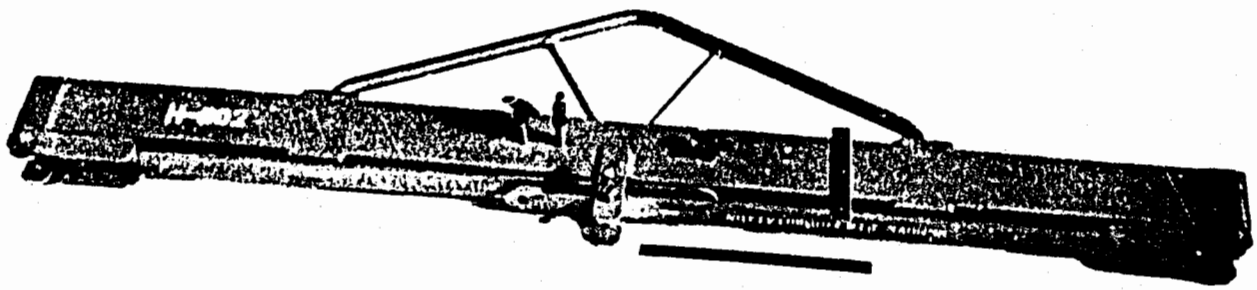

Figure 53. H-802 Bomb Subassembly Sling

H-807 Closing Plate Handle

The H-807 (Figure 57) consists of one handle, one knurled nut, and one guide pin. The handle screws into a 5/16-thread insert in the basic assembly closing plate. The guide pin screws into the 5/16-threaded holes in the basic case. Two H-807's are required. The handles are used to lift and control the closing plate. Two guide pins position the closing plate and thus prevent damage to the sealing surfaces.

H-808 Locating Fixture

The H-808 (Figure 58) is a Z-shaped aluminum casting with two machined flanges. One flange has a four-hole pattern for attachment to the basic assembly case flange. The H-808 is used to position and align the outer case segment. The H-808 is bolted to the underside of the flange on the basic assembly case. The basic assembly is then lowered by the H-836 sling into the outer case segment so that the outer flange of the H-808 bears against the end of the outer case segment. When the holes in the H-808 flange match the holes in the outer case segment, the basic assembly and outer case segment are in the proper position for the next assembly operation. The outer case segment is supported on the H-808 during this operation.

H-809 Shipping and Storage Container

The H-809 (Figure 59) is a sheet metal container designed to facilitate handling and to provide physical protection for the bomb nose assembly (nose, fairing, slip ring, and deformation switch) during shipment and storage. The H-809 consists of a cover and a steel weldment base. A mounting surface for the nose is provided. The deformation switch is mounted within the nose in the same manner as it is mounted in the bomb. The slip ring is mounted over the nose and fastened to four brackets welded to the base. Four springs are used to fasten the slip ring to the base and insure that excessive loads will not be applied. The fairing is then mounted over the nose and slip ring. The fairing is fastened to the nose in the H-809 in the same manner as on the TX-53. Rectangular tubes are provided for the base of the H-809 to facilitate handling by fork lift. A pear-shaped link is provided on the top of the cover for single-point pickup of the cover or the loaded container. Angles are welded to the top of the cover to orient and locate the second unit during stacking. Stacking of empty or loaded containers is permissible. Pear-shaped links are attached to the cover to provide for cargo aircraft tiedown.

H-810 Shipping and Storage Container

The H-810 (Figure 60) is a sheet-metal container designed to facilitate handling and to provide physical protection for the bomb outer case segment, wedge segment, and attaching strips during shipment and storage. Two H-810's are required to ship these items for one bomb. The H-810 consists of a base and cover. The base is a steel weldment constructed from square and rectangular tubing to which brackets are welded to provide the mounting surface for the store. Two guards made of square tubing are bolted to brackets welded to each end of the base in order to protect the store while the cover is lowered on the base. The cover, a steel weldment, consists of an angle frame covered with sheet metal. A structure of square tubing was added to provide for stacking (loaded or empty). A pear-shaped link located on the top of the cover provides a single-point pickup for the cover or the loaded container. Pear-shaped links are attached to the corners of the cover to provide for cargo aircraft tiedown.

H-811 Parachute Protector

The H-811 (Figure 61) is composed of one aluminum ring casting and eight spring clips. The ring casting attaches to the closed end of the stowage can (MC-1388) by six bolts. The spring clips slip between the stowage can and the shroud lines and lock to the ring casting. The ring casting prevents damage to the shroud lines and supports the recessed center part of the stowage can during handling and transportation. The spring clips prevent the shroud lines from becoming soiled and damaged.

H-813 Hoisting Adapter

The H-813 is fabricated of 2-inch-square steel tubing by welded construction. The hoisting adapter attaches to the forward face of the bomb fairing by four bolts. The adapter is used to remove or replace the fairing in its container (H-809) and to handle the fairing during installation on or removal from the bomb. The fairing, when attached to the H-813, can be rotated from the horizontal to the vertical position and vice versa. The H-813 adapter is used with the H-802 strongback (Figure 62) for all handling operations.

H-825 Security Cover Frame

The H-825 (Figure 63), which supports the H-826 security cover for the basic assembly, is a one-piece welded structure of round tubing. The frame is mounted on top of the basic assembly and is held in place by two nylon straps which are attached to the frame of the H-794.

H-826 Security Cover

The H-826 (Figure 64) provides visual security during shipping or storage of the basic assembly. The H-826 is fabricated from 16-ounce waterproof nylon fabric and is of one-piece construction. The cover is held in place by nylon straps which are attached to the frame of the H-794.

H-836 Beam Sling

The H-836 (Figure 65) is used for: (1) hoisting the basic assembly, (2) hoisting the outer case segments when used with the H-993, and (3) hoisting the basic assembly with nose installed when used with the H-962.

The H-836 is composed of a steel beam with a hoisting attachment point near its center. At one end of the beam is an adapter which is attached to the nose of the basic assembly by two 3/4-inch-diameter bolts. At the other end of the beam is an adapter which is connected to the basic assembly by two 3/8-inch-diameter quick-release pins. Points for attaching the H-962 and H-993 are marked at other points near the ends of the beam. During the time when the H-962 and H-993 are being used, the forward adapter of the H-836 can be removed and stored on the main beam of the H-836.

H-900 Mild Detonating Fuse Protective Ring

The H-900, shown installed in Figure 66, is an aluminum ring assembly which protects the mild detonating fuse (MDF) whenever the parachute assembly is removed from the rear case section. During any maintenance which requires removal of the parachute from the rear case section, the MDF must be protected to keep it from being accidentally struck by tools or other objects which are being used by maintenance personnel.

The H-900 is attached to the inner subassembly of the rear case section. A rubber pad approximately 38.5 inches long, 26 inches wide, and 1 inch thick is used with the H-900. This pad provides protection to the inner skin of the rear case section when maintenance personnel are working inside the rear case section.

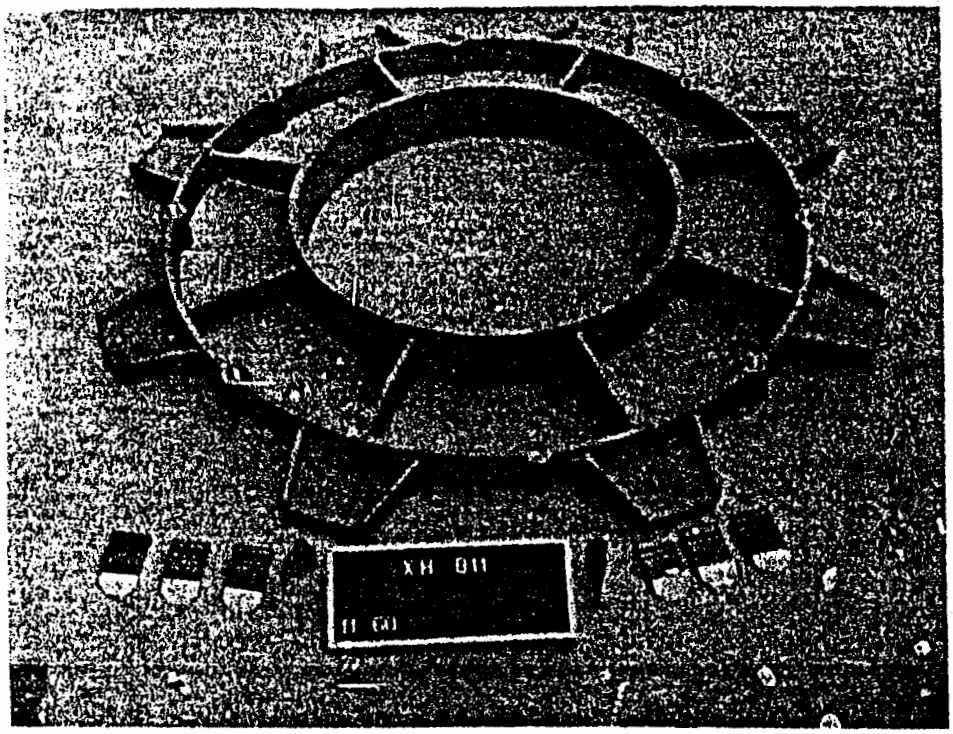

Figure 61. H-811 Parachute Protector

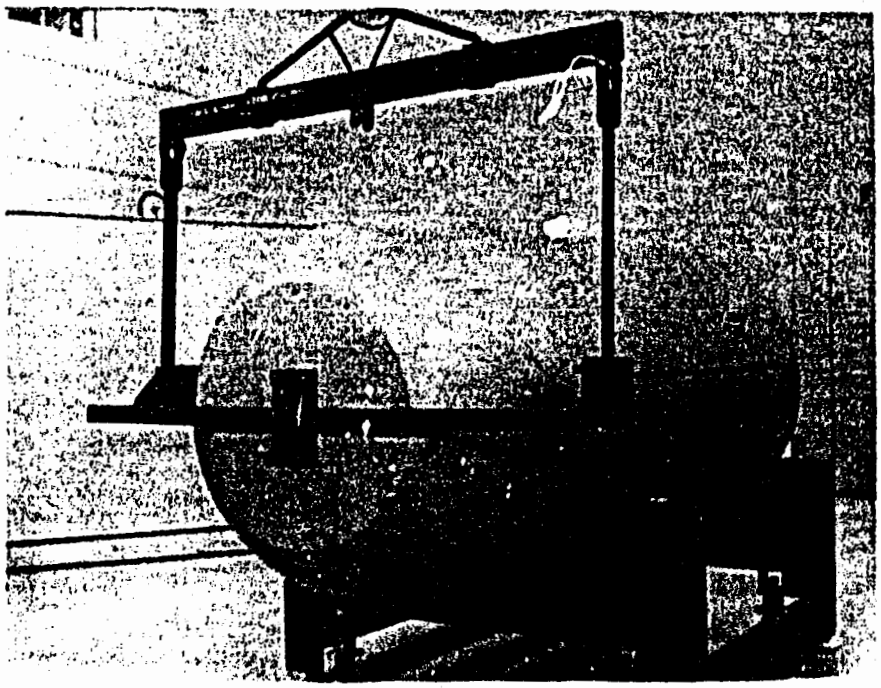

Figure 62. H-813 Hoisting Adapter

H-946 Rear Case Section Hoisting Adapter

The H-946 is used with the H-802 (Figure 67) for hoisting and rotating the rear case section. The H-946 is of welded steel construction. It attaches to the aft end of the rear case section by four bolts.

H-962 Hoisting Adapter

The H-962 (Figure 68) is an aluminum hoisting adapter for hoisting the basic assembly when the nose is installed. It is composed of two parts. The first part is a plate that is attached by six bolts to the basic assembly at the same radial hole pattern where the nose is attached. This part is rectangular in cross section and is curved to match the radius of the weapon in the area where it is attached. The second part of the H-962 is a clevis which links the first part to the H-836 hoisting beam.

H-971 Nose Hoisting Adapter

The H-971 (Figure 69) consists of a welded structure fabricated from 1.75-inch steel square tubing. It is used with the H-813 hoisting adapter and is attached to the H-813 by four bolts. The H-802 sling with the H-813/H-971 is used for hoisting the nose from the container and for rotating the nose from a horizontal to a vertical position or vice versa during conversion or maintenance operations.

H-993 Hoisting Adapter

The H-993 (Figure 70) is composed of two semicircular rings, two spreader beams, and two hoisting brackets. The H-993 is used for hoisting and rotating the bomb outer case segments and is used during bomb maintenance or conversion. When the semicircular rings are attached to the ends of the outer case segment, the outer case segment can be rotated by rolling it over on the floor. When the spreader beams and hoisting brackets are attached to the semicircular rings, the case segment can be hoisted with the H-836 sling.

H-995 Protective Ring

The H-995 (Figure 71) is a quarter segment of a circular ring 3/4 x 3/8 inch in cross section. A 1/16-inch thick rubber strip is bonded to one surface of the segment. When the closing plate is removed, the H-995 is bolted to the aft end of the basic assembly to protect the O-ring sealing surface.

H-989 Removal and Installing Tool

The H-989 (Figure 72) is used for removing and installing the component ring assembly. It is a welded aluminum construction.

Existing Equipment or Carryover H-Items

H-309 Warhead and Container Sling

The H-309 (Figure 73) is a four-legged cable sling which can be attached to the H-801 parachute protective cover to hoist the MC-1387 parachute assembly. The H-309 will be used to place the parachute assembly into or remove it from the H-800 parachute shipping and storage container.

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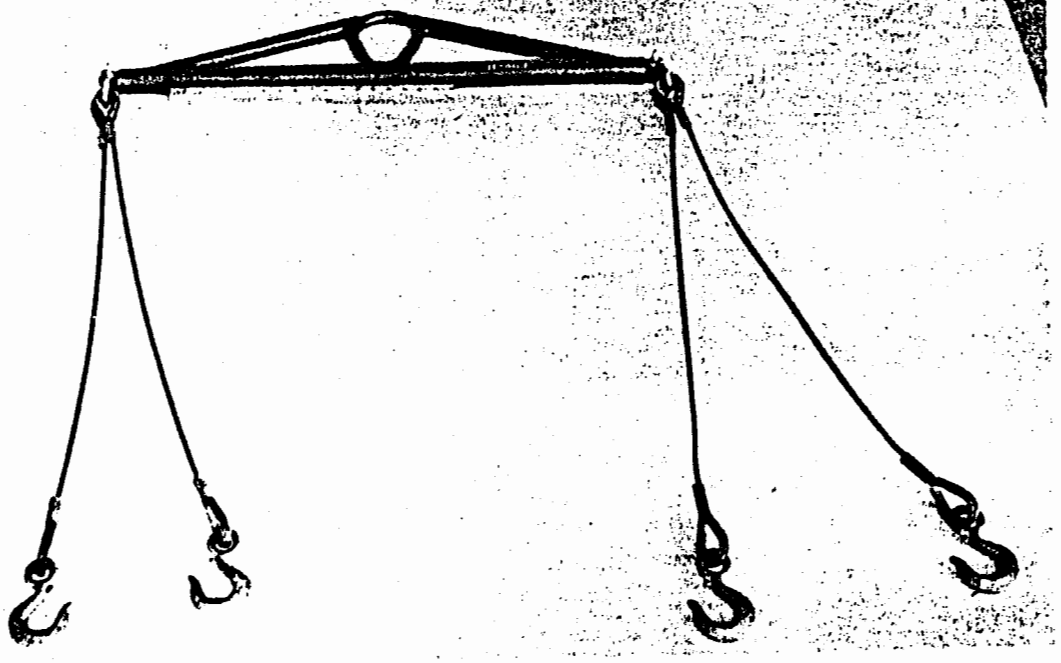

Figure 74. H-563 Bomb Hand Truck Sling

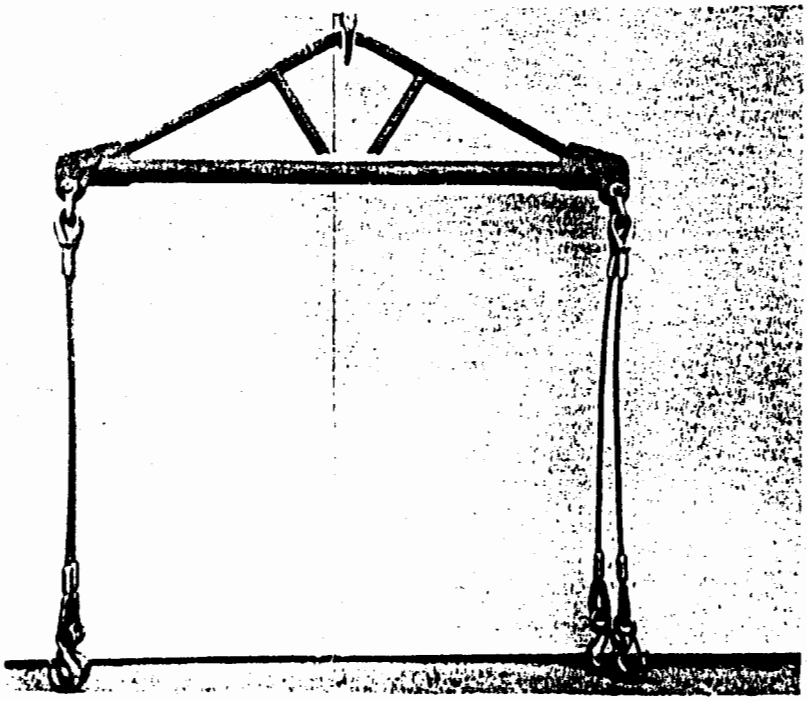

Figure 75. H-639 Bomb Hand Truck Sling

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TO: N. E. Bradbury, Director, Los Alamos Scientific Laboratory, Los Alamos, New Mexico
James W. McRae, President, Sandia Corporation
Attn: R. W. Henderson

Date: Sep 23 1958

FROM: Ralph P. Johnson, Assistant Manager for Manufacturing, ALOO

SUBJECT: CLASS C LAYDOWN WEAPON (FUFO)

SYMBOL: MPP:AOM

DOE b(3)

By SRD memorandum, Starbird/Hertford, subject: [redacted] Laydown Weapon", symbol: MAR:MRR, dated September 2, 1958, copies to Sandia Corporation and LASL, ALO is requested to advise DMA scheduling possibilities and the estimated OAD for a Class C Laydown Weapon.

An estimated timetable, based on the time that will be required to complete design, development, testing and first production for this program is requested.

This information is desired by October 15, 1958. If this date cannot be met ALO should be advised as to when a response can be expected.

Distribution:
1A - N. E. Bradbury, Dir., LASL, Los Alamos, New Mexico
2A & 3A - James W. McRae, Pres., SC, Attn: R. W. Henderson
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Mr. K. F. Hertford, Manager
Albuquerque Operations Office
P. O. Box 5400
Albuquerque, New Mexico

Attn: Mr. R. P. Johnson, Assistant Manager
Office of Manufacturing

Re: [redacted] DOE b(3)

Reference: SRD Ltr., Johnson, ALO, to McRae, Sandia Corp. and Bradbury, LASL, [redacted] DOE b(3)
Ref. Sym: [redacted]

The reference letter requested that a tentative development schedule be submitted by Sandia Corporation and Los Alamos Scientific Laboratory for the [redacted] weapon which will have full fuzing option. DOE b(3)

The following dates are the best current estimates which can be made and are based on informal information concerning the desired military characteristics for this weapon:

Complete Engineering Release - August, 1960
First Production Unit (WR) - August, 1961

As little or no data exist which are applicable to the design of the shock-mitigating features of a weapon in this weight class, it may be necessary to adjust the development schedule after significant drop-test data are available. Some testing may be done after CER. DOE b(3)

The above information is presented assuming use of the [redacted] with little modification. Should major changes be needed, a complete new evaluation of time scales will be essential.

J. P. Molnar - President
Sandia Corporation

N. E. Bradbury - Director
Los Alamos Scientific Laboratory

CLC:1217:jb

Distribution:
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4/7A - R. W. Henderson, 1000, Attn: S. A. Moore, 1210
5/7A - G. C. McDonald, 2530
6/7A - R. K. Smeltzer, Cen. Rec. File, 7221-3
7/7A - J. P. Molnar, 1
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DOE b(3)

TO: J. P. Molnar, Pres., Sandia Corporation
Attn: R. W. Henderson, Vice-Pres., Dev.
N. E. Bradbury, Dir., Los Alamos Scientific Laboratory, Los Alamos, New Mexico

FROM: Ralph P. Johnson, Assistant Manager for Manufacturing, Albuquerque Operations

SUBJECT: TX-53/B-70 COMPATIBILITY

DOE b(3)

SRD memorandum. copies of which were forwarded to you, requests additional information on TX-53/B-70 compatibility.

You are requested to develop the information requested in paragraph 3. of referenced memo and forward a coordinated reply direct to DMA at the earliest practicable date.

Distribution:
1, 2A - J. P. Molnar, Pres., SC, Attn: R. W. Henderson, 1000
3A - N. E. Bradbury, Dir., LASL, Los Alamos, New Mexico
4A - Brig. Gen. A. D. Starbird, USA, Dir., DMA, Washington, D. C.
5A - J. V. Durant, Br. Ch., Br. #2, Off. of Mfg., ALOO
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Oct 20 1959

Ref. Sym: 1000 (3434)
R&D File: TX-53, 2-1

Brig. General A. D. Starbird, Director
Division of Military Application
U. S. Atomic Energy Commission
Washington 25, D. C.

Re: TX-53/B-70 Compatibility

References: 1. SRD Memo, R. P. Johnson to J. P. Molnar, SC, and N. E. Bradbury, LASL, dtd 9/24/59, Q-86085, Ref. Sym: MPP:AOM, same subject

2. [redacted]

3. SRD Memo, J. P. Molnar to Brig. Gen. A. D. Starbird, dtd 4/14/59, Ref. Sym: 1 (1200), subject, Study of our Capability to Improve our Atomic Weapon to Withstand the Environment of the Air Force New Weapon Systems

The third paragraph of Reference 2 requested information relative to the TX-53/B-70 compatibility, and Reference 1 requested that this information be sent directly to DMA. As the answers to the specific questions are so interrelated, the information herein is not presented in the order asked.

Since the objective of our effort has been to achieve B-70 compatibility for special weapons with the minimum penalty to the over-all delivery capability as outlined in Reference 3, we have assumed in our study that any thermal protection must be part of the weapon. If aircraft bomb bay cooling or insulation is provided that will maintain weapon temperature below 165°F, the present TX-53 is compatible with the B-70 pending verification of aerodynamic and parachute system performance.

Several materials and components of the TX-53 require that there be no sustained exposure to temperatures higher than 165°F or brief exposure higher than 200°F. If it is necessary (as we have assumed) to provide this protection, it is anticipated that the version of the TX-53 for B-70 carriage can be made field convertible by replacing the shock mitigation system, afterbody, and parachute system with parts designed to withstand the higher temperatures. The resultant converted TX-53 would exceed the present physical parameters in that a length of 164 inches, a diameter of 52 inches, and weight of 9300 pounds could be expected. The present TX-53 is within the Military Characteristics parameters of 148 inches in length, 50 inches in diameter, and 8500 pounds, except for a local extension to provide increased parachute storage volume. This extension has been coordinated with and approved by Field Command, Defense Atomic Support Agency, as it does not affect aircraft bomb bay clearance. The B-70/TX-53 would be reversible to the original configuration for the B-47, B-52 (multiple carriage), or to that required for the B-58 applications. It is estimated that about 15 months of additional development, with FPU about February 1963, will be required to produce this version. This effort has already been reflected in our budget forecast.

No further authorization for development of a version of the TX-53 for the B-70 is considered necessary, since the Military Characteristics for the bomb clearly state this requirement.

R. W. Henderson

CLC:1217:nt

Distribution:
1/5A Brig. Gen. A. D. Starbird, DMA
2/5A K. F. Hertford, Mgr., ALO, Attn: J. V. Durant
3/5A N. E. Bradbury, Dir., LASL, Attn: E. H. Eyster
4/5A R. K. Smeltzer, Central Record File, 3421-3
5/5A R. W. Henderson, 1000, Attn: S. A. Moore

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TO: J. P. Molnar, President
Sandia Corporation

Date: May 2 1960

FROM: Paul W. Ager, Assistant Manager for
Advance Planning, ALO

SUBJECT: WEAPON DEVELOPMENT EFFORT IN SUPPORT OF THE B-70 AIRCRAFT

SYMBOL: PW:ABW

Ref: (a) DMA/ALOO Memo of 4/25/60, subject as above
(b) DMA/ALOO Memo of 1/18/60, subject as above
(c) ALOO/SC Memo of 1/26/60, subject as above

Being supplemental to References (b) and (c), the entire text of Reference (a) is quoted below for your information and guidance:

"I refer to my memorandum of January 18, 1960, subject as above.

"Until further notice, continue the current suspension of weapons developmental effort in support of the B-70 aircraft. Efforts should continue, however, on upgrading weapons components of the TX-53 and TX-41 to withstand the extreme environments of other advanced systems.

"For your information, the Air Force may, in the future, request the AEC to resume full weapon development effort in support of the B-70 program."

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5A - Marvin Martin, LRL
6A - R. E. Poole, Vice Pres., Sandia Corp, Livermore
7A - Brig. Gen. A. D. Starbird, Dir., DMA, USA, WashDC
8A - Maj. Gen. C. M. McCorkle, Commander, AFSWC-KAFB
9-10A - Commander, FC/DASA, Attn: Col. Charles E. Carson, FCDV
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Jan 27 1960

JAMES L. MC CRAW
ASSISTANT MANAGER FOR MANUFACTURING
USAEC, ALBUQUERQUE OPERATIONS

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USAEC, WASHINGTON, D. C.
ATTN: BRIG. GEN. A. D. STARBIRD

AS WAS DISCUSSED WITH YOUR MR. COOK ON JAN 22, SANDIA CORP. HAS FORMALLY RECOMMENDED THAT THE TX 53 PROGRAM BE SLIPPED BY SIX MONTHS, FPU/WR, FROM AUG 1961 TO FEB 1962. THE CONTROLLING CAUSE FOR DELAYS IN THE PROGRAM IS THE UNAVAILABILITY OF BASIC CASE STRUCTURES NECESSARY TO EVALUATE STRUCTURAL INTEGRITY OF THE CASE DESIGN AND PRACTICABILITY OF PROPOSED METHODS OF FABRICATION. PAR THE RECOMMENDED SIX MONTHS DELAY IN THIS PROGRAM REPRESENTS A MINIMUM OF ADDITIONAL TIME NECESSARY TO COMPLETE THE DEVELOPMENT BASED ON PRESENT COMMITMENTS FOR AVAILABILITY OF MATERIAL AND TEST FACILITIES. PAR THIS PROPOSED PROGRAM SLIP MAY CREATE A HARDSHIP IN ACHIEVING A B 58/ TX 53 CAPABILITY COINCIDENT WITH THE AVAILABILITY OF THE B 58 TWO COMPONENT POD (TCP). INFORMALLY, SANDIA CORP. HAS ADVISED SAC REPRESENTATIVES THAT AN EC OR IOC PROGRAM MAY BE POSSIBLE ON THE ORIGINAL TIMESCALES, HOWEVER, SUCH AN INTERIM CAPABILITY PROGRAM MAY CAUSE A FURTHER SLIP IN FPU/WR. SAC REPRESENTATIVES ARE TAKING THIS INFO TO SAC HQRTS AND ON FEB 8, AT THE NEXT B58 JOINT WORKING GROUP MEETING AT S.C. WILL PRESENT THE SAC DESIRES WITH REGARD TO AN EC OR IOC PROGRAM. PAR WITH THIS PROPOSED SLIP

DOE

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[redacted]

ALO PROPOSES TO CHANGE THE 53 PROGRAM DATES AS RECOMMENDED BY SANDIA CORP. AND REVISE THE ALO PROGRAMMING DOCUMENTS ACCORDINGLY. PAR YOUR COMMENTS AND/OR CONCURRENCE IS REQUESTED. END REF MPP:JVD

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From: AFSWC Kirtland AFB New Mexico

May 25 1961

TO: AFSC Andrews Air Force Base, Md.

INFO: USAF Washington D C
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ASD Wright Patterson AFB Ohio
DMA Germantown, Md.
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ALO, Sandia Base New Mexico

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For SCRAS at AFSC, AFDRT-GW/1 at USAF, DORQ at SAC, ADPSP-4 at ASD, General Betts, Attn: Colone Griffin at DMA, Div 7100, Lenander at Sandia Corporation, McCraw at ALO. Reference (A) SWVWT-15-5- Secret RD Msg, (b) Lenander to Betts 11 May, Confidential RD Telegraphic Message. This msg in three parts. Part I. Representatives of AEC, ALO, Sandia Corporation, and AFSWC met on 10 May to discuss time schedules related to testing, CDR, and FPU of the 53 Program. Part II. A normal weapon developme program utilizes the period between CDR and FPU to verify the system and make minor changes required to correct deficiencies revealed during system testing. In the TX-53 program many factors have contributed t an abnormally delayed drop test program which in turn is expected to delay the final design verification. Part III. The three month delay in FPU, which seems apparent to the representatives of AFSWC and the AE design agency who attended the meeting, is a delay resulting from a slow drop test program which in turn re sulted from the extremely difficult design problems encountered. Any further delay in the FPU is now depe dent upon the test results in the remaining eleven units in the Sandia laydown drop test program.

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SCP-1

JOHN J. DISHUCK
Colonel, USAF
Director
Development Directorate

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HEADQUARTERS FIELD COMMAND
DEFENSE ATOMIC SUPPORT AGENCY
SANDIA BASE, ALBUQUERQUE, NEW MEXICO

FCDDI 13 Feb 1962

SUBJECT: Interim Development Report for the TX-53 Basic Assembly and TX-53 Bomb SC-4621 (WD) (U)

TO: President
Sandia Corporation
Sandia Base
Albuquerque, New Mexico

1. The subject report has been reviewed in coordination with representatives of the interested Services.

2. This review has established that the design meets:

a. All requirements of the approved Military Characteristics (MC) except for the following:

(1) Warhead (See MC 2. 1. 1). There is no warhead entity of the TX-53 bomb. The BA-53 includes the warhead portion of the bomb as well as all the fuzing and firing components except the impact firing (deformation) switch. This deviation is acceptable to the Department of Defense (DOD).

(2) Reliability (See MC 2. 3. 1). There are no reliability figures associated with a warhead since none exists. This deviation is acceptable to the DOD.

(3) Continuity Monitoring (See MC 2. 3. 3). Power external to the BA-53 is required for electrical continuity monitoring. (T-304C). This deviation is acceptable to the DOD.

(4) Length (See MC 3. 2. 1. 2). Effective length of the TX-53 is 148. 75 inches to the rear automatic deployment cover. Compatibility of this length with designated carriers is satisfactory. This deviation is acceptable to the DOD.

(5) Weight (See MC 3. 2. 1. 3). Weight is approximately 8850 pounds. This deviation is acceptable to the DOD.

(6) Aircraft compatibility (See MC 3. 2. 2). No B-70 capability exists. Atomic Energy Commission, Division of Military Applications (AEC-DMA) has directed that no further development effort will be expended since the carrier is nonexistent. This deviation is acceptable to the DOD.

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Military characteristics	Comments
2.2 Operational Considerations:	
2.2.1 This warhead shall provide the maximum attainable yield consistent with other limitations.	
*2.2.2 To insure a continuing retrofit and minor maintenance capability by the military at depot level, the design agency will give particular attention to reasonable component accessibility in order to permit the replacement of limited life items, to permit engineering improvements, and to permit the exchange of components for which functional integrity cannot be predicted.	
2.2.3 This warhead shall be capable of carriage and delivery in the B-58 (Pod).	2.2.3 The basic assembly is compatible with the B-58 (pod).
2.3 Reliability Considerations:	
2.3.1 The probability of this warhead producing the desired full scale nuclear yield, after receipt of arming and firing signals in their proper sequence shall be [redacted] The reliability of this warhead shall not be dependent upon continuity monitoring immediately prior to employment.	2.3.1 Analysis indicates that the reliability of the TX-53 basic assembly will be [redacted]
2.3.2 [redacted]	
2.3.3 Any continuity monitoring system used shall be isolated insofar as practicable from functional circuits and shall not require external electrical power. Monitoring currents shall be limited to a value below that which will operate the most sensitive component. The connectors or controls and indicators for the continuity monitoring system shall be accessible at the exterior of the warhead.	2.3.3 Power external to the weapon is required for continuity monitoring. The T-304C will provide the necessary power and will properly limit the monitoring current.
2.4 Safety Considerations:	
**2.4.1 The probabilities for a premature nuclear detonation from random component failure for the environments specified herein are:	
**2.4.1.1 During storage, transportation, handling, and maintenance of the completely assembled warhead not in the bomb -- less than 1 in 10^6.	
**2.4.1.2 During storage, transportation, handling, and maintenance of the completely assembled warhead in the bomb -- 1 in 10^6.	
2.4.2 [redacted]	
2.4.3 Maximum safety during ground handling, maintenance, storage and logistic transportation shall be assured by the provision in the warhead for positive electrical isolation of the warhead arming and firing circuitry from possible arming and	

*Amendment Number 3.
**Amendment Number 2.

Military characteristics	Comments

3.2.3 This bomb shall be compatible with suspension, release, wiring, power, control, and monitoring systems of the designated carriers.

3.2.4 This bomb shall be capable of being delivered as a laydown weapon in addition to air and ground impact burst.

[redacted]

3.2.7 This bomb shall be designed to operate with the following fuzing and firing options:

3.2.7.1 Air burst, (free fall or retarded option to be ground selectable.)

3.2.7.2 Contact burst (ground or shallow water), (free fall or retarded to be ground selectable).

*3.2.7.3 Delayed burst, with a time delay sufficient to allow safe escape with no damage to the slowest designated carrier in normal flight maneuver.

3.2.8 Parachute failure.

[redacted]

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3.2.8.2 In event of parachute failure after release in laydown option, the weapon shall not detonate with nuclear yield (i.e., fail safe).

3.2.9 This bomb shall be designed to permit simplified procedures and minimum final strike preparation time.

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*Amendment Number 1.

Military characteristics	Comments

3.2.10 This bomb shall be designed to allow maintenance as stated in paragraph 2.2.2 for the warhead.

3.2.11 The activation of the bomb fuzing and firing, retardation, and laydown system shall be independent of aircraft power at release. If required, aircraft power may be used to perform auxiliary functions; however, these requirements for aircraft power shall be clearly established with the DOD before such use is considered acceptable.

3.2.12 The bomb requirement for aircraft power shall be compatible with power available in the designated aircraft under normal in-flight operating conditions as specified by the DOD.

3.3 Environmental Considerations:

3.3.1 This bomb shall withstand, without functional impairment, or reduction of operational reliability:

3.3.1.1 The environment criteria and forces of acceleration specified in the Stockpile-to-Target Sequence, applicable portions of MIL-E-5272B; MIL-A-8591B(ASG) and Joint Environmental Task Group Report SC-2943(TR).

3.3.1.2 Storage in the bomb bay of the specified carriers for at least 30 days in its strike configuration ready for immediate employment.

3.3.2 The completely assembled bomb and its handling equipment shall be capable of being transported by road, rail, ship, and aircraft without loss of functional reliability.

3.3.3 Vulnerability to blast, fragments, and to thermal, electromagnetic, and nuclear radiation shall be minimized, consistent with the protection provided by and the vulnerability of its carrier to those countermeasures.

3.3.4 This bomb shall be packaged so that it can be air-lifted by the following USAF aircraft: C-119, C-123, C-124, C-130, C-133.

3.3.5 This bomb shall require no special environmental conditions for storage.

3.4 Reliability Considerations:

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3.4.2 The reliability of this bomb shall not be dependent upon continuity monitoring immediately prior to take-off.

Military characteristics	Comments

3.4.4 If a ground continuity monitoring system is used, the continuity loop(s) of the warhead shall also be used for monitoring the desired bomb fuze components. The current shall be provided by the monitoring system used for the warhead. Monitoring currents shall be limited to a value below that which will operate the most sensitive component. The bomb shall be constructed so that the warhead monitoring system controls and indicators are accessible from outside the bomb.

3.5 Safety Considerations:

*3.5.1 The probability of premature detonation from random component failure alone for the environments specified herein shall be:

*3.5.1.1 During storage, transportation, handling, and maintenance of the bomb in an unready condition -- less than 1 in 10^6.

*3.5.1.2 During storage, transportation, handling, maintenance, assembly, and monitoring of the bomb in a completely assembled for strike configuration -- 1 in 10^6.

3.5.1.3 After initiation of the drop sequence and during the period wherein a nuclear detonation might endanger the launching aircraft or crew, 1 in 2,000, exclusive of parachute failure.

3.5.2 Release of the bomb in an unarmed condition must result in a nuclear dud weapon.

3.5.3 Manual safing, but not manual arming, and continuous visual indication of the safe or unsafe condition shall be provided during ground handling.

*3.5.4 The bomb shall also contain a SAFING device which is remotely controllable and reversible when the bomb is loaded in the strike aircraft. Provision shall be made so that positive indication of the UNSAFE condition can be determined from a remote location in the crew's space. The objective shall be the provision of positive safing of the weapon making it suitable for an aerial or surface maneuver above or across friendly territory in peace and war, and to prevent nuclear yield in the event of an accident or an inadvertent release.

3.5.5 All safety devices shall be designed so that after a normal armed release impact, they do not provide a means for the enemy's dudding the weapon.

4. MAINTAINING AND HANDLING EQUIPMENT

4.1 Equipment for maintaining and handling the bomb shall be such that these operations can be performed simply and rapidly with the minimum opportunity for human error.

4.2 Current and proposed handling equipment for present bombs and bombs being developed shall be utilized when practical. The most suitable features of such equipment shall be employed whenever practical in the development of any new equipment.

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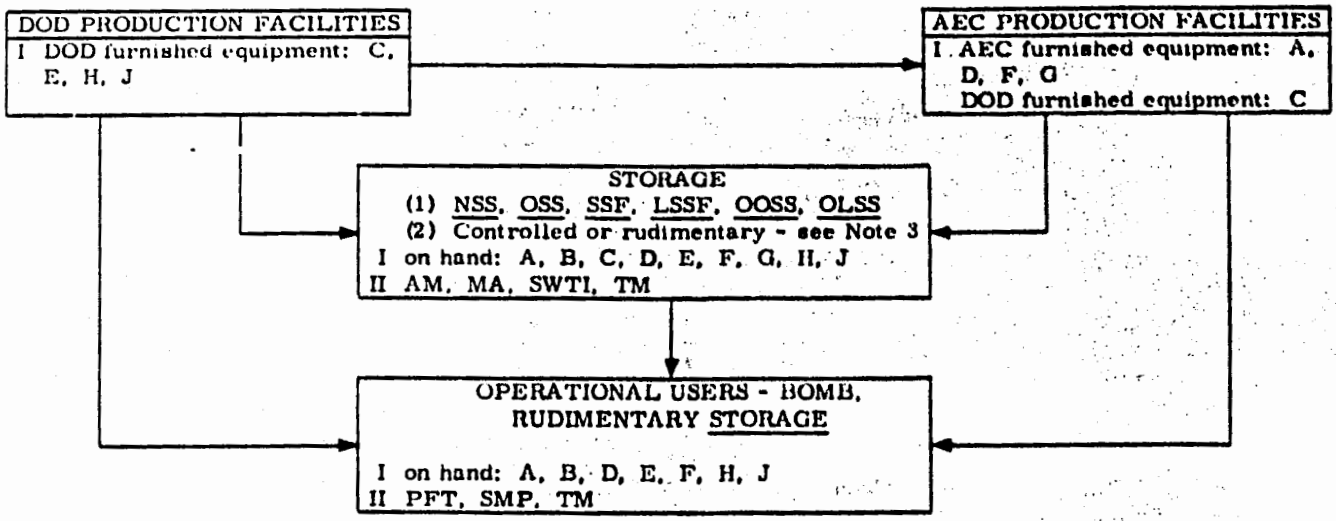
*Amendment Number 2.

Military characteristics	Comments
4.3 The handling equipment required shall be light in weight, few in numbers, adequately identified, transportable by common carriers, compact, and as easy to handle as is consistent with its functions.	
4.4 Handling equipment and packaging shall be capable of withstanding environmental conditions required of the bomb in the areas where these are used together.	
5. This document is classified SECRET-RESTRICTED DATA in its entirety because it reveals design characteristics of a nuclear weapon.	

SECTION I

TX-53 Stockpile-to-Target Sequence



KEY
I Atomic weapons material (see List I)
II Procedures (see List II)

List I - Atomic Weapons Material

A. TX-53 bomb
B. TX-53 bomb - (clip-in suspension system installed)
C. Parachute
D. AEC produced test and handling equipment
E. DOD produced test and handling equipment
F. AEC produced OST (Type 2) bombs
G. AEC produced Type 3A Trainers
H. DOD clip-in suspension system
J. DOD produced practice weapons

List II - Procedures

AM Authorized modifications
MA Maintenance. (See Note 4).
PFT Preflight test (visual inspection and go/no-go continuity test)
SMP Strike mission procedures (loading, post-loading and strike) - as defined by applicable technical publications and operations orders.
SWTI Special weapons transfer inspection (includes reacceptance inspections) - (visual inspection and go/no-go continuity test) - See Note 4.
TM Tritium monitoring (as required by applicable publications) - See Note 2.

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SECTION III MISSION PROFILE
B-47 Aircraft

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MISSION PROFILE
B-52 Aircraft

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TYPICAL B-52
AIRBORNE ALERT MISSION

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B-70 AIRCRAFT

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ENVIRONMENTAL DATA REFERENCES

Transmitted to Sandia Corporation as part of normal B-70 Joint Working Group functions.

Report number	Title	Classification
NA-58-231	Performance Specification Environmental Control Subsystem Group B-70 Air Vehicle Weapon System B-70	S
NA-58-225	Preliminary Weapon System Specification for B-70 Weapon System	S
NA-58-1709	Preliminary Study on Environmental Control Methods for Weapons B-70 Weapon System	S
NA-57-1006	Performance Specification Alternating Current Power Characteristics and Utilization Requirements for B-70 Air Vehicle, B-70 Weapon System	U
TFD-58-709 NA (Special Report)	Summary of B-70 Store Characteristics	S
Joint Working Group Minutes	1st Meeting 17 Nov 58 2nd Meeting 6 Jan 59 3rd Meeting 14 Apr 59	S S S
NA-58-1093	Compatibility Study TX-41-B-02 in B-70 Air Vehicle	S
AFSWC	Proposal for Joint B-70/Nuclear Bomb Capability Development and Test Program 7 May 58	S
NA-56-1201	Summary of Aerodynamic Force Coefficients for a Series of Isolated Bluff Store Shapes as Derived from Wind Tunnel Tests	S
NA-57-1223	Special Weapons Report Weapon System 110A	
NA-59-278	Data Submittal Schedule, B-70 Weapon System	U
NA-58-LA-0120	Supersonic Wind Tunnel Test of the 0.035 Scale Bluff Store Shapes for the Weapon System 110A/L Airplane	S
NA-59-172	Acoustical Environment of the B-70 Airplane	S

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APPENDIX D

SCHEMATICS

(The schematics to be used in this report are reductions of Drawings 165207 and 165206)

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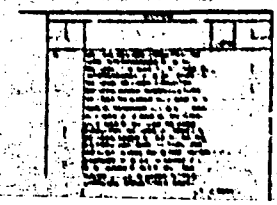

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