AIRCREW NONNUCLEAR WEAPONS DELIVERY MANUAL

Commanders are responsible for bringing this publication to the attention of all affected Air Force personnel.

USAF SERIES B-57B, B-57C AND B-57E AIRCRAFT

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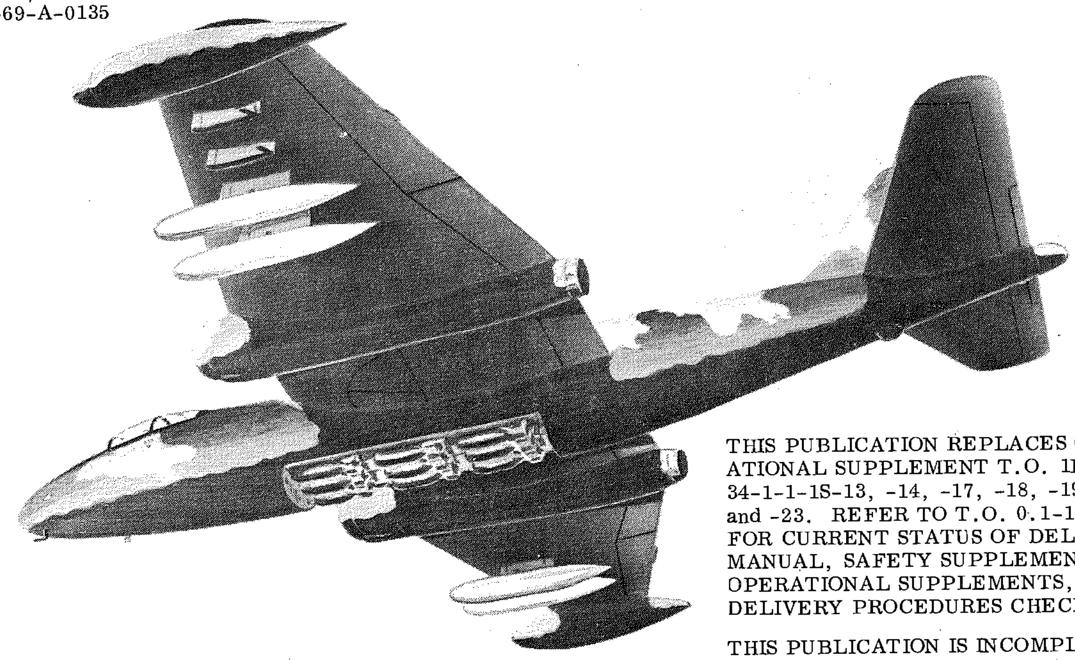

THIS PUBLICATION REPLACES OPERATIONAL SUPPLEMENT T.O. 1B-57-34-1-1-1S-13, -14, -17, -18, -19, -21, and -23. REFER TO T.O. 0.1-1-2A FOR CURRENT STATUS OF DELIVERY MANUAL, SAFETY SUPPLEMENTS, OPERATIONAL SUPPLEMENTS, AND DELIVERY PROCEDURES CHECKLIST.

THIS PUBLICATION IS INCOMPLETE WITHOUT THE BALLISTICS TABLES, T.O. 1B-57B-34-1-2, THE CLASSIFIED SUPPLEMENTS T.O. 1B-57B-34-1-1A, T.O. 1B-57B-34-1-2A, AND ABBREVIATED FLIGHT CREW CHECKLIST T.O. 1B-57B-34-1-1CL-1.

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USAF

WEAPONS DELIVERY MANUAL, SAFETY AND OPERATIONAL SUPPLEMENTS STATUS

This page will be published with Safety Supplements, Operational Supplements, Flight Crew Manual Change, and Flight Crew Manual Revision. It provides a comprehensive listing of the current Flight Crew Manual, Flight Crew Checklist, and supplements. The supplements you receive should follow in sequence and if you are missing one listed on this page, see your Publications Distribution Officer and get your copy. T.O. 0-1-1-2 series indexes should be checked periodically to make sure you have the latest supplement and basic manuals.

CURRENT FLIGHT CREW MANUAL	DATE	CHANGED
T.O. 1B-57B-34-1-1	17 Jul 69	None

CURRENT FLIGHT CREW CHECKLIST	DATE	CHANGED
T.O. 1B-57B-34-1-1CL-1	17 Jul 69	None

CURRENT SAFETY SUPPLEMENTS	DATE
T.O. 1B-57B-34-1-1S-24	5 Nov 69

CURRENT OPERATIONAL SUPPLEMENTS

STATUS OF SUPPLEMENTAL MANUALS

T.O. 1B-57B-34-1-1A	17 Jul 69	Classified Delivery Manual
T.O. 1B-57B-34-1-2	17 Jul 69	Ballistics Tables
T.O. 1B-57B-34-1-2A	17 Jul 69	Classified Ballistics Tables

NOTE

B-57 activities actively engaged in weapons release should requisition the classified manuals and ballistics tables.

REPLACED OR RESCINDED SAFETY SUPPLEMENTS

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TABLE OF CONTENTS (CONT)

SIGHT LINE (SL): A sight line which has been depressed to correct for parallax and becomes the base, or zero, line for all sight computations.

SIGHT PICTURE: The relationship of the tracking index to the target, as it appears to the pilot.

SLANT RANGE (SR): The distance from the aircraft to the target at the time of firing guns, missiles, rockets or releasing bombs.

TRACKING INDEX: The aiming point, pipper, cross, etc., used by the pilot in weapons delivery.

TRAJECTORY SHIFT: The angular deviation of the bullet trajectory from fixed bore toward the flight path of the aircraft.

TRUE SIGHT DEPRESSION: A no-wind sight setting computed for preplanned release conditions.

UNEXPENDED STORES: Any item attached to the bomb door or pylon stations, for the purpose of dropping or firing, which has not received an electrical release of jettison impulse.

ZERO SIGHT LINE (ZSL): The base or zero line for all sight computations prior to parallax correction.

REFERENCES.

AFM-32-2	Ground Safety Manual
AFM-50-30	Fighter Weapons Manual
AFM-127-1	Aircraft Accident Prevention and Investigation
AFM-127-100	Explosives Safety Manual
NAVAIR OP2216 Vol I	Aircraft Bombs, Fuses and Associated Components
T.O. 1-1-26	Aircraft Stores Compatibility Manual
T.O. 1B-57B-1	B57B, C and E Flight Manual
T.O. 1B-57B-2-10	Maintenance Instruction, Armament and Photographic Systems
T.O. 1B-57B-5	Basic Weight Checklist and Loading Data
T.O. 1B-57B-33-1-1	Conventional Munitions Loading Manual, Basic Information
T.O. 1B-57B-33-1-2	Conventional Munitions Loading Manual, Expanded Loading Procedure
T.O. 1B-57B-34-1-1A	Aircrew Nonnuclear Weapons Delivery Manual, Classified Supplement
T.O. 1B-57B-34-1-2	Aircrew Nonnuclear Weapons Delivery Manual, Ballistics Tables
T.O. 1B-57B-34-1-2A	Aircrew Nonnuclear Weapons Delivery Manual, Ballistics Tables, Classified Supplement
T.O. 11-1-28	General - Bombs, Fins, Fuzes, Arming Wires and Related Components
T.O. 11-1-29	Tactical Munitions Manual for Bombs
T.O. 11-1-30	Tactical Munitions Manual for Rockets and Missile
T.O. 11-1-31	Tactical Munitions Manual for Small-Arms Ammunition
T.O. 11-1-32	Tactical Munitions Manual for Dispensers, Bombs and Fuzes
T.O. 11A-1-1-7	Bombs for Aircraft
T.O. 11A-1-33SS-1	Ground Handling of Aircraft Containing Ammunitions and Explosive Material
T.O. 11A-1-46	Ammunition Complete Round Chart and Transportation and Storage Guide

SECTION I
DESCRIPTION

TABLE OF CONTENTS

INTRODUCTION.

This section contains a description of the delivery modes pertinent to the mission, a brief description of the aircraft weapons systems, their release systems and associated armament equipment, the weapons suspension systems and their controls, the applicable nonnuclear munitions and fuzing data.

MISSION DESCRIPTION.

AIR-TO-GROUND STRAFING ATTACK.

A 20mm or .50 caliber strafing attack against surface targets is the most versatile and accurate method of delivering ordnance against a target and is, therefore, highly effective against a wide variety of targets. The strafing attack is easily performed and may be initiated with a minimum of pre-planning. The attack may be conducted from an angle-off or straight-ahead approach and the dive angle may be varied to fit the particular target situation. The lower dive angles (5 to 15 degrees) are generally more effective due to ease in tracking and an increase in the amount of ordnance that may be effectively placed on the target during a single firing pass. The main concern during this delivery is firing at the proper slant ranges where bullet impact is in proximity to the pipper position. If firing is to be accomplished beyond these ranges, the sight is further depressed so that pipper position and bullet impact are coincidental. Refer to sight setting tables in T.O. 1B-57B-34-1-2 for proper sight settings for different firing ranges. Although the effect is small, rangewind and crosswind do affect the strafing attack and must be compensated for, expecially on pinpoint targets.

DIVE BOMB DELIVERY.

Dive bombing is usually divided into categories of high-angle, medium-angle, and low-angle: these distinctions will not be made in this manual. The dive bombing tables in T.O. 1B-57B-34-1-2 provide trajectory data for dive angles of 15 degrees through 45 degrees for approved ordnance to be delivered. Consistency in the all important roll-in parameter cannot be overemphasized. The parameters of altitude, airspeed, distance from target, and power setting must be designed to place the aircraft at a predetermined release altitude and distance from target, with a predetermined bomb release velocity and altitude to effect an accurate hit. Because of the longer periods of wind effect on the trajectory of the bomb, it is also important that the pilot have knowledge of the magnitude of wind effect and, primarily, the wind velocity at release altitude.

The optical sight is used, in conjunction with the altimeter, to determine the release point. The bombing tables provide the sight depression angle relative to the flight path for various rangewinds and dive angles.

Several factors must be considered when determining an indicated release altitude: altitude loss during pullout, minimum aircraft ground clearance, altimeter lag, target elevation, and fragmentation clearance. The altimeter is set according to target pressure reduced to sea level. Immediately following bomb release, a minimum 3.5 g pullout is initiated. The acceleration rate of 3.5 g minimum must be attained within 2 seconds after release.

AIR-TO-GROUND STRAFING ATTACK

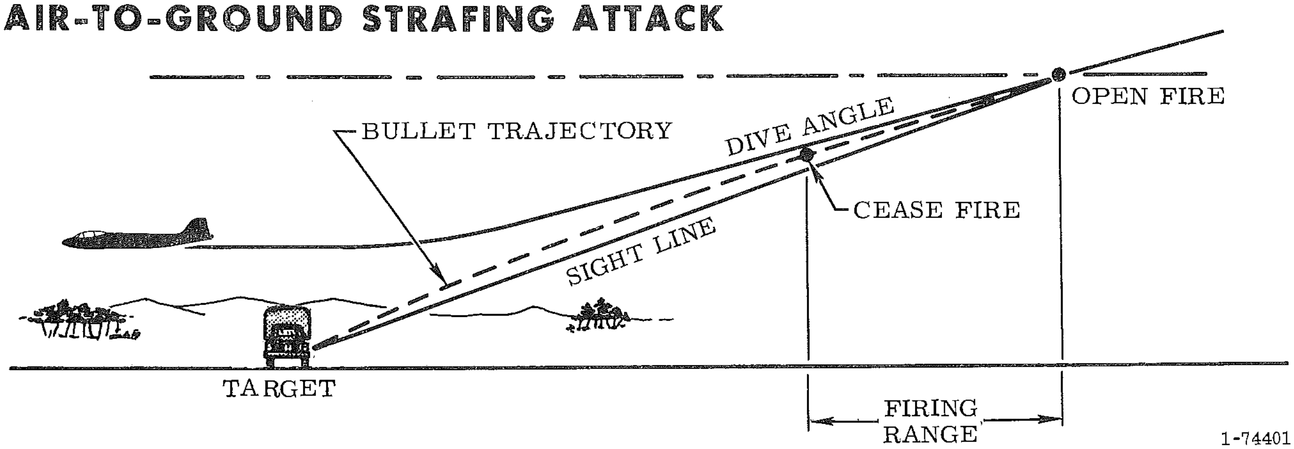


Figure 1-1

DIVE BOMB DELIVERY

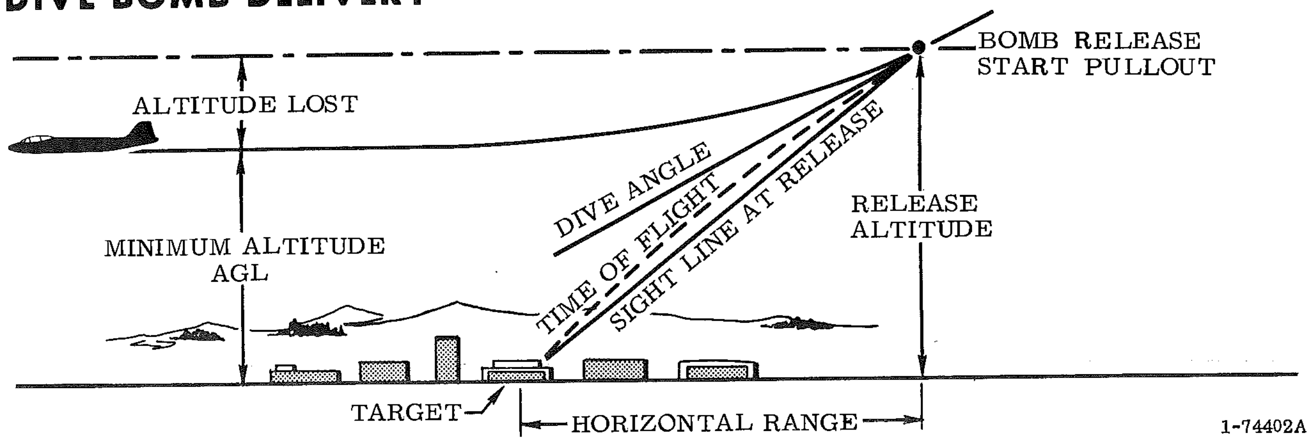


Figure 1-2

AIR-TO-GROUND ROCKET DELIVERY

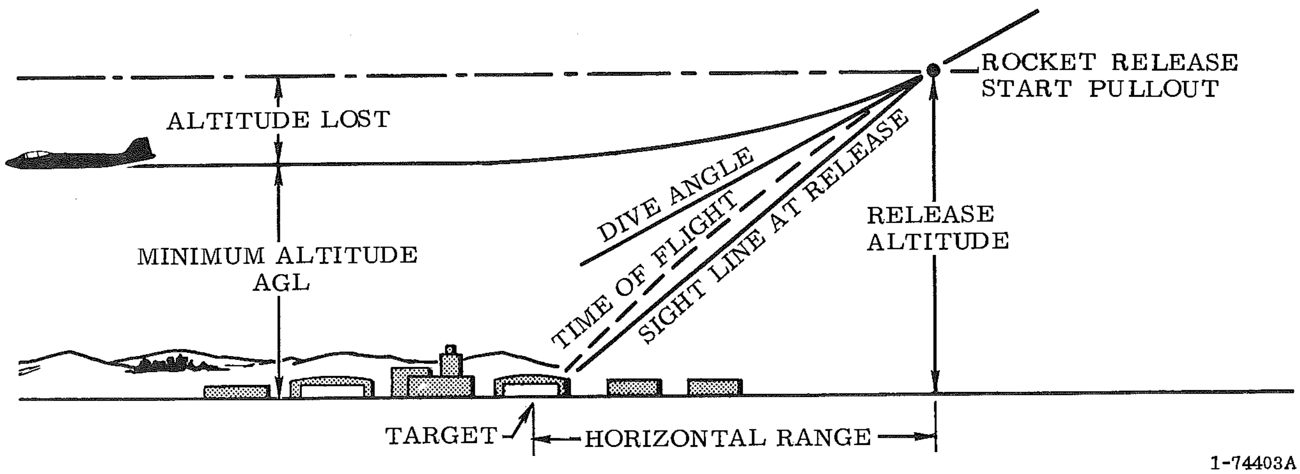


Figure 1-3

LOW ALTITUDE LEVEL BOMBING

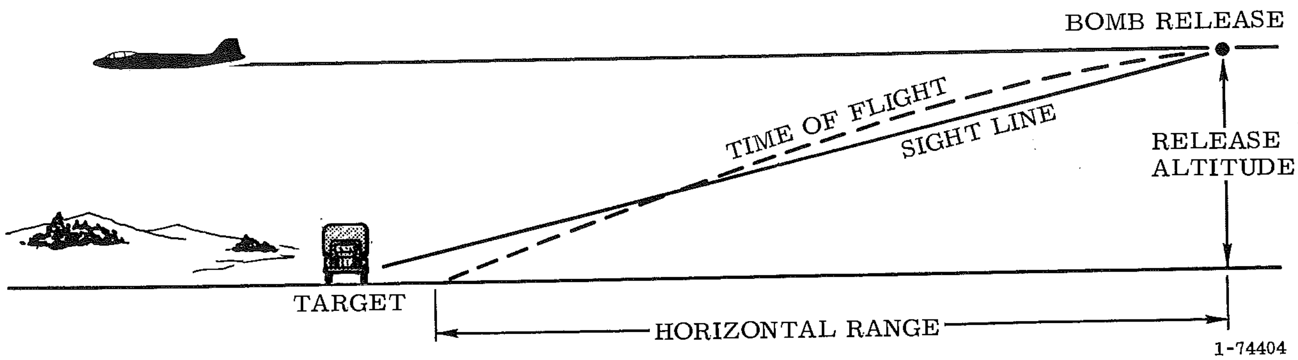


Figure 1-4

AIR-TO-GROUND ROCKET DELIVERY.

Rocket delivery and dive bombing considerations are essentially the same with respect to roll-in position, wind condition, release point, and pull-out maneuver.

The rocket launcher fires the 2.75-inch FFAR (Folding Fin Aircraft Rocket) at a fixed interval, until the entire package is fired. This provides excellent dispersion when firing at high speeds.

The MA-2/A rocket launcher is an underwing launcher capable of launching two 2.75-inch rockets. Each aft launcher support consists of a tube and casting assembiy incorporating an electrical circuit which energizes the rocket firing circuit. The left support contains the rocket ignition circuit.

The LAU-3/A rocket launcher is intended for service launching nineteen 2.75-inch rockets. Contact fingers on the launcher aft bulkhead provide the rockets with a ground so that the firing circuits may be energized. An intervalometer within the launcher converts the firing pulse to ripple firing with a 10-millisecond delay between rocket firing.

The LAU-32 series rocket launchers are underwing stores, capable of launching seven 2.75-inch rockets. Contact fingers on the launchers aft bulkhead provide the rockets with a ground so that the firing circuits may be energized. An intervalometer within the launcher converts the firing pulse into ripple firing with a 10-millisecond delay between rocket firing.

The LAU-59 rocket launcher is an underwing launch vehicle for launching seven 2.75-inch rockets. Each launcher tube has a detent which retains the rocket and a contact which ignities the rocket. When the launcher is in the ripple mode, all seven rockets are launched at 17 to 23 millisecond intervals.

The rocket launch tables eliminate lengthy computation of the optical sight depression angle by providing the actual sight setting for no-wind. Actual sight settings are tabulated for various angle-of-attack values at launch. All that remains to be accomplished is determining the necessary rangewind and crosswind correction.

LOW ALTITUDE LEVEL BOMB DELIVERY

Fire bomb and GP retards delivery may be accomplished by two modes of delivery, depending upon target characteristics and terrain features. The two delivery methods are:

a. Low Altitude Level Bombing - consists of a level approach to the aim point, maintaining a predetermined release airspeed and altitude. Ballistics tables are furnished for altitudes of 50 feet through 600 feet.

b. Low Altitude Glide Bombing - consists of a shallow dive angle approach to the aim point, maintaining a predetermined release airspeed and dive angle.

During the low altitude level delivery, release airspeed and height above target are established during the level flight approach to the target. The optical sight depression used to determine the release point is based on the distance from release to impact, corrected for rangewind. Crosswind is corrected for by crabbing into the wind so that the aircraft flight path is directly over the target. Crabbing to eliminate crosswind may cause the sighting reference to be offset from the target at release.

The considerations in delivering fire bombs and GP retards during a Low Altitude Glide Bomb Attack are essentially the same as in dive bombing. The aircraft must be flown so as to position it at a predetermined release altitude, slant range from the target, and release velocity in order to have an accurate bomb impact. A depressed sight line corrected for rangewind is used as a release reference. Correction for crosswind during this delivery requires an offset aim point due to aircraft drift at release affecting bomb line of flight.

Ballistics tables for fire bombs and GP retards practice bombs utilizing both level and glide deliveries provide sight depression data that will place the point of impact on the target.

RIPPLE BOMBING.

Multiple bomb releases may be accomplished using the select or train release mode for either level or diving attack conditions. See figures

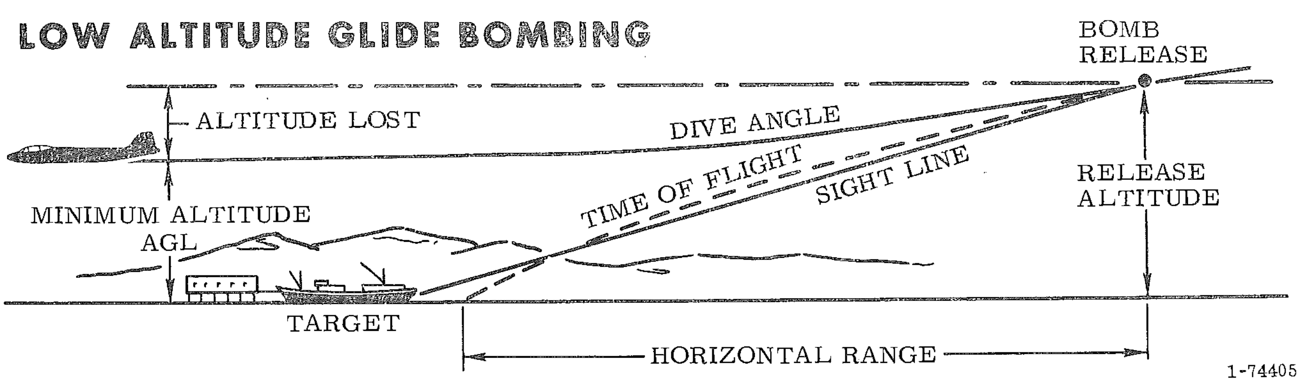


Figure 1-5

1-6 and 1-7. If the select position is used, the pilot must release each bomb individually. If the train position is used along with the number of bombs released control, the bomb intervalometer (B-3A or B-3B) may be used to release a planned number of bombs at a time interval between releases which will provide the desired bomb impact spacing. The desired impact spacing will depend on the type of target to be attacked. Ripple bombing tables are provided in T.O. 1B-57B-34-1-2 for various bombs, release conditions, number of bombs, and various intervalometer settings. For a given ripple bomb release situation, a slight depression angle from flight path (based on the initial release altitude) is provided to allow for aiming the center of the impact ripple at the target. The impact ripple length is listed along with the release altitude of the last bomb in the ripple release. The average impact spacing between bombs may be computed by dividing the ripple length by the number of bombs minus one. The ripple length and the release altitude of the last bomb, as listed in these tables, assume that the pilot maintains a fixed dive angle during the release time cycle. In this situation, the sight pipper would pass on through the target during the release cycle.

WARNING

- For ripple bombs released from a dive approach, the release altitude of the last bomb in the ripple must be greater than the minimum release altitude shown in the safe separation data charts.
- When multiple releases are planned, using either the train or select feature, caution must be exercised to avoid extreme aft or forward CG conditions. Normally, this would not be a problem unless a full bomb door load of stores is carried and one bay is to be train released. If these type stores are to be train released one bay at a time, the recommended order is aft, center, and forward.

MK82 (Snakeye I).

WARNING

Special care must be exercised during mission planning for train release of MK82 bombs (Snakeye I). The minimum release time between Snakeye I bombs is 0.16 seconds for 3 bombs carried on the bomb door to avoid the possibility of bomb collision and premature detonation after release.

MK15 Mod 0 fin is restricted to low drag unretarded release with the MK82 bomb.

MK15 Mod 1 fin may be dropped high drag with MK82 bomb.

AIRCRAFT MUNITIONS SYSTEMS AND CONTROLS.

AIRCRAFT DESCRIPTION.

The aircraft are equipped to carry guns, bombs, and mines, flares, and rockets. Stores are carried within the aircraft on a rotary bomb carrier door in the fuselage center section and on pylons on the outer wings. The rotating bomb carrier door is capable of carrying up to 21 bombs or mines depending upon their size. The four wing stations on each outer wing can be configured to carry either all rockets or rockets on the outer two stations and bombs, mines or flare dispensers on the inner two stations. Gun installations consist of four .50-caliber M3 or two 20-millimeter M39 guns in each wing outboard of the engine nacelle.

RIPPLE BOMBING - LEVEL RELEASE PROFILE

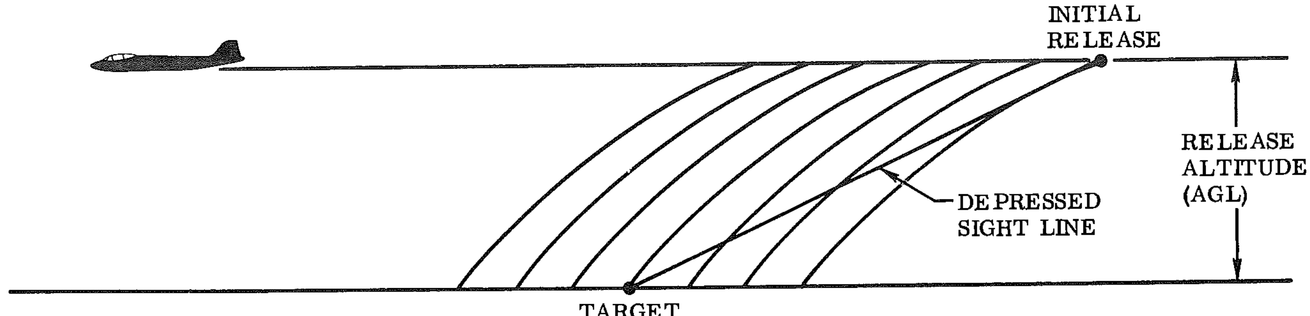


Figure 1-6

RIPPLE BOMBING - DIVE RELEASE PROFILE

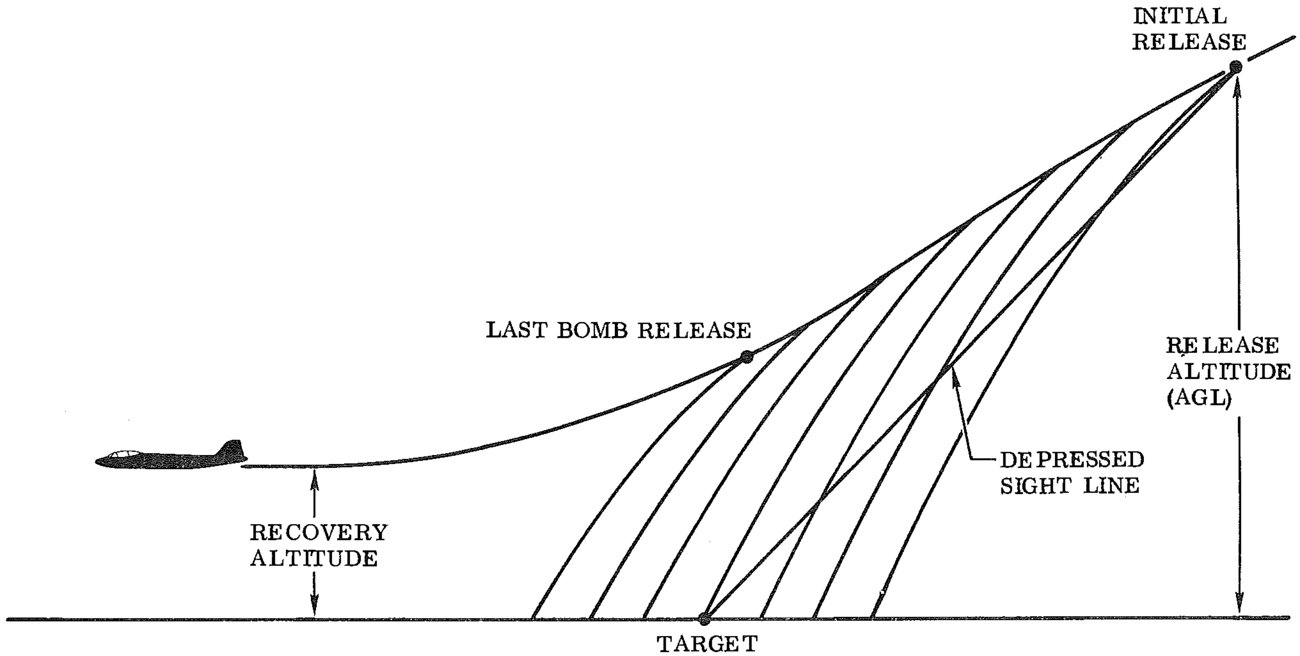


Figure 1-7

ARMAMENT CONTROLS.

The armament control system consists of the gun sight, an intervalometer, the armament control panel, the select armament switch, the jettison system and miscellaneous controls and indicators.

Gunsight.

An illuminated Mark 8 Mod 8 (Modified) Gunsight (figure 1-9) on the pilot's glare shield is the sight for visual attack. The sight is of the collimator type, and the pilot observes the reticle image on an adjustable reflecting glass plate through which the target is also visible. A soft rubber crash pad is on the front of the sight. The adjustable reflector plate can be tilted to allow 4 degrees elevation and at least 8-1/2 degrees depression of the reticle image with respect to the detent lock position of the reflector plate. Detent positions have been added to some gunsights to aid the pilot in selecting the desired sight setting for night deliveries. The dot in the center of the reticle is the "pipper." It is two mils in diameter, and the first circle from the center has a 50-mil radius. The second circle has a 100-mil radius, and the vertical row of indexes are 10 mils apart.

Gunsight Tilting Knob.

The knurled tilting knob, on the left side of the gunsight, elevates or depresses the reticle image. The tilting knob is turned up or down to align the index pointer with desired sight setting (figure 1-10).

Gunsight Light Switch.

The gunsight light switch, on the left side of the fuel control panel, controls the lamp for the reticle image in the sight. The switch has three positions: GUNSIGHT ON, ALTERNATE ON, and off (neutral). The lamp is of the dual-filament type, so that if the filament which is controlled by the GUNSIGHT ON position should burn out, the outer filament will light when the switch is placed in the ALTERNATE ON position. The master guns switch on the armament control panel must be in GUNS, or SIGHT & RADAR for the circuit to be completed to the gunsight light switch. See Master Guns Switch in this section.

Gunsight Light Rheostat.

The gunsight light rheostat, on the left side of the fuel control panel, controls the brilliance of the reticle image. When the gunsight light is on, the brilliance of the image may be adjusted as desired by positioning the rheostat to any position between the BRT and DIM markings on the panel.

ARMAMENT CONTROLS (TYPICAL)

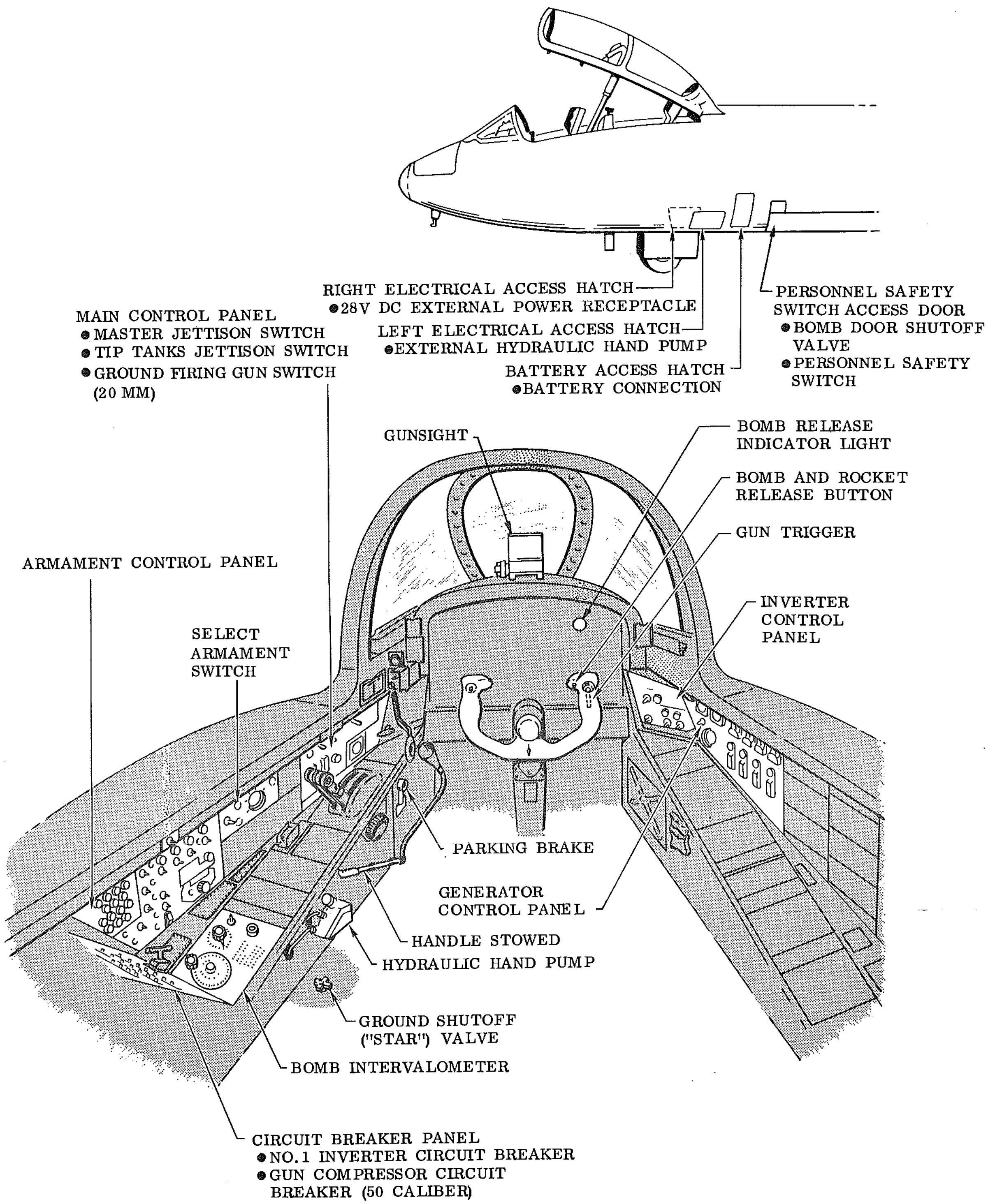
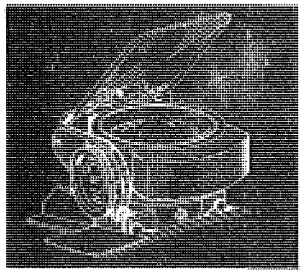
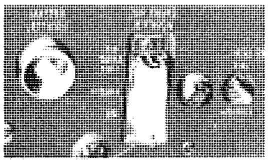


Figure 1-8. (Sheet 1 of 2)

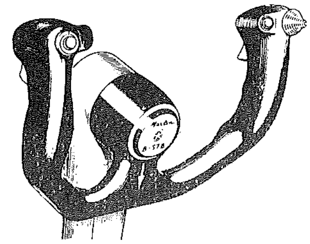


GUNSIGHT

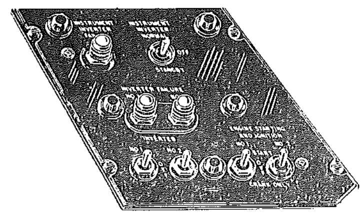


JETTISON SWITCHES

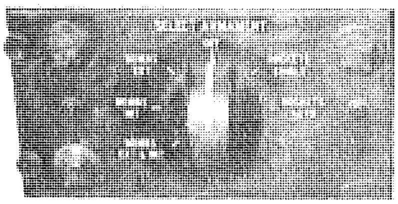
BOMB RELEASE INDICATOR LIGHT



CONTROL WHEEL

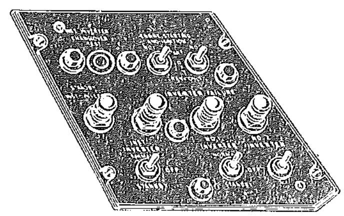


INVERTER CONTROL PANEL
(B-57B, B-57C, AND EARLY
B-57E MODELS)

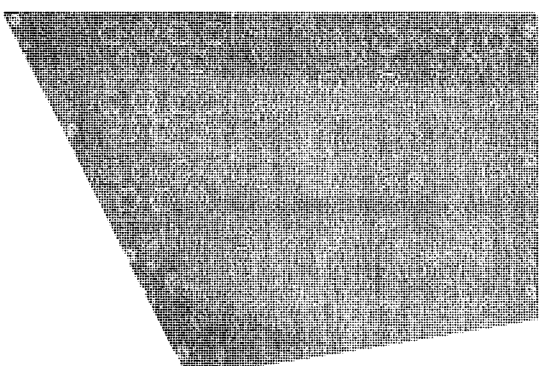


ARMAMENT SELECT SWITCH

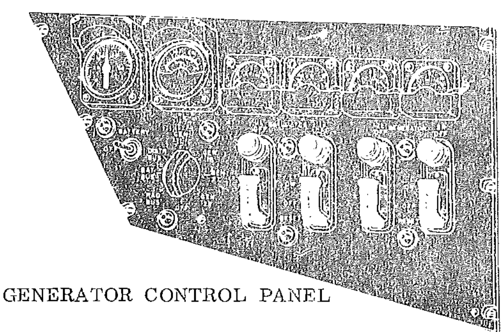
GROUND FIRING
SWITCH



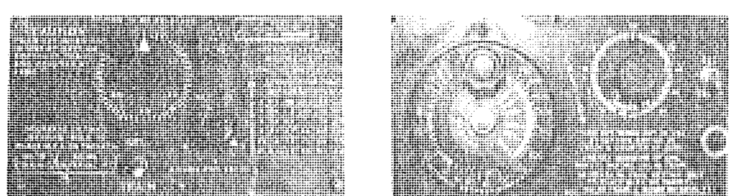
INVERTER CONTROL PANEL
(LATE B-57E MODELS)



ARMAMENT CONTROL PANEL



GENERATOR CONTROL PANEL



INTERVALOMETERS

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Figure 1-8. (Sheet 2 of 2)

GUNSIGHT

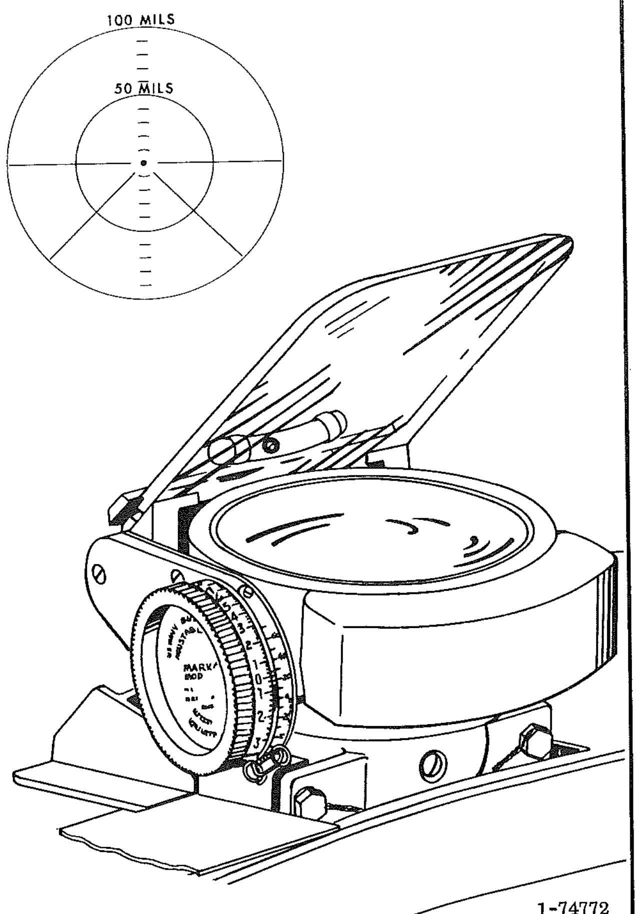
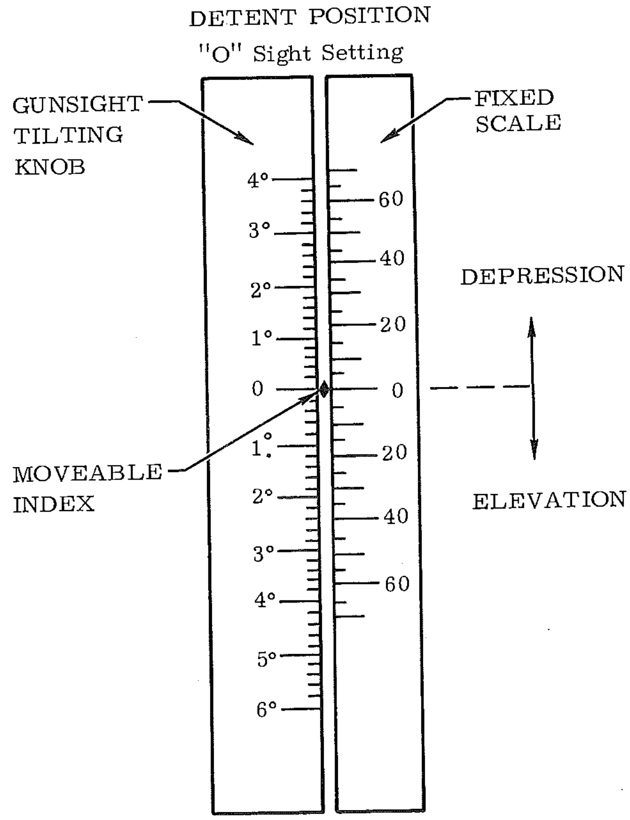


Figure 1-9

GUNSIGHT SETTING SCALES



1. Scale on Tilting Knob is in Degrees.
2. Scale on Fixed Dial is in Mils.
3. Procedure for setting sight:
   a. Start with sight in Detent Position.
   b. For Rockets, Guns, and Bombs - Place moveable index to desired position opposite fixed scale; then move "O" index on Tilting Knob opposite the moveable index.

1-74544A

Figure 1-10

Select Armament Switch.

The select armament switch (figure 1-11) selects the stores to be released. When this switch is OFF, the armament bus is de-energized; when the switch is in any position other than OFF, the armament bus is energized. The stores may be selected for release as follows: internal, external, or both. The rockets may be released either singly or automatically.

Bomb Intervalometer.

The bomb intervalometer (figures 1-12 and 1-13) enables the pilot to release the internal and external bombs individually or in train. The select-train switch on the intervalometer selects the method of release. Placing the switch in SEL releases the bombs singly. When the train release is desired, the switch must be in TRAIN and the bomb counter must be set for the number of bombs to be released. The B-3A groundspeed/interval setting or the B-3B releases per second setting is used to obtain the required time between bomb releases for the desired impact spacing for maximum weapon effectiveness. Release time intervals from approximately 0.05 second to 1.0 second are available with either intervalometer. Figure 1-14 shows the time between bombs for the range of B-3A groundspeed/interval settings and the B-3B releases per second setting. Figure 1-13 shows the B-3A interval settings (detent positions) which may be set opposite the 100 MPH groundspeed value. B-3B interval settings (releases/sec) of 1, 2, 3, 5, 8, 12, and 20 may be selected.

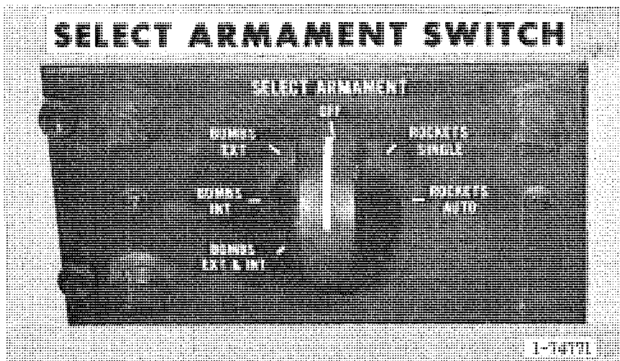


Figure 1-11

NOTE

Intervalometers should be set at a number greater than the number of bombs to be released to insure that all bombs are released.

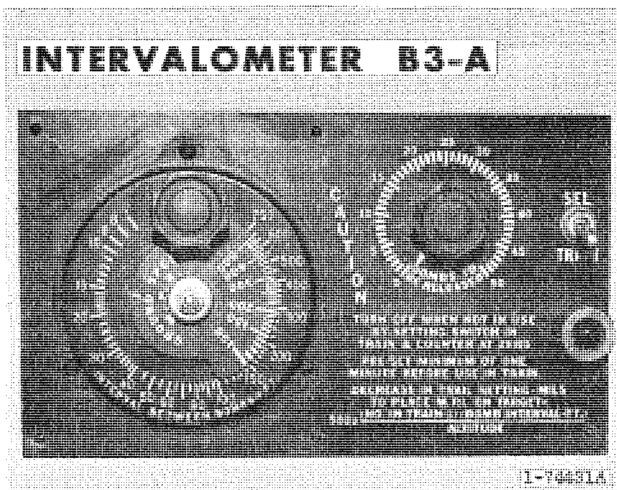


Figure 1-12

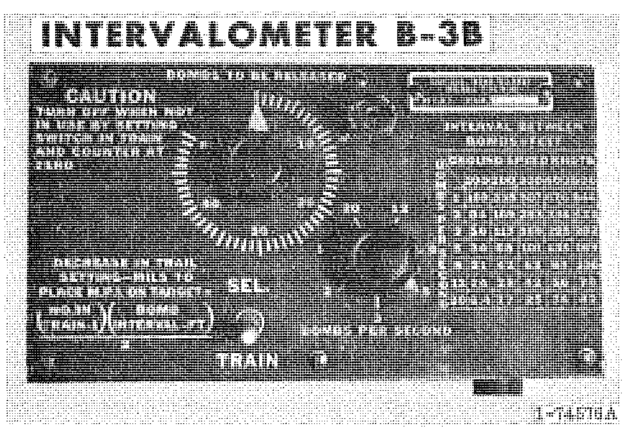
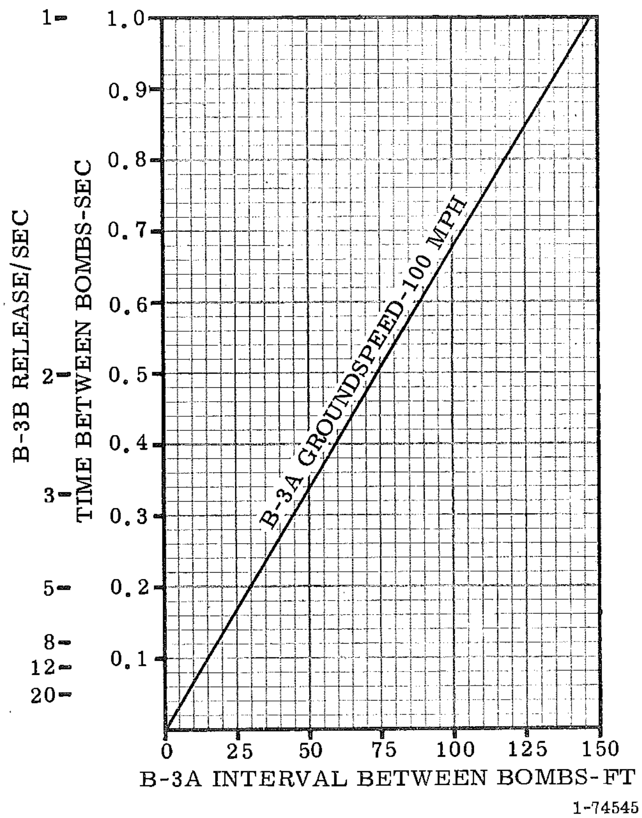


Figure 1-13

B-3A/B INTERVALOMETER CONVERSION



B-3A INTERVAL SETTING FOR 100 MPH GROUNDSPEED

1.	7.5	12.	40.0
2.	9.0	13.	45.0
3.	10.0	14.	53.0
4.	12.0	15.	62.0
5.	14.0	16.	72.0
6.	16.0	17.	84.0
7.	19.0	18.	97.0
8.	22.0	19.	112.0
9.	25.0	20.	130.0
10.	30.0	21.	150.0
11.	34.0		

Figure 1-14

With either method of release, the internal bombs are normally dropped in ascending numerical order from the bomb stations which are loaded and selected. When the select armament switch is in BOMBS EXT & INT, the external stores are released before the internal stores. External STA switches must be OFF for release of external stores singly or in train when EXT & INT stores are selected.

NOTE

Preset intervalometer a minimum of one minute before use in train.

Armament Control Panel.

The armament control panel contains switches and indicator lights to determine which stores are to be released from both the internal and external stores. These switches are used in conjunction with the bomb intervalometer.

The armament control panel is used with the bomb intervalometer to select and control the release of both internal and external stores. The armament control panel is used with the select armament switch to control rocket firing. This panel also contains the master gunnery switch and the gun charger switch.

Master Jettison Switch.

The master jettison switch is on the pilot's left main control panel. When this switch is actuated, the rotating bomb door will open and all stores, including external stores, will be released. In addition, a relay opens the bomb arming circuit so that the bombs will be released unarmed.

CAUTION

The tip tanks will be jettisoned along with the stores if the tip tank jettison switch is in NORMAL when the master jettison switch is actuated.

Tip Tank Jettison Switch.

The guarded tip tank jettison switch is on the pilot's left main control panel. Switch markings are TIP TANKS ONLY, NORMAL, and OFF. The switch is spring loaded from TIP TANKS ONLY to NORMAL. Placing the switch in the momentary TIP TANKS ONLY position fires the explosive bolts and releases both tip tanks simultaneously. Pressing the master jettison switch when the TIP TANK JETTISON switch is in NOR-

ARMAMENT CONTROL PANEL

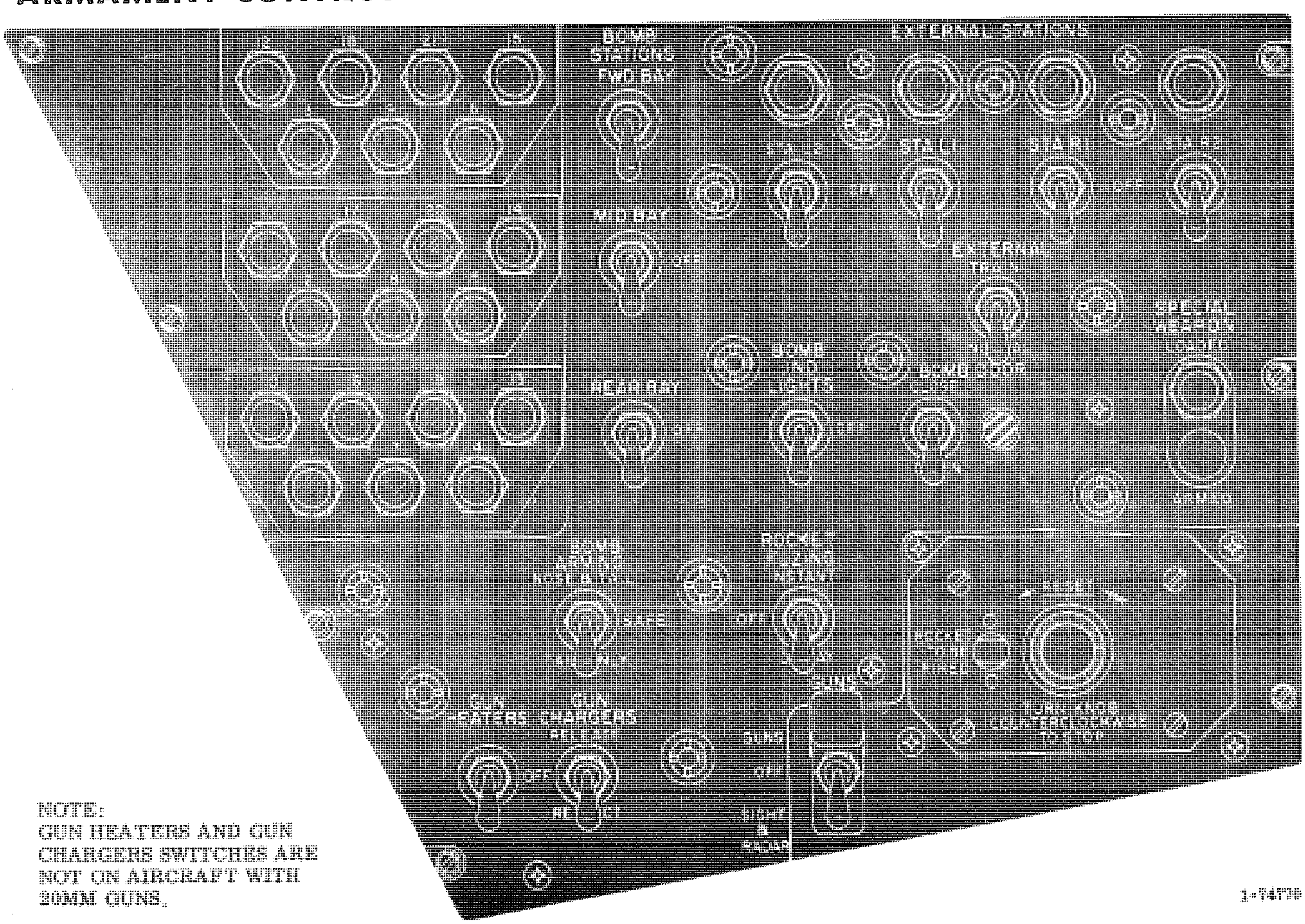


Figure 1-15

MAL causes the tip tanks to jettison along with the stores. The OFF position retains the tip tanks when the master jettison switch is pressed.

CAUTION

When pressing the master jettison switch with the tip tank jettison switch in the OFF position, make sure that the bomb door is closed after releasing the stores. Failure to close the bomb door and safe the personnel safety switch or insert the tip tank grounding switch pins can result in inadvertent jettison of the tip tanks upon engine shutdown.

INTERNAL STORES SYSTEM.

Controls and Indicators.

The release of the internal stores is selected by the BOMBS INT position of the select armament switch, or by the BOMBS EXT & INT position, and the exact stores to be released are determined by the BOMB STATIONS switches on the Armament Control Panel and by the Intervalometer. The BOMB STATIONS switches determine from which bay the stores are to be released and the Intervalometer determines how many and with what spacing. The actual store release is initiated by the bomb and rocket release button on the right handgrip of the pilot's control wheel.

The location and number of all internal stores loaded are indicated by the bomb indicator lights on the Armament Control Panel; as each store is released, its corresponding indicator goes off. Also as each store is released, the bomb-released indicator light will go on and off.

Bomb Station Switches.

Three bomb station switches are marked FWD BAY, MID BAY, and REAR BAY. Each switch is located adjacent to the indicator lights for its respective bay. These switches enable the pilot to select the bay to be released. When any or all of the switches are placed in their respective BAY position with all racks loaded, the bombs are released in ascending numerical order, either singly or in train, depending upon the position of the intervalometer train-select switch. If a reduced number of racks are loaded, the release sequence will change to keep the bomb door balanced. When the intervalometer is set for train and the select armament switch is in BOMB EXT & INT, the external stores will be released before the internal stores.

Bomb-Released Indicator Light.

A bomb-released indicator light is mounted on the pilot's main instrument panel and another is mounted on the aft crew member's instrument panel. When stores are being released, the

BOMB, ROCKET RELEASE BUTTON--GUN TRIGGER

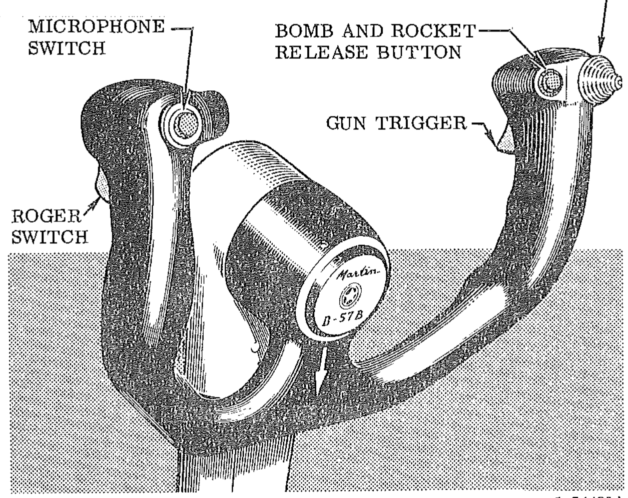


Figure 1-16

pulse from the intervalometer which energizes the bomb racks also energizes a circuit to the bomb-released indicator lights. Therefore, every time a pulse is transmitted, the indicator lights will go on for the time the signal is transmitted for bomb release, but does not necessarily indicate that the bomb has been released.

Bomb Indicator Lights.

Twenty-one bomb indicator lights are mounted on the armament control panel. Each light corresponds to a bomb station. The lights are arranged in three groups of seven to correspond to a bomb station and to correspond to the three bomb bays of the bomb carrier door. When bombs are loaded at any or all stations or the respective racks are cocked, the lights go on, provided the armament bus is energized and the bomb station and bomb indicator lights bay switches are on. When a bomb is released, its corresponding indicator light should go off.

Bomb Indicator Lights Switch.

When bombs are loaded at any or all stations, or when the racks are cocked and the bomb station switches placed in BAY, actuating the bomb indicator light switch causes the respective bomb indicator lights to operate.

Bomb-Arming Switch.

The bomb-arming switch is used to arm both the external and internal stores. The switch has three positions: NOSE & TAIL, TAIL ONLY, and SAFE. The NOSE & TAIL position arms two solenoids in the bomb rack, whereas the TAIL ONLY position arms one solenoid. The loading personnel will make the required hook-up, depending on the type of detonation required for the mission. The bombs will be released unarmed if the switch is in SAFE. When the jettison bomb system is actuated, a relay opens the arming circuit so that the bombs will be released in an unarmed condition.

WARNING

- The bomb arming switch must be in the safe position when the armament select switch is operated to preclude inadvertent release of armed ordnance.
- The normal arming of external and internal stores does not depend on the position of the bomb door.

Bomb and Rocket Release Button.

The bomb and rocket release button is located on the right handgrip of the pilot's control wheel. When the stores or rockets and their manner of release have been selected by the select armament switch and the armament control panel, depressing the bomb and rocket release button energizes the firing circuits.

BOMB-DOOR CONTROLS AND INDICATORS.

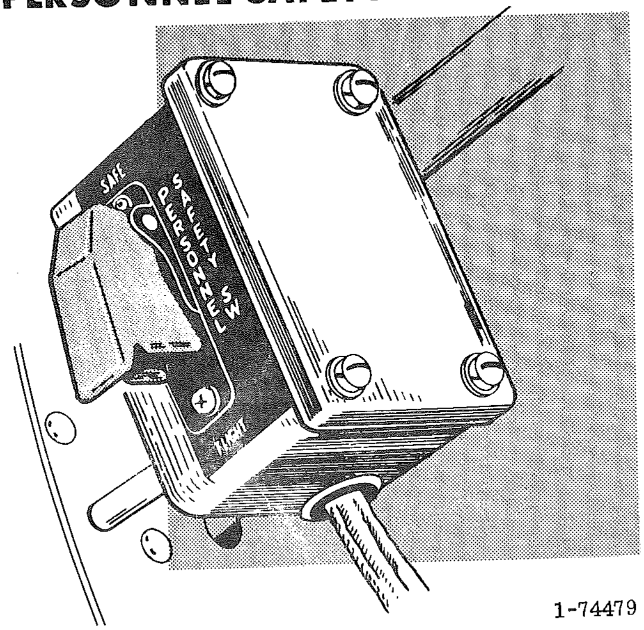
Bomb-Door Switch.

The bomb-door switches located on the armament control panel (figure 1-15) and on the aft crew member's left console are of the momentary type and have three positions: OFF, OPEN, and CLOSE. The switch is spring-loaded to OFF. When either switch is placed in OPEN, power passes to a double-acting solenoid valve, energizing the open side of the valve. When the valve opens, hydraulic pressure passes to two double-acting actuating cylinders which rotate the door 180-degrees clockwise in 4-seconds. When either bomb door switch is placed to CLOSE, the door rotates counterclockwise 180-degrees in 6-seconds to the close position. When the door fully opened or closed, the double-acting solenoid valve remains in the selected position. The door has no mechanical locks since the actuating cylinder lines are pressurized in either direction. Loss of hydraulic fluid in these lines normally causes the door to move to a position near full closed.

Personnel Safety Switch.

The personnel safety switch (figure 1-17), at the left forward corner of the bomb door area adjacent to the bomb-door ground shutoff valve, is a ground handling safety feature used to open the bomb bay circuits as a precaution against inadvertent operation of the bombing equipment when personnel are working in the bomb-door area. This switch prevents power from being supplied from the armament bus to the bombing

PERSONNEL SAFETY SWITCH



1-74479

Figure 1-17

and jettisoning circuits when switch is in SAFE. Before flight the switch must be in the FLIGHT position.

Bomb-Door Ground Shutoff Valve.

A manually operated bomb-door ground shutoff valve (figure 1-18) at the left forward end of the bomb door area, adjacent to the personnel safety switch, positions and locks the door during servicing operations. The valve is mechanically connected with the hinged access door which covers the personnel safety switch. When the access door is opened, the valve is automatically positioned in the closed (safe) position. When the access door is closed, the valve is in the open (flight) position. The valve must be in the flight position prior to all flights.

Emergency Bomb-Door Open Handle.

The emergency bomb-door open handle over the aft crew member's left console is used if the bomb door fails to open normally. When this handle is lifted, turned one-quarter turn clockwise, and pulled all the way out (4 inches), a cable attached to the handle will manually override the bomb-door control valve solenoid and position the valve so that hydraulic pressure from an emergency selector valve will be routed to the open side of the bomb-door actuating cylinders. Pressure is routed to the emergency selector valve from the emergency pressure line of the hydraulic system by the hydraulic system handpump.

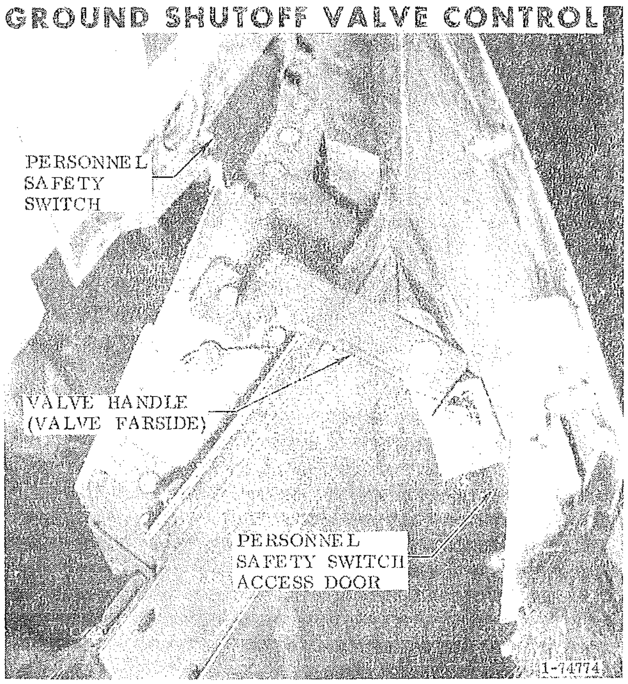


Figure 1-18

CAUTION

The emergency landing gear down handle must be at the "in" position when the emergency bomb-door handle is used to open the bomb door. Otherwise the bomb door cannot be opened.

NOTE

After the emergency bomb-door open handle has been pulled all the way out, it will remain in that position to keep the manual override on the bomb-door control valve solenoid in the correct position. The valve cannot be returned to the door-closed position until the aircraft is on the ground. To return the valve to the door-closed position, pull out the lanyard in the upper left forward bomb hoist access door a distance of about 4 inches.

Bomb-Door Position Indicators.

The bomb-door position indicators, on the armament control panel (figure 1-15) and on the aft crew member's instrument panel, indicate the position of the bomb door. When the door is fully closed, the word CLOSED appears on the indicators. When the door is fully opened, seven dots appear on the indicators. The dots are arranged in two horizontal rows, four on the top and three on the bottom, representing the position of the stores as they are ready for release. When the door is in any position other than fully open or fully closed, diagonal lines (barber pole) appear on the indicators.

NOTE

The bomb-door position indicators will not function unless the select armament switch is in any position other than OFF.

EXTERNAL STORES SYSTEM.

Controls and Indicators.

The controls and indicators for the external stores consist of the BOMBS EXT and BOMBS EXT & INT positions of the Select Armament Switch, the Intervalometer, the EXTERNAL STATIONS lights and switches on the Armament Control Panel and the BOMB ARMING switch on the same panel. Release of the external stores is selected by the BOMBS EXT position, or the BOMBS EXT & INT position, of the Select Armament Switch, and the particular stores to be released are determined by the EXTERNAL STATIONS switches and by the Intervalometer. Bomb release is initiated by the bomb and rocket release button on the right handgrip of the pilot's control column.

The location and number of external stores loaded are indicated by the bomb indicator lights on the Armament Control Panel which are controlled by the STA switches; as each store is released the bomb-released indicator lights will go on and off.

External Stores Switches.

Four external stores switches select any or all of the external stores to be dropped by the bomb release system. There is one switch for each external store carried, as follows: STA L2 controls the power circuit to the left outboard pylon bomb rack; STA L1, the left inboard rack; STA R1, the right inboard rack; and STA R2, the right outboard rack. The external stores may be dropped in salvo, train or individually, depending upon the setting of the switches and the intervalometer. If the EXTERNAL STORES switches are in the STA position, each external store selected will be released simultaneously; if the switches are OFF, the stores will be released individually or in train depending upon the setting of the intervalometer SEL. -TRAIN switch. If both the external stores and internal stores are to be dropped in train, the external stores will be dropped first in the following order: STA L2, STA R2, STA R1, STA L1.

External Stores Train Release Switch. (See figure 1-15.)

An external train switch has been added on some aircraft on the armament control panel. Placing the switch in the TRAIN position allows the external stores to always be released in train. With the switch in the NORMAL position the bombs will be released the same as before the modification. The train switch has been safety wired to normal on most aircraft.

External Stores Indicator Lights.

Each of the four external stores indicator lights correspond to one of the external stores stations. When external stores are loaded at any or all of the stations and the respective racks are cocked, the lights operate, provided the armament bus is energized and the external stores and bomb indicator lights switches are on. When an external store is released, its corresponding indicator light goes out.

NOTE

> If external stores are released singly or in train by the EXT & INT selection, STA switches OFF, the external station lights do not operate to indicate an external release.

External Stores Kickaway Brace.

Kickaway braces are steel tube constructed and prevent the aft end of long weapons from pitching up and contacting the aircraft. When available and not precluded by ordnance design, kidkaway braces are recommended on all externally carried munitions.

ROCKET SYSTEM.

The rocket system is configured to carry and deliver 2.75 inch FFAR's in the MA-2/A LAU-3A, LAU-32 series and LAU-59 rocket launchers.

Controls.

The controls for the rockets consist of the rocket intervalometer, the ROCKET FUZING switch, and the Select Armament Control.

Rocket Intervalometer.

The rocket intervalometer controls the sequence of firing in both single firing or salvo. When the select armament switch has been set at ROCKETS SINGLE, one rocket or rocket pod is fired each time the pilot depresses the bomb and rocket release button, and the intervalometer automatically steps to the next rocket station. When the select armament switch is set at ROCKETS AUTO and the bomb and rocket release button is depressed, the intervalometer causes the rockets to be fired in the proper salvo sequence at approximately 1/10-second intervals as long as the button is depressed. A numbered dial, visible through a window in the intervalometer housing, indicates the rocket to be fired. The reset knob on the intervalometer selects release of any particular rocket in case of misfire or other malfunction during a single release.

Rocket Fuzing (Arming) Switch.

This switch is not used for the 2.75-inch FFAR.

GUNNERY SYSTEM .50 CALIBER.

In certain B-57B and C series aircraft, there are eight M3, .50 caliber machine guns. Four guns are mounted in a horizontal bank in a gun bay outboard of the engine nacelle in each wing. The guns are fixed to fire downward at four degrees below fuselage reference line and to converge at a point 3250 feet in front of the aircraft. Each gun can fire 300 rounds of ammunition at a rate of 1150 rounds per minute for a total of 2400 rounds for the aircraft. Gun heaters are removed from all aircraft.

Master Guns Switch.

The master guns switch has three positions: GUNS, SIGHT and RADAR, and OFF. When guns are to be fired, the switch must be in GUNS. When the switch is in GUNS, a circuit is completed to the gun firing switch and the gun-sight light switch. When rockets are to be fired or bombs dropped, and the gunsight is to be used, the master guns switch should be in SIGHT AND RADAR. When the switch is in this position, a circuit is completed from the distribution bus to the gunsight light switch, but the circuit to the gun firing switch will be open. When the switch is in OFF, both circuits are broken.

WARNING

> If GUNS position is selected, the gun system will be armed.

Gun Heaters Switch.

Gun heaters have been removed.

Gun Chargers Switch.

The GUN CHARGERS switch, on the armament control panel (figure 1-15), permits charging the guns while airborne and clearing the guns if a misfire should occur. The switch is spring-loaded from the CHARGE to the center BAT position and has another permanent position of RETRACT. When the switch is placed momentarily in CHARGE, the chargers pull the bolts back momentarily and release them, charging the guns. Placing the switch in RETRACT causes the chargers to place the guns in a hold-back condition.

Gun-Firing Trigger.

The gun-firing switch, in the right handgrip of the control wheel, is the trigger for the guns. When the master guns switch is energized, depressing the gunfiring trigger switch closes the circuit to the gun controls in the wings, causing the guns to fire.

Ground Firing Switch.

A ground firing switch mounted under the left canopy sill (.50 caliber) permits the guns to be fired while the aircraft is on the ground by-passing the landing gear gun cutout relay. The gun-firing switch is placarded OFF and GROUND FIRING.

GUNNERY SYSTEM, 20mm.

In certain B-57B, C and E series aircraft there are four M39, 20-millimeter guns. Two guns are mounted in a horizontal bank in a gun bay outboard of the engine nacelle in each wing. The guns are fixed to fire downward at four degrees below fuselage reference line and converge at a point 3250 feet in front of the aircarft. Each gun can fire 290 rounds of ammunition, totaling 1160 rounds for the aircraft. The guns have a rate of fire in excess of 1500 rounds per minute. All control for the guns is electrical, with the exception of the manual chargers.

Controls.

The controls for the 20mm guns consist of the master guns switch, the gun-firing trigger, and the ground firing switch located on main control panel. (See GUNNERY SYSTEM, .50 CALIBER in this section.)

Ground Charger Cables.

Each M39, 20-millimeter gun is equipped with a manual gun charger. To ready the guns for firing, charge each gun separately prior to flight. The guns cannot be charged in flight.

Gun Purge Doors.

Aircraft equipped with 20mm guns have two gun purge doors in the leading edge of each wing. These doors are hydraulically operated and must be fully open before the respective gun will fire. The doors open automatically when the master gun switch is placed to GUNS position and the gun firing trigger is fully depressed. The time required for the doors to open is negligible and the doors remain open for two minutes after each burst.

MUNITIONS SUSPENSION SYSTEM.

BOMB DOOR.

The rotary type bomb door is a quick-acting, hydraulically operated, electrically controlled unit. The door is divided into three armament bays: forward, middle, and rear, each having seven bomb stations. Two alternate stations are located between the middle and rear bays for carrying the large stores. Bomb stations are arranged and electrically connected so that any number of bomb racks up to a maximum of 21 may be installed to accommodate various stores loading. Bomb racks are the MA-4A type incorporating nose and tail fuze arming solenoids and suspension hooks for loading 14-inch lug-to-lug stores. Depending upon the type of store and quantity, stores can be loaded either in a single layer or a two layer configuration. Lower level bomb racks are positioned in wells within the door structure, and upper layer bomb racks are attached to suspension assemblies attached to the door structure. Electrical receptacles are provided for electrical connection of the bomb racks.

Type MA-4A Bomb Racks.

Type MA-4A bomb racks are electrically controlled, self-contained, double-hook racks. They are positioned in wells at each bomb station and are bolted to four straps projecting out of the wells. The racks, rectangular in outline, consist of a stainless steel frame and cover, two bomb carrying hooks, associated mechanical linkage, and an electrical harness with switches and solenoids. All interior parts are treated for corrosion resistance. Four holes in the frame and cover are used for mounting and sway bracing. The main operating units consist of a release solenoid assembly, two arming solenoids, two switches, and a hook link assembly and operating mechanisms. Mechanical cocking of a released rack is accomplished automatically by loading a store in the rack. The rack may also be cocked manually by pulling the cocking lever forward. After the initial loading of stores, all subsequent operation of the racks is electrically controlled from the pilot station. The arming solenoids operate independently of the release and transfer circuits, and stores may be released singly in the armed or safe condition, or jettisoned in the safe condition.

Bomb Rack Chocks.

Two types of chocks are used on the bomb door. The "Y" chock is used on the small stores, and the 220-pound and 260-pound fragmentation bombs. The "X" chock is used on the 500-pound stores, the 750-pound store arrangement, and the 1000-pound general purpose bomb. The chocks are attached to the bomb door with two pins which are bolted to the bomb doors. The arms of the chocks are attached to the straps projecting out of the wells. The outermost chocks are installed on the outer curvature of the bomb door.

When a second layer of bombs is to be installed, the chocks must be installed in their respective places on the second layer support assembly.

Bomb Door Loading.

Figures 1-25 through 1-60 depict the authorized loads to be carried on the bomb door. These figures show the maximum load for each store; however, lesser quantities of stores can be carried. The stores should be loaded symmetrically, since this will keep the release sequence in a numerically ascending order.

BOMB PYLONS.

Of the eight external pylon locations, four can be configured with bomb pylons. These four stations are the two inboard stations on each wing. Each pylon is attached to the wing with four bolts, one at each corner of the pylon, and is cushioned against the wing by a rubber gasket the complete length of the fairing. A capability for jettisoning the pylon is not provided. The pylon incorporates an MA-4A type bomb rack having nose and tail fuze arming solenoids, and suspension hooks for loading 14-inch lug-to-lug stores. The bomb rack can be released either electrically from the cockpit or manually at the pylon. Manual release is achieved by opening an access door on the side of the pylon and actuating the manual release. Resetting of the rack is accomplished by removing the pylon forward access door and sharply pulling forward and releasing the cocking ring. Fully adjustable bomb chocks are incorporated in the pylon. Electrical connectors incorporated in the pylon provide for connecting the pylon to an electrical receptacle in the wing through an access door in the lower wing surface and, where applicable, to the store loaded on the pylon. All pylon electrical circuits operate from the aircraft 28-volt dc electrical system.

These bomb pylons are also used to carry the LAU-3/A, LAU-32 series or LAU-59 rocket launchers. (See ROCKETS in this section.)

Bomb Pylon Loading.

Figures 1-25 through 1-60 depict the authorized loads to be carried on the bomb pylons. These stores can be intermixed if the stores are loaded symmetrically.

ROCKET PYLONS.

Two types of pylons are required for the rocket launchers. One pylon is the same pylon that is used for bombs; this pylon carries the LAU-3A, LAU-32 series or LAU-59 rocket launchers. These pylons are attached only at the two inboard stations under each wing. When special adapters are used, LAU-32 and LAU-59 rocket launchers may be used on rocket pylons.

The rocket pylon for the MA-2/A rocket launchers can be attached to all eight external stations. Each pylon is attached to the wing with four bolts, one at each corner of the pylon, and is cushioned against the wing by a rubber gasket along the complete length of the fairing. A capability for jettisoning the pylon is not provided. However, an explosive bolt incorporated in the forward end of the pylon provides a jettisoning capability for the rocket launcher. Electrical receptacles on the pylon provide for electrical connection to the rocket launcher. An electrical connector at the aft end of the pylon provides for connecting to an electrical receptacle in the wing through an access door in the lower wing surface. All pylon electrical circuits operate from the aircraft 28-volt dc electrical system.

NONNUCLEAR MUNITIONS (COMBAT).

M3, .50 CALIBER MACHINE GUN. (Figure 1-19.)

The M3, .50-caliber aircraft machine gun is an automatic, recoil-operated, link belt-fed, air-cooled weapon having a rate of fire over 1150 rounds per minute. Ammunition can be fed from either the left or right side, depending on the position of bolt, cover, and receiver parts. An Edgewater M3 gun adapter is utilized to reduce the forces in recoil and counter-recoil that are transmitted to adjoining aircraft structure. A metallic link disintegrating belt is used to hold the ammunition while it is being fed into the gun. After a round is fired, the empty case is ejected overboard and the belt links are ejected into a wing compartment. Pneumatic gun chargers are utilized on each gun to hold the gun in the retracted position for purposes of safety, to permit cooling of the gun, to charge the gun during gunfire when a failure to fire occurs, and to fire the gun by use of an electro-pneumatic sear actuator contained in the charger.

M39, 20mm GUNS. (Figure 1-20.)

The M39, 20-millimeter gun is a gas-operated, belt-fed and electrically fired revolver type weapon, featuring a drum assembly containing five cartridge chambers parallel to its axis of rotation. Ammunition may be fed from either left or right side. A disintegrating link type belt is used to feed the ammunition into the gun. When a round is fired, the empty case is ejected overboard via a cartridge chute. Gun belt links are ejected into a compartment in the aircraft wing.

AMMUNITION-20-MILLIMETER.

All 20mm ammunition for the M39 gun is classified as artillery ammunition and is issued in the form of complete rounds of "fixed ammunition." A complete round, known as a cartridge, consists of a cartridge case, a projectile (bullet), propellant powder, and an electrical primer. Certain 20mm projectiles contain high explosives and are assembled with point detonating fuzes. All 20mm cartridges have a rotating band at the rear of the projectile to effect projectile rotating (stabilizing it in flight) and to prevent the escape of propelling gases past the projectile during travel through the gun barrel. The firing of a cartridge is initiated when the firing pin ignites the primer by means of an electrical impulse. The resulting flame passes through a vent leading to the propellant chamber and ignites the propelling charge. The expansion of the resulting gas forces the projectile out through the bore of the weapon. Upon impact, a fuze causes initiation of the explosive in one type 20mm projectile (HEI), while initiation of an incendiary composition in another (API) is caused by the crushing force and heat generated upon impact.

M3, .50 CALIBER MACHINE GUN

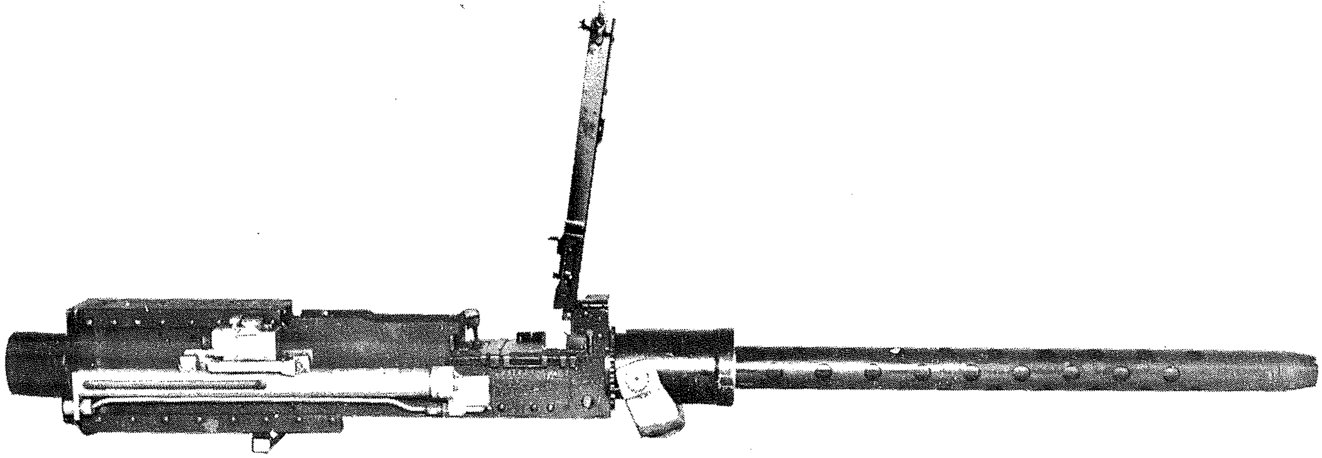


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Figure 1-19

M39, 20 MM GUN

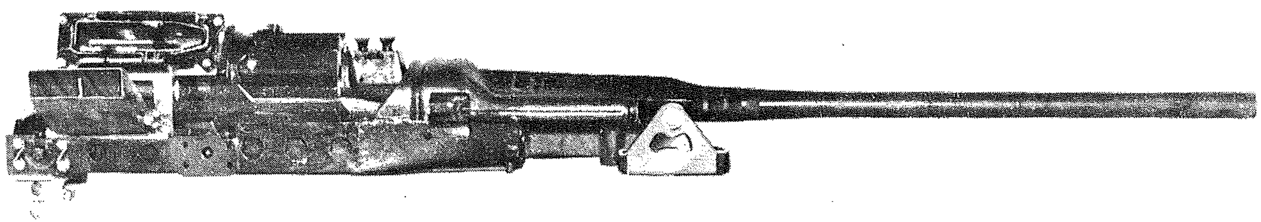

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Figure 1-20

Ammunition for the M39 gun is further classified according to the type of projectile used. There are presently three types of cartridges available: target practice (TP) or ball, armor-piercing incendiary (API), and high-explosive incendiary (HEI).

Cartridge - 20mm, Ball, M55A2.

This cartridge (figure 1-21) is used for practice firing. The projectile consists of a body, a nose, and a rotating band. The body is made of steel, is hollow, and contains no filler. The brass cartridge case is loaded with approximately 0.084-pound of propellant and contains an electric primer.

Cartridge - 20mm, API, M53.

This cartridge (figure 1-21) is for use against armored targets, functioning with a combined incendiary and penetration effect. The body of the projectile is solid shot made from bar alloy steel. The nose, which is made of aluminum alloy, is charged with a separately pressed increments of incendiary composition weighing a total of 85 grains. The nose is sealed with a closure disk. A steel adapter is crimped so as to allow the conical base of the closure disk to seat on the tip of the projectile body. This cartridge does not require a fuze, as functioning is initiated by impact of nose upon target. Cartridge case M103 and electrical primer M52A3B1 are used in this cartridge. A cellulose case vent seal is assembled in the primer recess between the vent and the primer.

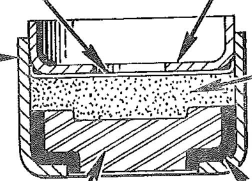
Cartridge - 20mm, HEI, M56A3.

This cartridge (figure 1-21) is used against aircraft and light material targets, functioning with both detonative and incendiary effect. The projectile body is a steel relatively thin-walled casing. The total weight of filler is 0.03-pound, composed of incendiary MOX-2B and RDX. Upon impact, the charge is functioned with a combined detonative and incendiary effect. Functioning is initiated by the fuze M505A3, an instantaneous fuze of the impact type. Cartridge case M103, loaded with approximately 0.083-pound of double base propellant, and the electric primer M52A381 are used in this cartridge.

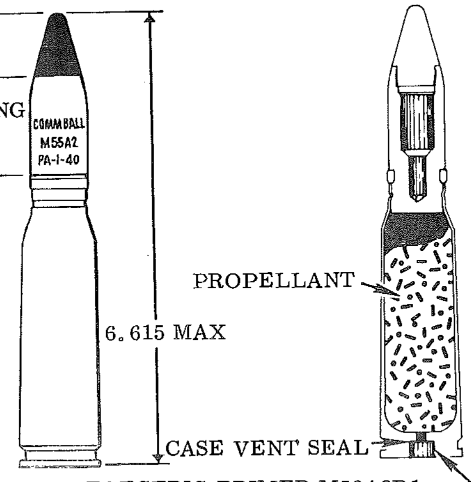
20 MILLIMETER AMMUNITION

M55A2 TP

WEIGHT, COMPLETE ROUND. . . . . . 0.56 POUNDS
WEIGHT, PROJECTILE . . . . 0.22 POUNDS
LENGTH, COMPLETE ROUND . . . . . 6.615 INCHES
LENGTH, CARTRIDGE CASE . . . . . . 4.015 INCHES
LENGTH, PROJECTILE. . . . . 2.98 INCHES
DIAMETER, PROJECTILE . . . . 0.79 INCHES

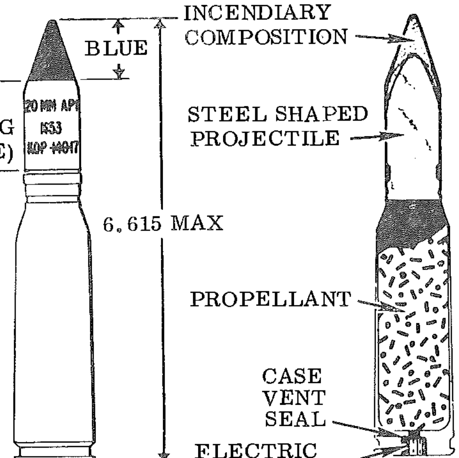


ELECTRIC PRIMER M52A3B1-ENLARGED



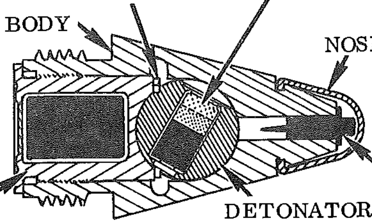
M53 API

WEIGHT, COMPLETE ROUND. . . . . . 0.57 POUNDS
WEIGHT, PROJECTILE . . . . 0.22 POUNDS
LENGTH, COMPLETE ROUND . . . . . 6.615 INCHES
LENGTH, CARTRIDGE CASE. . . . . . . 4.015 INCHES
LENGTH, PROJECTILE . . . . 2.98 INCHES
DIAMETER, PROJECTILE . . . . 0.79 INCHES

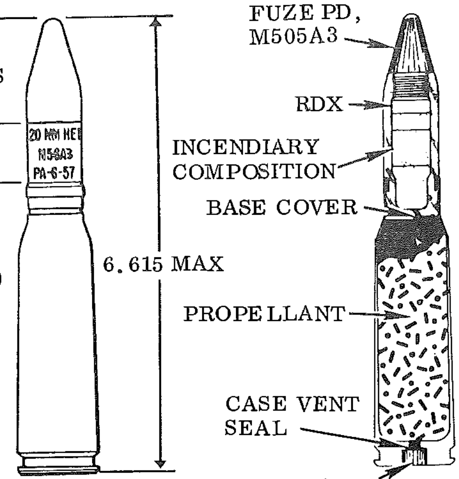


M56A3 HEI

WEIGHT, COMPLETE ROUND. . . . . . 0.56 POUNDS
WEIGHT, PROJECTILE . . . . 0.22 POUNDS
LENGTH, COMPLETE ROUND . . . . . 6.615 INCHES
LENGTH, CARTRIDGE CASE . . . . . . 4.015 INCHES
LENGTH, PROJECTILE. . . . . 3.025 INCHES
DIAMETER, PROJECTILE . . . . 0.79 INCHES



M505A3 FUZE



1-74777

Figure 1-21

AMMUNITION - .50 CALIBER.

The .50 caliber cartridges used in the B-57 aircraft are classified as follows:

a. Armor - piercing - incendiary-tracer, M20.

b. Ball, M2, M33

The cartridge components and terminology are shown in figure 1-22.

Armor-Piercing-Incendiary-Tracer.

This bullet (figure 1-23) contains a hard steel core, a gilding metal jacket, an incendiary composition as a point filler and a tracer element in the base. These bullets have smooth cannelures cut into the jacket for crimping of the cartridge case. This round has a bright trace after traveling 100-yards, and the bright trace continues for a distance of 1600-yards.

Ball.

This type of cartridge, intended for use against personnel and light material targets, is the oldest service type. It has been replaced for combat purposes, however, by armor-piercing and other types. The caliber .50 ball bullet (figure 1-23) is a metal-jacketed bullet containing a soft steel core with a lead-antimony point filler.

BOMB, GENERAL PURPOSE, 100, 250-POUND, M30A1, M57A1.

The general purpose bomb is a relatively thin cased bomb with an ogival nose, parallel side walls, and a tapered aft section. Either a box-type or a conical-type fin assembly may be used on general purpose bombs. A conical-type fin assembly is preferred because it increases the aerodynamic performance of the bomb and permits greater accuracy in bombing operations. When a conical-type fin assembly is installed, the bomb is fitted with antirotational devices to prevent inadvertent rotation of the fin during

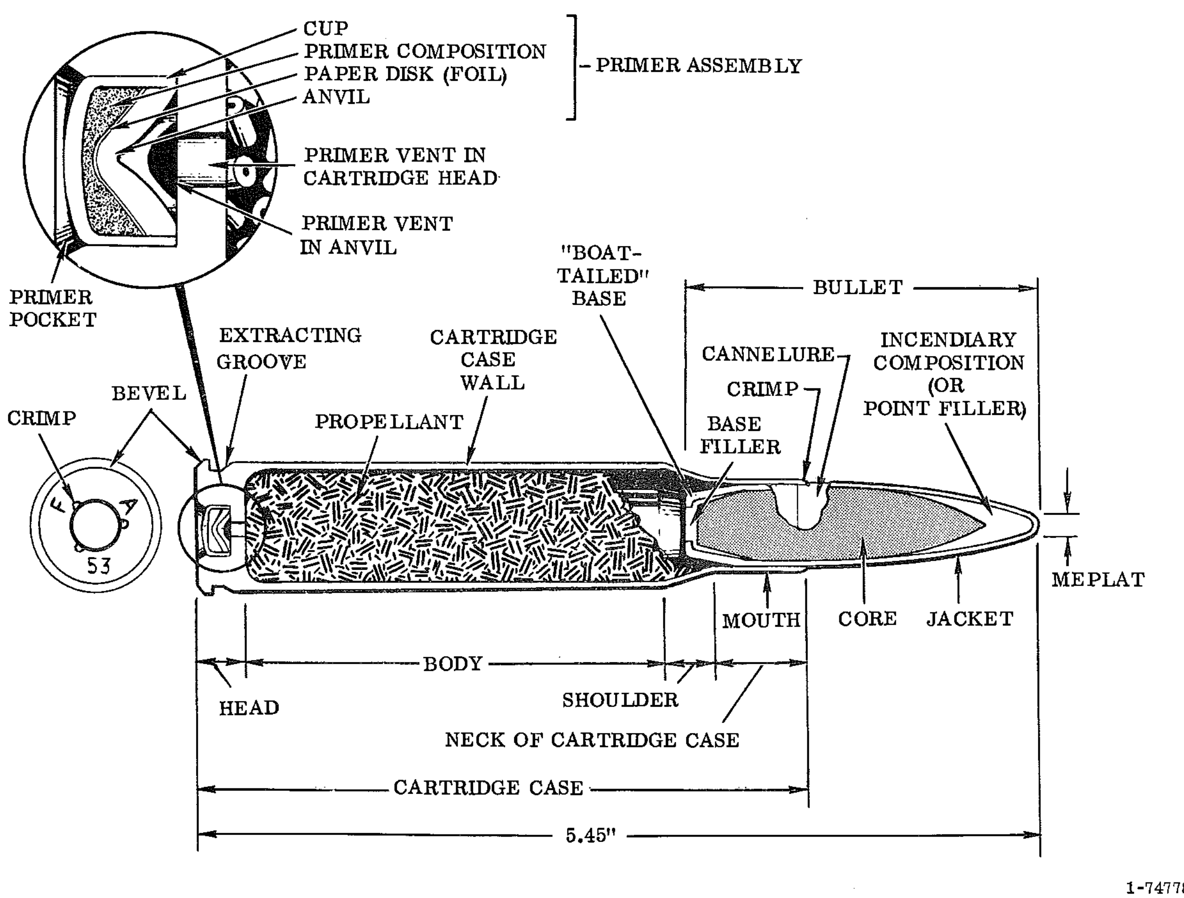


Figure 1-22

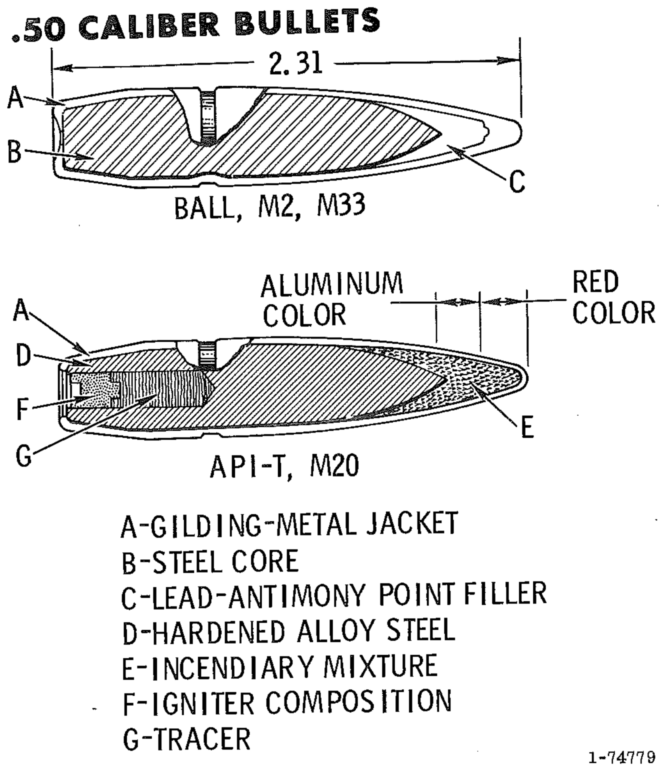


Figure 1-23

flight. The bombs are equipped with lugs welded to the case for both single-and double-point suspension. The double-suspension lugs are spaced for compatibility with 14 inch bomb racks, utilized with the B-57 series aircraft. General purpose bombs use both nose and tail fuzes. The base plug of these bombs is locked securely to the bomb body by two studs which extend from the base plug into the solidified explosive charge. To make the anti-withdrawal devices of long-delay fuzes more effective, these bombs also provide a means of locking the adapter-booster to the base plug to prevent removal of the base plug and adapter-booster. A fundamental characteristic of the explosive charges employed in general purpose bombs is their relative insensitivity to ordinary shock and heat incident to loading, transporting, handling, and storing. Different fuzing may be used with a general purpose bombs, dependent upon mission requirements.

BOMB, GENERAL PURPOSE, 250-POUND, MK81.

The 250-pound low drag bomb has a slender body with a long pointed nose. A conical-type fin is attached to the aft end of the bomb by eight setscrews. The bomb is filled with 80-20 tritonal or H-6. To accommodate threaded hoisting lug, the bomb has suspension lugs 14-inches apart and lug inserts located at the center of gravity. The bomb is equipped internally with a conduit assembly. This conduit connects the charging well with the nose and tail fuze wells allowing the use of electric type fuzing, or lanyard armed fuzing.

These bombs may be delivered from 0 to 45 degrees, at speeds up to 444 KIAS. Aircraft with MK81 LDGP bombs on external stations were not tested above tip tank airspeed limits contained in the Flight Manual. A kickaway brace is required for releases above 400 KIAS.

NOTE

> The special stores wire cable at station 12 on the bomb door interfere with MK81 LDGP bombs with certain fuzes. The cable must be moved and securely fastened when station 12 on the bomb door is loaded.

BOMB, GENERAL PURPOSE, 500-POUND, MK82.

The 500-pound MK82 bomb is a low-drag bomb with a slender cylindrical body and a sharply pointed nose. A conical-type fin assembly is attached to the aft end of the bomb. The bomb is designed for use with a nose and a tail fuze, and uses mechanical-type fuzes. These bombs may be delivered from 0 to 45 degrees at speeds up to 444 KIAS. Aircraft with MK82 bombs on external stations were not tested above 444 KIAS or Mach .78, whichever was less. A kickaway brace is required for releases above 400 KIAS. The tip tank airspeed contained in the Flight Manual should not be exceeded.

BOMB, GENERAL PURPOSE, 500-POUND, MK82 (SNAKEYE I).

The 500-pound MK82 Snakeye I bomb is a general purpose low drag type having a pointed nose, a slender cylindrical body, and a tapered aft section to which a flight retarding type fin assembly is attached. The Snakeye I type fins are designed to provide aircraft with a high-speed low-altitude bombing capability. These fins replace the standard fin assemblies normally used on these bombs and present a low-drag component in the closed configuration. The Snakeye I is aerodynamically stable when released in the closed configuration and can be used in the same manner as a standard low-drag. When the retarding fin release band latch mechanism is activated, the assembly expands into four dive brake-type flaps which stabilize and decelerate the bomb by creating high drag forces. The release band latch is activated mechanically by removal of the tail release wire when the bomb is dropped armed. Suspension lugs, spaced for compatibility with 14-inch bomb racks, are installed on the bomb body. A Mark 15 Mod 0 fin assembly and Mark 82 general purpose low drag bomb are identified jointly as the Mark 82 Snakeye I bomb.

BOMB, GENERAL PURPOSE, 750-POUND, M117 AND M117A1.

The M117 bomb is a general purpose bomb normally used for demolition purposes. The blast effect that can be obtained from the M117 is greater than can be obtained from other general purpose bombs of comparable weight. The bomb has a short ogival nose, a cylindrical body, and a a tapered aft section to which a conical-type fin assembly is attached. The basic structure of the bomb is steel. The double-suspension lug provisions are spaced for compatibility with 14-inch bomb racks utilized with the B-57 series aircraft. The bomb may be filled with one of several different type explosives. A fundamental characteristic of the explosive charges is their relative insensitivity to ordinary shock and heat incident to loading, transporting, handling, and storing. The M131 (T152E2) conical-type fin assembly, installed on this bomb, increases the aerodynamic performance of the bomb during flight and permits greater accuracy during bombing operations. Antirotational devices are installed on the bomb to prevent inadvertent rotation of the fin during flight. The fin assembly consists of an elongated cone and four identical streamlined blades assembled perpendicular to the cone. The fin cone contains two access holes (hand holes) and two smaller holes to provide for attachment of the arming head of the fuze. Each access hole is closed by a cover. Access hole covers with cutouts are supplied to the field to replace solid covers when tail fuzes requiring the M44 drive assembly are utilized. The M117 bomb is designed primarily for electric fuzing. Two conduits for the electric fuze cable harness connect the nose and the tail fuze cavities with a charging receptacle located between the suspension lugs. However, mechanical fuzes may also be used in the nose cavity, tail cavity, or both. When using mechanical fuzes an adapter-booster must also be installed.

BOMB, GENERAL PURPOSE, 750-POUND, M117 (RETARDED).

The M117 (retarded) bomb uses a quick-attach MAU-91A/B fin assembly to retard the bomb when it is dropped in high speed, low altitude bombing runs. The fin assembly is held in closed position by a release band which is secured with an arming wire. When the bomb is dropped, the fin assembly is opened by release springs and air loads, and four fins decelerate and stabilize the bomb. The bomb can be dropped as an unretarded bomb if the fin assembly is not released.

BOMBS, FRAGMENTATION, 260/220-POUND, M81 AND M88.

The 260-pound, M81, fragmentation bomb has a body constructed of spirally wound 1-inch square steel wire. The 220-pound, M88, fragmentation bomb is similarly constructed of 13/16-inch square steel wire. Both bombs have a seamless steel tube forming the base for the wire wrapping. The steel wire wrapping is forged at the nose and tail to form solid nose and tail sections. The nose and tail sections are threaded to accommodate nose and tail fuzes. The M88 bomb is a later, lighter version of the M81 bomb. The M88 is lighter because of its thinner steel wire wrapping. Dimensionally both bombs are the same; however, the explosive cavity of the M88 is larger and contains about 5 pounds more explosive filler. The physical characteristics of the bombs are otherwise similar. The bombs are equipped with lugs welded to the case for both single- and double-point suspension. The double-suspension lugs are spaced for compatibility with 14-inch bomb racks.

BOMB, INCENDIARY CLUSTER, 700-POUND, M35 AND 900-POUND M36.

The incendiary bomb cluster consists of the M30 cluster adapter loaded with either fifty-seven M74A1, 10-pound PT1 incendiary bomb or one hundred and eighty-two M128, 4-pound TH-3 incendiary bombs, the M14 cluster fin and two M152A1 mechanical time tail fuzes. Two half-cylinder casings, provided with a continuous hinge-type locking system along the entire length of both sides, make up the M30 incendiary bomb casing. Provisions for both single- and double-point suspension are provided on the bomb casing. The double-suspension provisions are spaced for compatibility with the 14-inch bomb racks utilized on the B-57 aircraft. A 22-foot length of type IV detonating cord is threaded through the hinge tube and is detonated by one or both fuzes. The M14 cluster fin has four straight double-wedge blades. Two fuze adapters for the fuzes are attached to the fin cone by use of fairings. A fin tie-rod is provided for locking the fin to the cluster body at 15-degree increments through 360 degrees.

CBU MUNITIONS WITH SUU-30 DISPENSERS, CBU-24A/B, CBU-24B/B, CBU-29A/B, CBU-29B/B, CBU-49A/B, CBU-49B/B, CBU-53/B, CBU-54/B.

Cluster munitions, CBU-24A/B, CBU-29A/B and CBU-49A/B utilize SUU-30A/B Dispensers and CBU-24B/B, CBU-29B/B, CBU-49B/B, CBU-53/B and CBU-54/B utilize SUU-30B/B Dispensers.

The SUU-30A/B and SUU-30B/B dispensers are divided in half longitudinally. The upper half contains a strong back section for aircraft with forced ejection. The lower half provides a marked hard shell area for chocking purposes. The dispenser skin is of low alloy high strength steel. The two halves are locked together by a nose locking cap at the forward end and by a ring and plate assembly at the aft end. Two suspension lugs are mounted 14 inches top center for aircraft attachment.

A dual set of external arming wire/lanyard guides are positioned along the upper half of the dispenser for compatibility with various type bomb racks. The SUU-30B/B dispenser is provided with internal plumbing to facilitate the electrical fuzes and their arming devices. These CBU munitions are factory loaded and are delivered to the flight line ready to use except for installation of the fuzing system.

Fuzing and Bomblets.

Fuse and Bomblets combinations are shown in Table 1-1.

BOMBS, FRAGMENTATION CLUSTER, M1A2 AND M1A4.

The 100-pound fragmentation bomb cluster, M1A2, and M1A4 consists of six 20-pound M41A1 fragmentation bombs in an M1A3 cluster adapter. The M1A3 cluster adapter is a "quick opening frame" mechanical type, which holds the bombs in two banks of three each and releases them upon withdrawal of the arming wires from the toggle strap clamp. All clusters are issued unfuzed but assembled; fuzing is performed before the cluster is loaded on the aircraft.

The M1A3 cluster adapter has four bomb supports spaced at intervals on two tubes. Three flat steel suspension lugs and two side plates are attached to the upper tube and two spring straps are fitted to the bottom tube. Fuze vane lock springs fit into a ferrule in front of the spring straps. These lock springs prevent rotation of the fuze arming vanes while the bombs are in the cluster. Two metal straps hold the bombs in place against the adapter; their free ends are locked in place by a toggle strap clamp secured by the arming wires. When the cluster is released armed, the arming wires are pulled out, the clamps open, and the bombs are freed from the adapter. The cluster is equipped with lugs welded to the upper tube for both single- and double-point suspension. The double-suspension lugs are spaced for compatibility with 14-inch bomb racks.

The difference in the M1A2 cluster and the M1A4 is that the suspension lugs have been removed from the M41A4 fragmentation bombs. Removal of the center suspension lug from the M1A3 cluster adapter modifies the fragmentation cluster and adapter to the M1A4. These modifications do not change the loading procedures of functional characteristics of the cluster in any manner.

BOMB, FIRE, 250-POUND, BLU-10/B, BLU-10A/B.

The BLU-10 series fire bombs are incendijel filled air munitions designed for external carriage on the aircraft. The bomb has a cylindrical body with a tapered nose and tail. The basic structural material is aluminum with reinforced area for sway bracing and forced ejection. An initiator cavity is located between the suspension lugs on top of the bomb. An igniter cavity is located at each end bulkhead of the bomb. A fuze is installed in each of the igniters. Electrical cables, internally installed in the bomb, provide for electrical connection of the initiator and the fuzes. The bomb is fitted with removable nose and tail end caps which provide covers for the fuze igniter assemblies. Early production fuze

TABLE 1-1

	CBU-24A/B	CBU-24B/B	CBU-29A/B	CBU-29B/B	CBU-49A/B	CBU-49B/B	CBU-53/B	CBU-54/B
Dispenser	SUU-30A/B	SUU-30B/B	SUU-30A/B	SUU-30B/B	SUU-30A/B	SUU-30B/B	SUU-30B/B	SUU-30B/B
Dispenser Fuze	M907	FMU-26A/B FMU-56/B	M907	FMU-26A/B FMU-56/B	M907	FMU-26A/B FMU-56/B	FMU-26A/B FMU-56/B	FMU-26A/B FMU-56/B
Bomblet	BLU-26	BLU-26	BLU-36	BLU-36	BLU-59	BLU-59	BLU-70/B	BLU-68/B
Bomblet Fuze	M219	M219	M218	M218	M224	M224	M219E1	M219E1
Number of Bomblets	670	670	670	670	670	670	670	670

The M907 fuze will physically fit SUU-30B/B munitions; however, it is not considered reliable. Ballistics data for CBU-24A/B, CBU-29A/B, CBU-49A/B are identical. Ballistics data for CBU-24B/B, CBU-29B/B, CBU-49B/B, CBU-53/B and CBU-54/B are identical. For ballistics data and pattern diameter refer to T.O. 1B-57B-34-1-1A.

systems have an arming delay which prevents the bomb from arming if the bomb is ejected below altitudes of 50 feet. The arming delay of later production fuze systems enables bomb arming if the bomb is ejected at altitudes of 30 feet or above.

BOMB, FIRE, 500-POUND, BLU-23/B AND BLU-32/B

The BLU-23/B and BLU-32/B fire bombs are incendiary filled air munitions designed for external carriage. The bombs have reinforced areas to permit proper sway bracing. Suspension lugs (hangers) are on center, spaced 14 inches apart. Each bomb consists of three major sections: nose, center and tail.

The BLU-32/B is a welded, one-piece version of the BLU-23/B and identical externally to the BLU-23/B except that the BLU-32/B has no clamp bar on the center section of the bomb and the bulkheads have been reversed so that option of using an end cap or a fin assembly on the tail of the BLU-32/B is available after the bomb has been filled.

BOMB, FIRE, 750-POUND, BLU-1/B, BLU-1B/B AND BLU-1C/B.

The BLU-1 series fire bombs are incendijel filled air munitions designed for external carriage on the aircraft. The bomb has a cylindrical body with a tapered nose and tail. The basic structural material is aluminum with steel suspension lugs inserted in the top of the bomb. A reinforced area below each suspension lug provides for sway bracing and aircraft forced ejection. An initiator cavity is located between the suspension lugs on top of the bomb. An igniter cavity is located at each end bulkhead of the bomb. A fuze is installed in each of the igniters.

Electrical cables, internally installed in the bomb, provide for electrical connection of the initiator and the fuzes. The bomb is fitted with removable nose cap and tail cap or fin assembly which provide covers for the fuze-igniter assemblies. Early production fuze systems have an arming delay which prevents the bomb from arming if the bomb is ejected below altitudes of 50 feet. The arming delay of later production fuze systems enables bomb arming if the bomb is ejected at altitudes of 30 feet or above. The BLU-1 series bombs are interchangeable and are similar.

BOMB, FIRE, BLU-27B.

BLU-27/B fire bombs are incendiary filled, air munitions designed for external carriage on aircraft. The basic structure is one-piece welded aluminum, with steel suspension lugs inserted in the top of the bomb. A fuze is installed in each end of the bomb. Electrical cables are internally installed to provide electrical connections to the fuze. The bomb is fitted with removable nose and tail end caps which provide covers for the fuze-igniter assemblies and installation of fin assembly.

BOMB, PRACTICE, 25-POUND, BDU-33/B.

The BDU-33/B practice bomb has elongated, tear-drop shaped body and a fin assembly composed of four shrouded fin blades welded to a center tube. A conical section covers the center tube and is threaded to the bomb body. The two sections are staked together to prevent unscrewing. A signal (spotting charge) and firing pin assembly are inserted in the nose of the bomb and retained in position by a cotter pin. A single suspension lug is threaded into the bomb body and cemented in place. The firing pin assembly detonates the signal upon impact. The signal produces a smoke cloud to provide a visual indication of point of impact.

BOMB, PRACTICE, 25-POUND, BDU-33A/B.

The BDU-33A/B differs from the BDU-33/B in that it has a cruciform type tail fin in place of the shroud type fin and the spotting charge and firing pin have been relocated in the aft end of the bomb.

BOMB, LEAFLET, 750-POUND, M129 AND M129E1.

NOTE

The number of leaflets carried in the bomb determines the weight of the bomb.

The M129 and M129E1 leaflet bombs are constructed of fiberglass and have an external configuration similar to the 750-pound general purpose bomb. The bombs may be carried on the inboard universal and/or outboard pylons. The bombs have three inline recesses to receive lugs for suspension; however, only the two outer recesses which have a 14-inch spacing are used for carriage from the B-57. The only difference between the M129 and the M129E1 is the size of the reinforcing plate which is installed beneath the fiberglass in the lug areas. A new plate was designed for the M129E1 to provide better reinforcement against ejection forces and to withstand pylon sway-back torques. The M149 tail fin consists of four fiberglass sections glued and riveted together to form a cone about 20 inches long with four fin blades about 23 inches long.

BOMB, SMOKE, 100-POUND, M47 SERIES.

The 100-pound smoke bomb, AN-M47A4 has a cylindrical body, a rounded nose, and a tapered aft section to which a box-type fin assembly is welded. The bomb is constructed of thin sheet steel and is threaded at the nose to receive an axial burster well which extends to the aft end of the bomb body.

Two suspension bands of sheet steel, each equipped with a heavy-gage suspension lug, circle the bomb body. The AN-M47A4 smoke bomb is filled with PWP (plasticized white phosphorous) or WP. PWP is more effective than WP because of its longer burning, reduced pillaring and anti-personnel effect. Either the AN-M20 or the AN-M18 burster is secured in place by an impact-type nose fuze which is threaded into the forward end of the burster well. The AN-M-18 burster is used when the bomb is to be dropped from low altitudes. Smoke bombs are used to conceal all types of troop and ship movements and installations in both the combat zone and rear areas. Upon impact of the bomb, functioning of the fuze detonates the burster. The burster shatters the bomb and disperses the agent over a circular area of 30 to 50 yards in radius. Atmospheric oxygen ignites and causes the agent to burn and produce smoke; an effective white smoke screen may be produced with a duration up to 5 minutes.

CLUSTER, ADAPTER, MISSILE, MK44.

The MK44 missile cluster adapter is an anti-personnel munition which physically resembles a 750-pound leaflet bomb. The main body is a hollow shell with the entire upper half acting as a lid which is hinged at the base of the conical fin tail assembly. The body is filled with a large quantity of small missiles in paper sacks. An AN-M146A1 mechanical time fuze is used to release the case locking cup which allows the lid to open and release the missiles. The missiles are small anti-personnel projectiles with winged tail assemblies.

DESTRUCTORS; M117D, 750-POUND; MK36, 500-POUND.

Refer to T.O. 1B-57B-34-1-1A.

FLARE, MARK 24 SERIES.

The MK24 series aircraft parachute flares are incendiary illumination stores designed to be carried and dropped from aircraft. The flare consists of a cylindrical aluminum case containing an ejection fuze assembly, an ignition fuze assembly, an illuminate charge (candle), and a parachute assembly. The ejection and ignition fuze assemblies contain time-delay mechanisms which may be adjusted for delay times of 5 to 30 seconds. Dials for setting the time delay mechanisms are on the face of the flare. A thumb screw on the face of the flare prevents inadvertent movement of the time-delay mechanisms.

The MK24 parachute flare is a delay-type flare designed for launching from aircraft. The flare weighs 27 pounds. It provides an average of 2,000,000 candle power and burns an average of 3 minutes.

The flare package is contained inside the metal outer case. This package consists of the ignition fuze, candle assembly, and parachute assembly and is expelled from the opposite end from the fuze dials by ignition of the ejection disc. MK24 flares are fitted with two time-delay fuzes. These are the ejection and the ignition fuzes. The dials for these fuzes are fitted in one end of the flare. The ejection fuze for the MK24 has a fuze dial setting of 5 to 30 seconds. The flares have only a 10 to 30 second ignition fuze setting. The flares also have a safety cotter pin inserted through the ignition dial to prevent the lanyard from being accidentally pulled.

The ejection fuze is armed by a minimum pull of 12-pounds on the lanyard. After the preset timing interval on the ejection fuze has lapsed, the ejection fuze ignites the ejection disc inside the flare container. The ejection disc initiates the ignition fuze and ejects the flare package from the flare case simultaneously. The preset timing sequence on the ignition fuze dial starts from the time the ejection disc ignites the ignition fuze. As the flare package leaves the outer container, the parachute opens, suspending the ignition fuze and candle. After the preset timing sequence on the ignition fuze has lapsed, the ignition fuze initiates a transfer disc which ignites the candle. Prior to candle ignition, the suspended flare assembly falls at the rate of 15 feet per second. After ignition, the flare descends at a rate of 7.5 feet per second.

DISPENSER, FLARE SUU-25A.

The SUU-25 Dispenser is a reusable four tube dispenser. It is capable of dispensing eight MK24 Flares, two at a time. When flares are loaded, big coil springs are compressed. End plugs with explosive detents hold the flares on the tubes against the spring pressure. When the explosive detent is fired by electrical impulse, the coil spring and air flow through the tubes eject the flares from the rear of the dispensers.

A selector switch, SINGLE or RIPPLE is located on the rear of the dispenser. When the switch is set to SINGLE, two flares are release for each electrical impulse to the dispenser. An intervalometer in the dispenser directs the next electrical impulse to the next tube to be fired. On B-57 aircraft, the SUU-25 Dispenser is operated through the rocket system and the electrical impulse is not of sufficient duration to ripple all four tubes of the dispenser on one electrical impulse. Therefore, the selector switch should always be set for single release.

SUU-25 dispensers are carried on the bomb pylon stations only. The rocket intervalometer provides the bomb pylon stations an electrical impulse on No. 5 through 8. The pylon stations will fire in the following order: L2 will fire on No. 5, R2 will fire on No. 6, L1 will fire on No. 7, R1 will fire on No. 8. All other numbers are for their respective rocket pylons and will only advance the rocket counter when rockets are not installed. After a firing sequence has been completed, the rocket intervalometer will have to be reset to No. 5 for another sequence to fire the remaining flare tubes.

ROCKET, 2.75-INCH FFAR.

The 2.75-inch, folding-fin aircraft rocket (FFAR), is designed to provide air-to-air and air-to-ground armament. The rocket is adapted to use a high-explosive (HE) head, a high-explosive antitank (HEAT) head, or a plaster-filled (inert) head for practice. The 2.75-inch rocket motor is equipped with stabilizing fins which fold within the diameter of the rocket motor for firing from tubular launchers.

High Explosive Warhead, MK1.

The warhead body (figure 1-24) is a steel case, threaded internally at the forward end for fuze attachment and threaded externally at the aft end for attachment to the motor assembly. The warhead has a high explosive charge of 1.4-pounds of HBX-1 explosive, uses the MK176 fuze, and is intended for air-to-air or air-to-ground attack. The warhead is shipped and stored with fuze installed.

High Explosive Antitank Warhead, MK5.

The warhead (figure 1-24) is similar in external configuration to the MK1 warhead. The filler of the MK5 is Composition B in the form of a shaped charge. A booster pellet is installed at the base of the shaped charge. The warhead is intended for use against heavy vehicles and armor. The MK5 warhead uses the MK181 fuze.

Rocket Warhead, M151.

The M151 warhead (figure 1-24) has a pearlite malleable iron (PMI) case filled with Composition B4 and is intended for air-to-ground use against personnel and light targets. The M151 warhead may be shipped with or without fuze. The warhead uses the M427 fuze.

Rocket Smoke (WP) Warhead, M156.

This warhead is a target spotting warhead (figure 1-24) for the 2.75-inch FFAR. The appearance of the M156 warhead is identical to the M151 high explosive warhead, and because of this feature, the markings must be carefully observed and maintained. The warhead contains a filler of white phosphorus. The M156 warhead uses the M423 or M427 fuze.

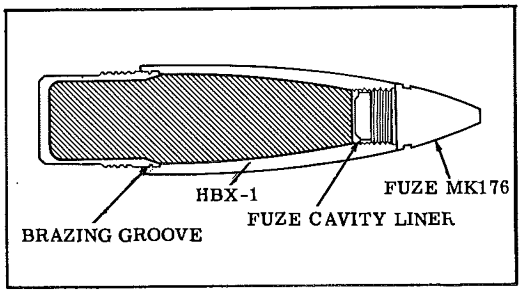
Rocket Flechette Warhead, WDU-4/A, WDU-4A/A.

The WDU-4A/A warhead is a flechette (miniature steel dart) antipersonnel warhead. The WDU-4A/A warhead is 2.75-inches in diameter, 17.76-inches long, weighs 9.4 pounds, and contains a base fuze, ejecting charge, piston, 2200 20-grain flechettes, and an aerodynamic nose cone. The WDU-4A/A warhead is compatible with all 2.75-inch FFAR motors and launches. The fuze is installed during assembly and is an integral part of the warhead. At launch, acceleration forces arm the fuze. At motor burnout (approximately 1.8 seconds after launch), an airburst is initiated by the deceleration forces which frees the spring-loaded firing pin to ignite the M9 ejecting charge. The M9 ejecting charge generates a gas pressure against the pusher plate (piston) which transmits the pressure through the stacked flechettes and to the shear pins on the nose cone. The shear pins are broken to allow the nose cone to be ejected, followed by the flechettes. The flechettes are packed tightly in the split sleeves with alternating flechettes pointing fore and aft. When the flechettes are ejected, aerodynamic forces cause the tail-forward flechettes to tumble and streamline; this weather-vaning causes dispersion. Slant range at launch is a factor in determining the flant range at rocket motor burnout and therefore, is a critical factor in determining the dispersion and weapon effectiveness. Refer to the rocket launch table for flechette warhead ballistics data. Refer to T.O. 1B-57B-1-1A supplement to this manual for the planning charts used to determine impact pattern size and optimum launch conditions.

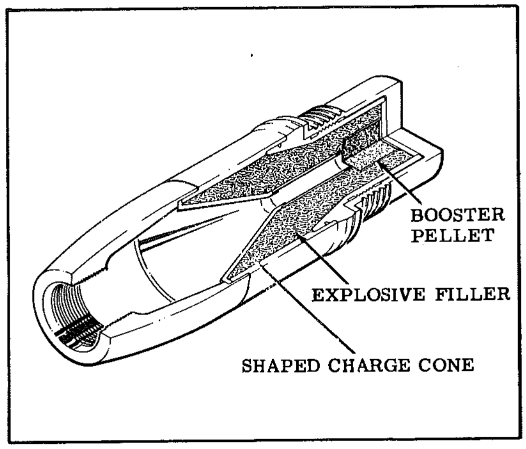
LAUNCHER, ROCKET, MA-2/A.

The MA-2/A rocket launcher is an underwing launcher which permits the carrying and launching of two 2.75-inch folding-fin, aircraft rockets (FFAR), all Marks and Models. The launcher is intended for use on aircraft equipped with flush type rocket mounts designed originally for launching the 5.0-inch high-velocity aircraft rocket (HVAR). The launcher consists of two tubes and a forward and two aft support assemblies. The launching tubes are fabricated from

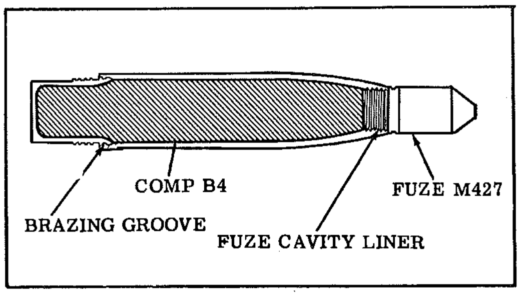
2.75-INCH FFAR ROCKET WARHEADS



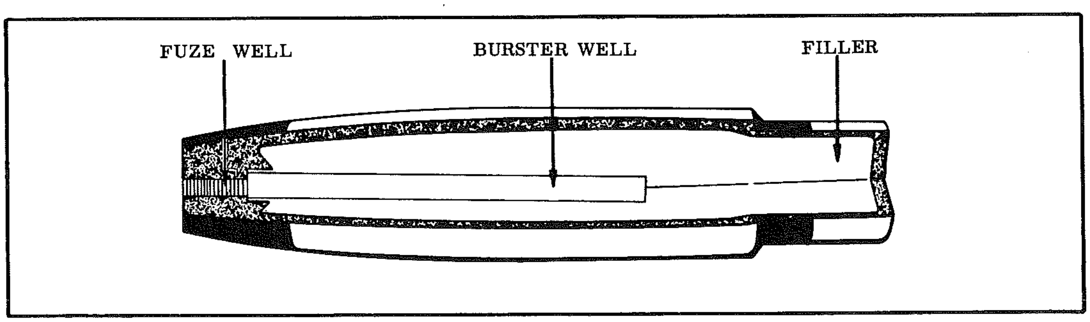
HIGH EXPLOSIVE WARHEAD, MK1



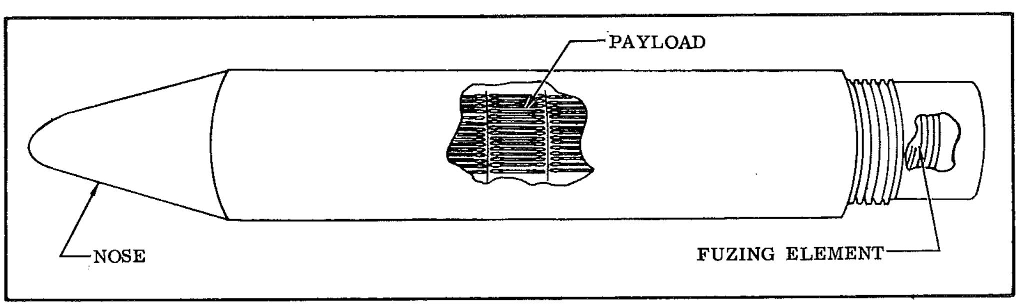
HIGH EXPLOSIVE ANTITANK WARHEAD, MK5



M151



SMOKE (WP) M156



ROCKET FLECHETTE WARHEAD, WDU-4/A, WAU-4A/A

1-74843

Figure 1-24

aluminum alloy and are joined together at each end by spacer brackets. Detect latches are incorporated within the tubes to restrain the rockets against normal flight loads. Each launcher is provided with two safety pins which, when installed, protrude within the launcher tubes immediately forward of the firing pin contacts to prevent inadvertent rocket firing during loading. The forward launcher support assembly incorporates a track and two clamp units for attaching the forward end of the launcher to the rocket pylon. Each aft launcher support consists of a tube and casting assembly incorporating an electrical circuitry for transmission of electrical current from the aircraft to the rocket firing circuit. The left support contains the rocket ignition circuit. Each pylon support contains a separate insulated firing contact which protrudes within the launching tubes to permit contact with the rockets. A small red indicator lamp on each support is connected in parallel with the firing contacts to provide a ready means for checking the launcher electrical circuits.

LAUNCHER, ROCKET, LAU-3/A.

The LAU-3/A rocket launcher is an expendable underwing store, capable of launching nineteen, 2.75-inch, folding-fin, aircraft rockets (FFAR). The launcher is designed to be jettisoned after the rockets are fired, or at any time the pilot may deem necessary. The launcher consists of three major components: a center section, and a forward and a rear frangible fairing. The center section is constructed of 19 paper tubes clustered and bonded together to form an integral part of the structure. The ends of the center section are enclosed by metal bulkheads. External hangers are provided for pylon attachment. The hangers may be adjusted for 14-inch or 30-inch pylon rack provisions and for the United Kingdom single-lug pylons. Detent devices within the tubes restrain the rockets against normal flight loads, and the detent also provide electrical contact to the rocket. Contact fingers on the launcher aft bulkhead provide the rockets with a ground so that the firing circuits may be energized. Two receptacles on top of the center section provide for connection to the aircraft rocket-firing circuitry. These receptacles are wired in parallel; therefore, only one of them is connected to the aircraft. The frangible fairings are attached to the forward and rear bulkhead of the launcher center section. The fairings are constructed of treated paper; therefore, they must be handled with care as they are easily damaged. A metal band at the base of each fairing has eight lugs which engage grooves in the launcher bulkheads to secure the fairings in position. The fairings are marked "FRONT" and "REAR," and they must be installed in their respective positions.

LAUNCHER, ROCKET, LAU-32 AND LAU-59.

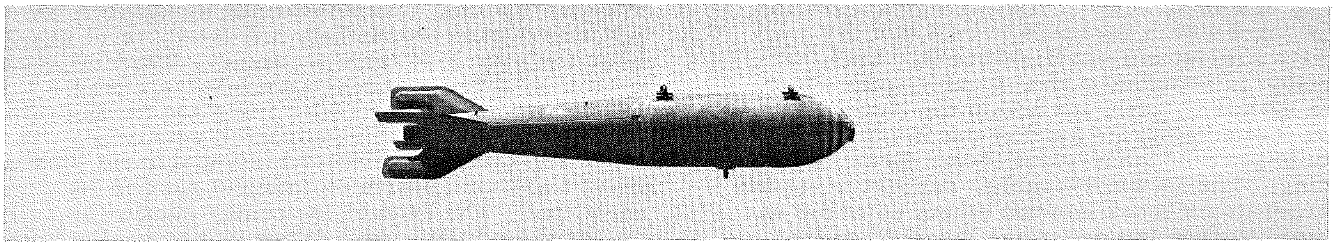
The LAU-32 series and LAU-59 rocket launchers are expendable underwing stores, capable of launching seven 2.75-inch folding-fin-aircraft rockets (FFAR). The launcher is designed to be jettisoned after the rockets are fired, or at any time the pilot may deem necessary. The launchers consist of three major components: a center section and a front and rear frangible fairing. The center section is constructed with seven tubes and one intervalometer compartment clustered together to form an integral part of the structure. The ends of the center section are enclosed by bulkheads. External suspension lugs are provided for rack attachment. Detent devices within the tubes restrain the rockets against normal flight loads, and the detents also provide electrical contact to the rockets. Contact fingers on the launcher aft bulkhead provide rockets with a ground so that the firing circuit may be energized. Two receptacles on top of the center section provide for connection to aircraft rocket-firing circuitry. An intervalometer within the launcher converts the firing pulse into ripple firing with a 10-millisecond delay between each rocket firing. The frangible fairings are attached to the forward and rear bulkheads of the launcher center section. The fairings are made of impregnated molded fiber designed with a waffle or grenade type structure to shatter readily from rocket impact. The front fairing consists of a one-piece molded section, which entirely disintegrates on rocket impact. The rear fairing is molded in two sections. The rocket blast shatters the center portion of the rear fairing while the base section remains on the launcher and acts as a choke or funnel to direct debris away from the aircraft. The fairings are marked "FRONT" and "REAR" and must be installed in their respective positions.

NOTE

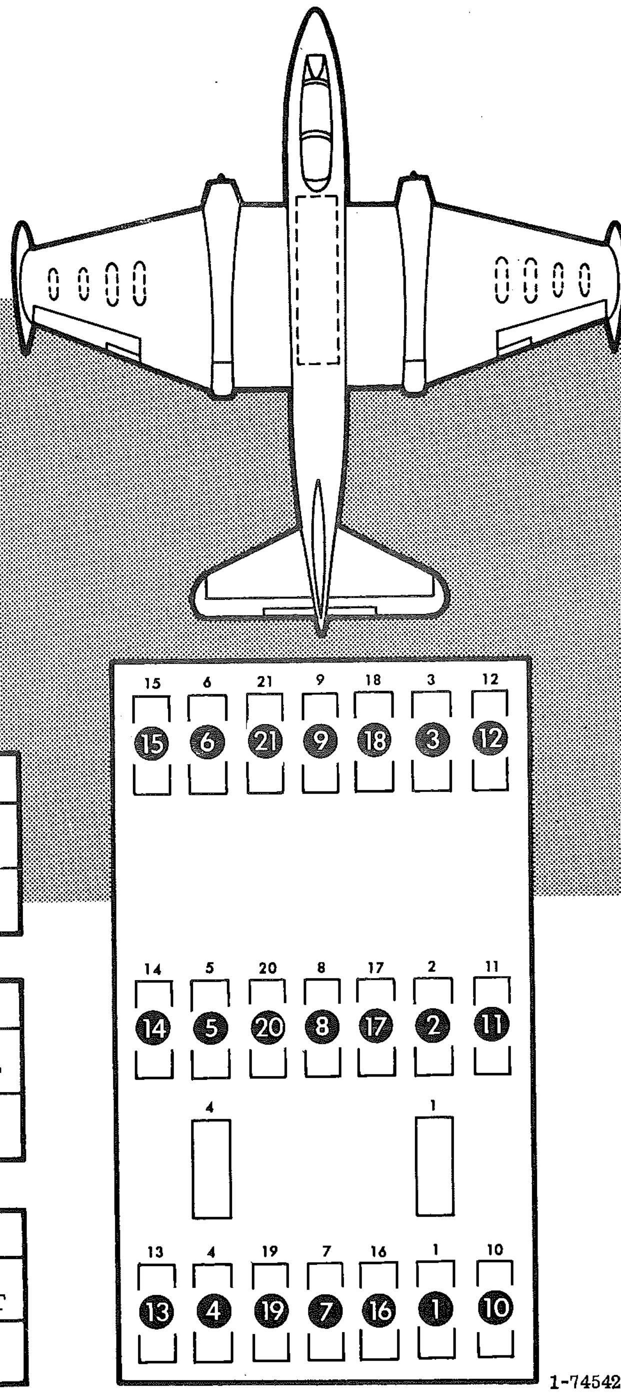
LAU-32 series and LAU-59 have a single/ripple selector switch located on the top aft. This switch should be in the RIPPLE position.

LOADING DATA.

Figures 1-25 through 1-60 show the maximum authorized carriage of individual ordnance. This optimum loading is not necessarily restricted by physical carriage capabilities of the aircraft, nor necessarily by the weapon weight or shape, but could be limited by release methods, release timing, potential weapons collision, premature detonation, bomb fragment envelope, and assorted aerodynamic and ballistic considerations. External loading configurations should be symmetrical.



M30A1 GENERAL PURPOSE BOMB



1-74542A

DRAG INDEX	1.0
WEIGHT FULL	136 lb.
LENGTH	54.2 in.
DIAMETER	8.18 in.
FIN SPAN	11.2 in.
SUSPENSION LUG DISTANCE	14.0 in.
COMPONENTS OF A COMPLETE ROUND:	
FUZE, TAIL	As Required*
FUZE, NOSE	As Required*
FIN ASSEMBLY	M135
ARMING WIRE AND SWIVEL	As Required

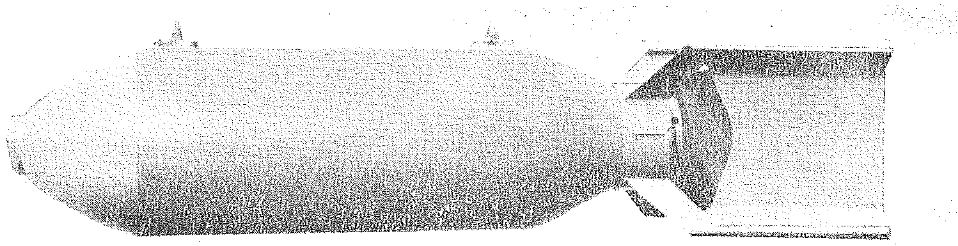
*SEE TABLE 1-2

EXTERNAL SUSPENSION EQUIPMENT			
EQUIPMENT	WEIGHT/ STATION	DRAG/ STATION	TOTAL WEIGHT
PYLON	--	--	--

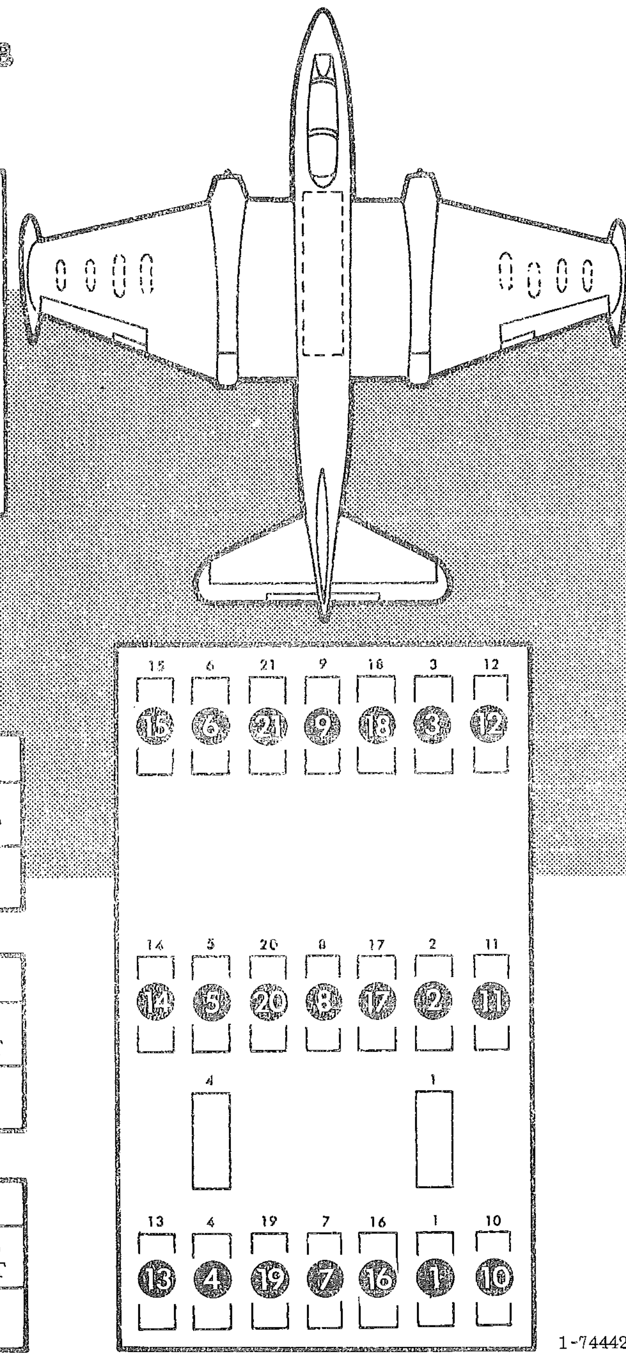
INTERNAL SUSPENSION EQUIPMENT		
EQUIPMENT	WEIGHT/ STATION	TOTAL WEIGHT
SHACKLES AND CHOCKS	12.5	264

MAXIMUM LOAD CONFIGURATION			
DRAG INDEX	EXTERNAL WEIGHT	INTERNAL WEIGHT	TOTAL WEIGHT
--	--	3120	3908

Figure 1-25



M30A1 GENERAL PURPOSE BOMB



DRAG INDEX	1.4
WEIGHT FULL	121 lb.
LENGTH.	40.26 in.
DIAMETER	8.18 in.
FIN SPAN	11.0 in.
SUSPENSION LUG DISTANCE	14.0 in.
COMPONENTS OF COMPLETE ROUND:	
FUZE, TAIL	*As Required
FUZE, NOSE.	*As Required
FIN ASSEMBLY	M103
ARMING WIRE AND SWIVEL	As Required

*SEE TABLE 1-2

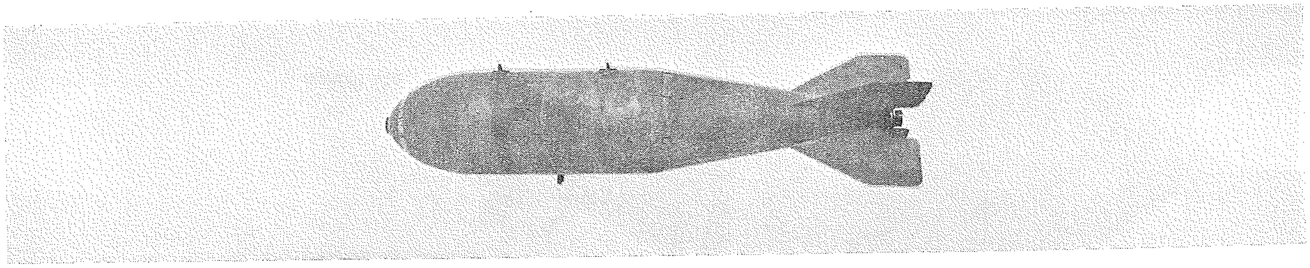
EXTERNAL SUSPENSION EQUIPMENT			
EQUIPMENT	WEIGHT/ STATION	DRAG/ STATION	TOTAL WEIGHT
PYLON	--	--	--

INTERNAL SUSPENSION EQUIPMENT		
EQUIPMENT	WEIGHT/ STATION	TOTAL WEIGHT
SHACKLES AND CHOCKS	12.5	264

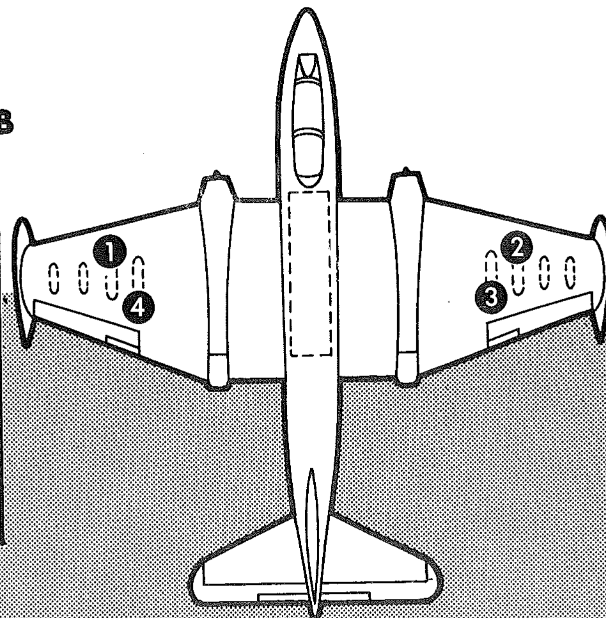
MAXIMUM LOAD CONFIGURATION			
DRAG INDEX	EXTERNAL WEIGHT	INTERNAL WEIGHT	TOTAL WEIGHT
--	--	2805	2805

1-74442A

Figure 1-26



M57A1 GENERAL PURPOSE BOMB



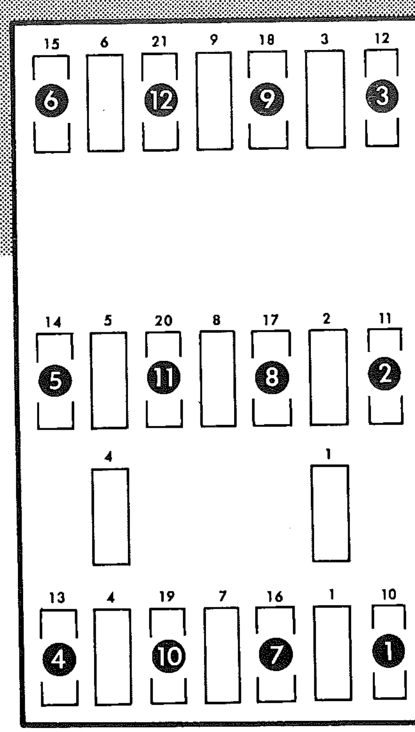
DRAG INDEX	1.6
WEIGHT FULL	284 lb.
LENGTH	62.43 in.
DIAMETER	10.93 in.
FIN SPAN	15.0 in.
SUSPENSION LUG DISTANCE	14.0 in.
COMPONENTS OF A COMPLETE ROUND:	
FUZE, TAIL	As Required*
FUZE, NOSE	As Required*
FIN ASSEMBLY	M126
ARMING WIRE AND SWIVEL	As Required

*SEE TABLE 1-2

EXTERNAL SUSPENSION EQUIPMENT			
EQUIPMENT	WEIGHT/ STATION	DRAG/ STATION	TOTAL WEIGHT
PYLON	61	4.3	244

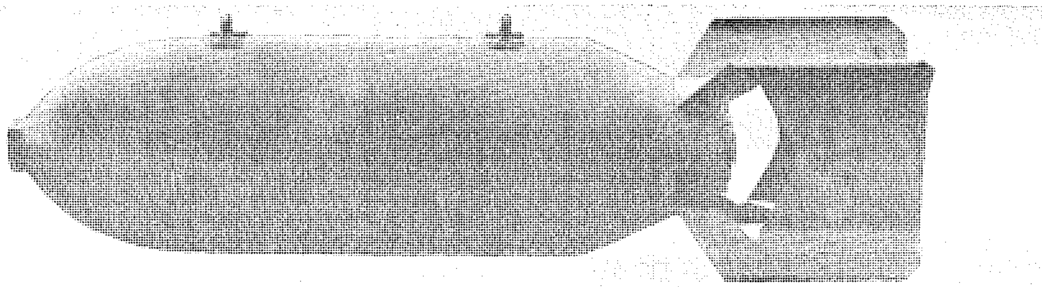
INTERNAL SUSPENSION EQUIPMENT		
EQUIPMENT	WEIGHT/ STATION	TOTAL WEIGHT
SHACKLES AND CHOCKS	12.5	150

MAXIMUM LOAD CONFIGURATION			
DRAG INDEX	EXTERNAL WEIGHT	INTERNAL WEIGHT	TOTAL WEIGHT
23.6	1380	3558	4938



1-74543A

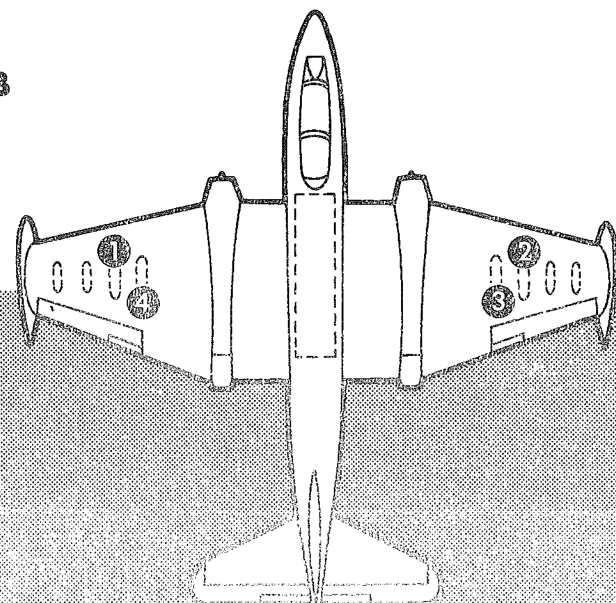
Figure 1-27



M57A1 GENERAL PURPOSE BOMB

DRAG INDEX.........................	2.4
WEIGHT FULL.........................	236 lb.
LENGTH............................	47.8 in.
DIAMETER	10.93 in.
FIN SPAN..........................	14.9 in.
SUSPENSION LUG DISTANCE	14.0 in.
COMPONENTS OF A COMPLETE ROUND:	
FUZE, TAIL....................	As Required*
FUZE, NOSE....................	As Required*
FIN ASSEMBLY	M106
ARMING WIRE AND SWIVEL	As Required

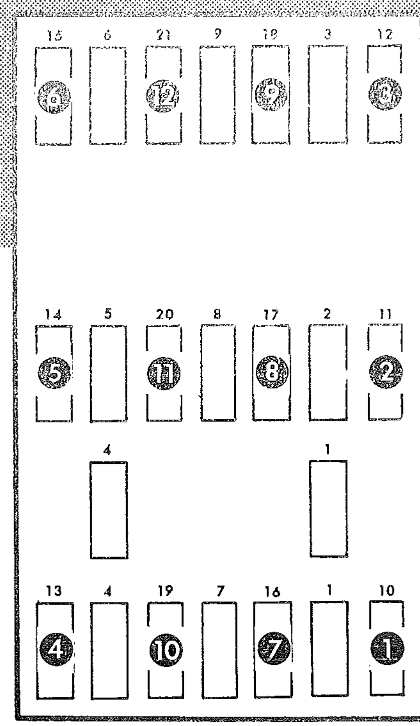
*SEE TABLE 1-2



EXTERNAL SUSPENSION EQUIPMENT			
EQUIPMENT	WEIGHT/ STATION	DRAG/ STATION	TOTAL WEIGHT
PYLON	61	4.3	244

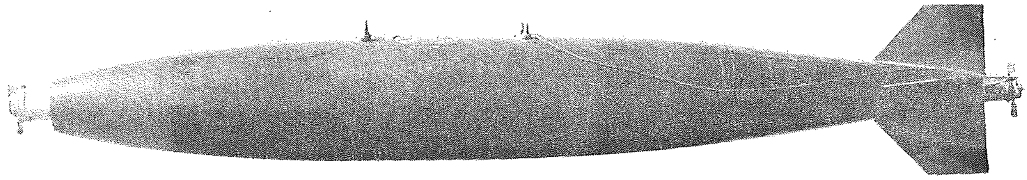
INTERNAL SUSPENSION EQUIPMENT		
EQUIPMENT	WEIGHT/ STATION	TOTAL WEIGHT
SHACKLES AND CHOCKS	12.5	150

MAXIMUM LOAD CONFIGURATION			
DRAG INDEX	EXTERNAL WEIGHT	INTERNAL WEIGHT	TOTAL WEIGHT
26.8	1188	2982	4170



1-74446A

Figure 1-28

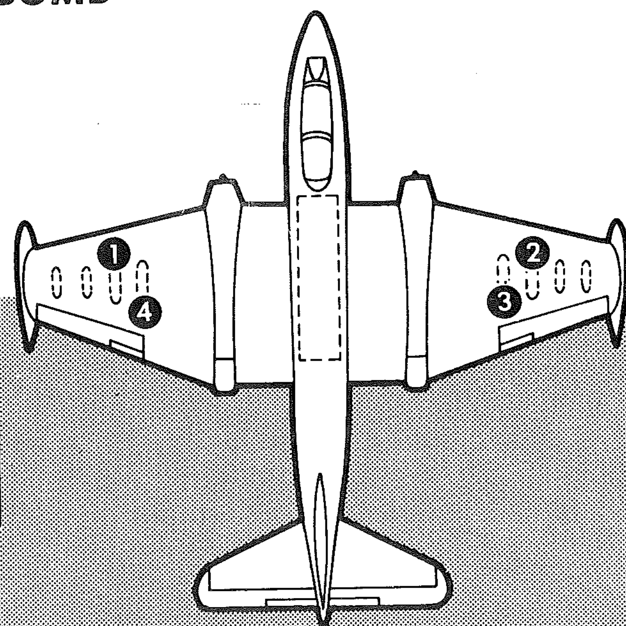


MK 81 LOW DRAG GENERAL PURPOSE (CONICAL FINS) BOMB

DRAG INDEX	0.9
WEIGHT FULL	260 lb.
LENGTH	76.5 in.
DIAMETER	9 in.
FIN SPAN	12.6 in.
SUSPENSION LUG DISTANCE	14.0 in.
COMPONENTS OF COMPLETE ROUND:	
FUZE, TAIL	*As Required
FUZE, NOSE	*As Required
PRIMER DETONATOR	As Required
ARMING WIRE AND SWIVEL	As Required
ADAPTER BOOSTER, NOSE	As Required
ADAPTER BOOSTER, TAIL	As Required

THE SPECIAL STORES WIRE CABLE MUST BE MOVED AND SECURELY FASTENED WHEN STATION 12 IS LOADED.

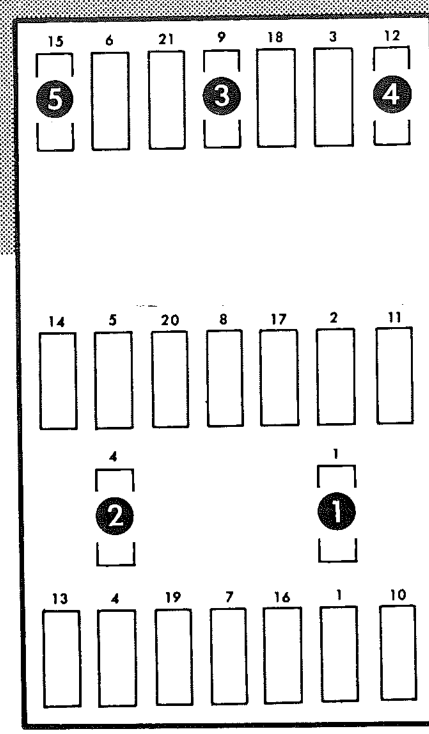
*SEE TABLE 1-2



EXTERNAL SUSPENSION EQUIPMENT			
EQUIPMENT	WEIGHT/ STATION	DRAG/ STATION	TOTAL WEIGHT
PYLON	61	4.3	244

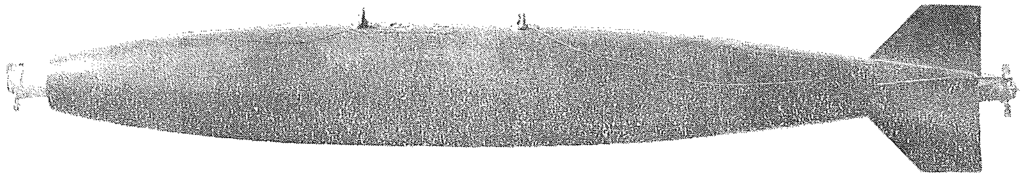
INTERNAL SUSPENSION EQUIPMENT		
EQUIPMENT	WEIGHT/ STATION	TOTAL WEIGHT
SHACKLES AND CHOCKS	11.3 FWD / 12.5 AFT	59

MAXIMUM LOAD CONFIGURATION			
DRAG INDEX	EXTERNAL WEIGHT	INTERNAL WEIGHT	TOTAL WEIGHT
20.8	1284	1359	2643



1-74848

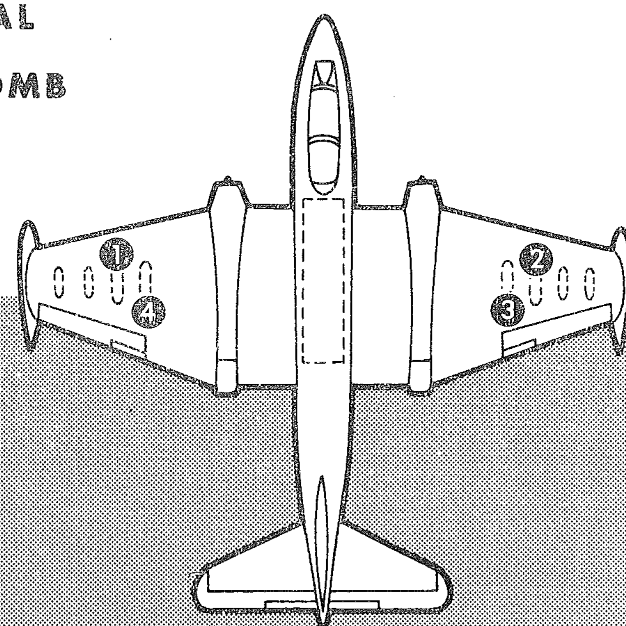
Figure 1-29



MK 82 LOW DRAG GENERAL PURPOSE (CONICAL FIN) BOMB

DRAG INDEX	1.2
WEIGHT FULL	531 lb.
LENGTH	90.9 in.
DIAMETER	10.75 in.
FIN SPAN	15.1 in.
SUSPENSION LUGS DISTANCE	14.0 in.
COMPONENTS OF COMPLETE ROUND:	
FUZE, TAIL	*As Required
FUZE, NOSE	*As Required
PRIMER DETONATOR	As Required
ARMING WIRE AND SWIVEL	As Required
ADAPTER BOOSTER, NOSE	As Required
ADAPTER BOOSTER, TAIL	As Required

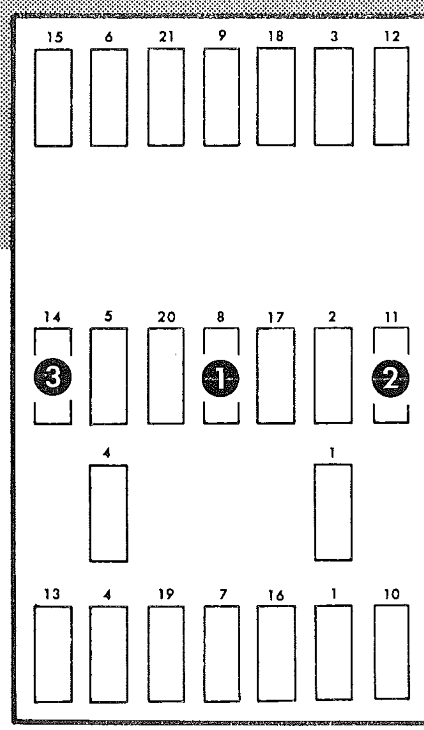
*SEE TABLE 1-2



EXTERNAL SUSPENSION EQUIPMENT			
EQUIPMENT	WEIGHT/ STATION	DRAG/ STATION	TOTAL WEIGHT
PYLON	61	4.3	244

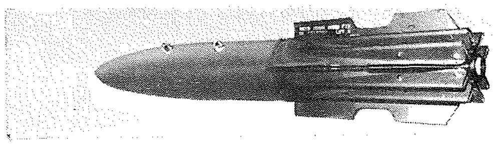
INTERNAL SUSPENSION EQUIPMENT		
EQUIPMENT	WEIGHT/ STATION	TOTAL WEIGHT
SHACKLES & CHOCKS	12.5	37.5

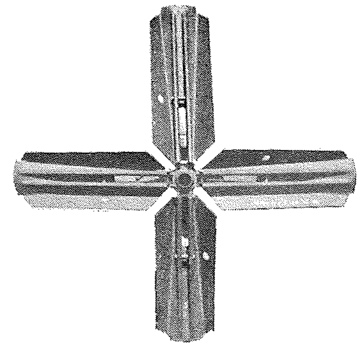
MAXIMUM LOAD CONFIGURATION			
DRAG INDEX	EXTERNAL WEIGHT	INTERNAL WEIGHT	TOTAL WEIGHT
22.0	2368	1631	3999



1-74851

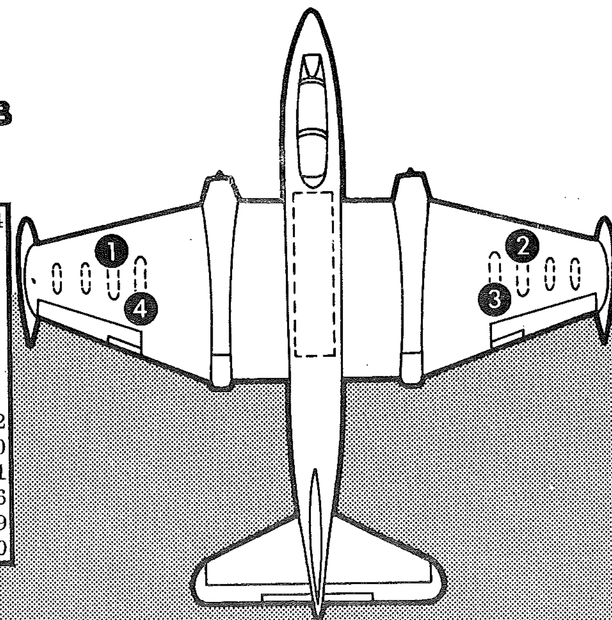
Figure 1-30





MK82 GENERAL PURPOSE BOMB (SNAKEYE I)

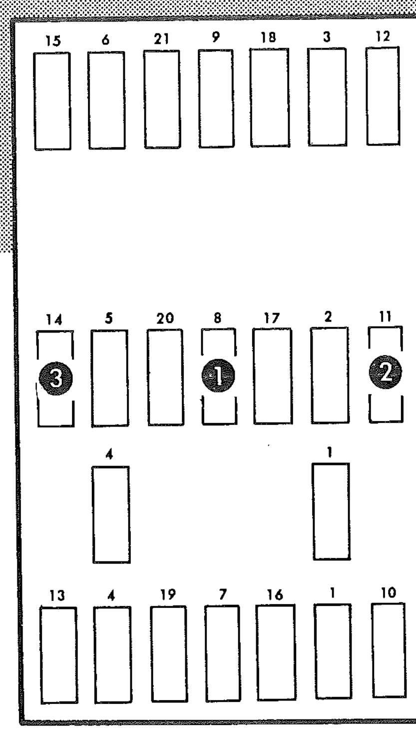
DRAG INDEX	1.4
WEIGHT FULL	560 lb.
LENGTH	92.68 in.
DIAMETER	10.75 in.
FIN SPAN	15.1 in.
SUSPENSION LUG DISTANCE	14.0 in.
COMPONENTS OF A COMPLETE ROUND:	
TAIL RELEASE WIRE	
FUZE, NOSE	M904E2
FIN ASSEMBLY	MK15 MOD0 MK15 MOD1
ADAPTER BOOSTER, NOSE	M126
DELAY ELEMENT	M9
SUSPENSION LUGS	MK6 MOD0



EXTERNAL SUSPENSION EQUIPMENT			
EQUIPMENT	WEIGHT/ STATION	DRAG/ STATION	TOTAL WEIGHT
PYLON	61	4.3	244

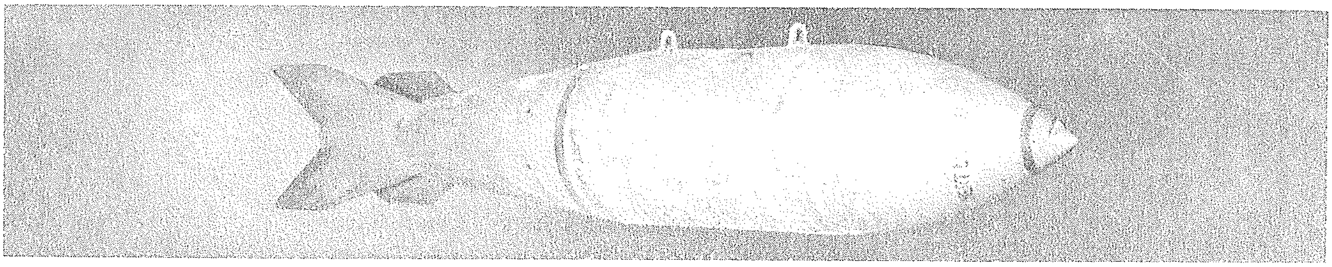
INTERNAL SUSPENSION EQUIPMENT		
EQUIPMENT	WEIGHT/ STATION	TOTAL WEIGHT
SHACKLES AND CHOCKS	12.5	38

MAXIMUM LOAD CONFIGURATION			
DRAG INDEX	EXTERNAL WEIGHT	INTERNAL WEIGHT	TOTAL WEIGHT
22.8	2484	1718	4202



1-74450A

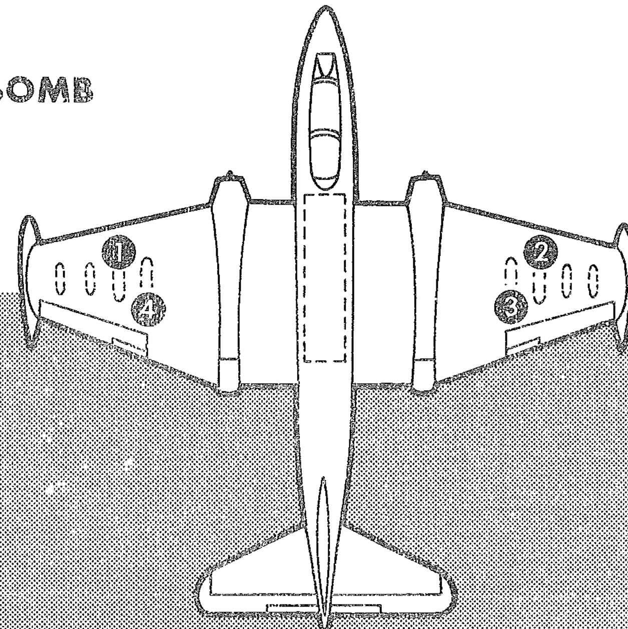
Figure 1-31



M117/M117A1 GENERAL PURPOSE BOMB

DRAG INDEX	2.7
WEIGHT FULL	800 lb.
LENGTH	84 in.
DIAMETER	16.0 in.
FIN SPAN	22.4 in.
SUSPENSION LUG DISTANCE	14.0 in.
COMPONENTS OF A COMPLETE ROUND:	
FUZE, TAIL	As Required*
FUZE, NOSE	As Required*
FIN ASSEMBLY	M131
PRIMER-DETONATOR	As Required*
ARMING WIRE AND SWIVEL	As Required
ADAPTER BOOSTER, NOSE	M126
ADAPTER BOOSTER, TAIL	T46E4

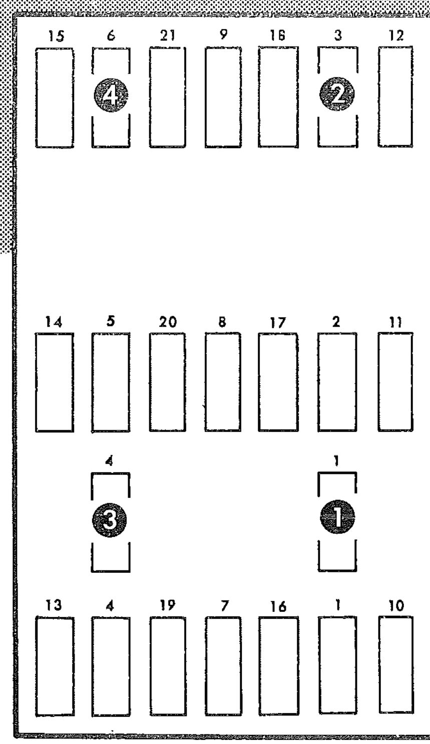
*SEE TABLE 1-2



EXTERNAL SUSPENSION EQUIPMENT			
EQUIPMENT	WEIGHT/ STATION	DRAG/ STATION	TOTAL WEIGHT
PYLON	61	4.3	244

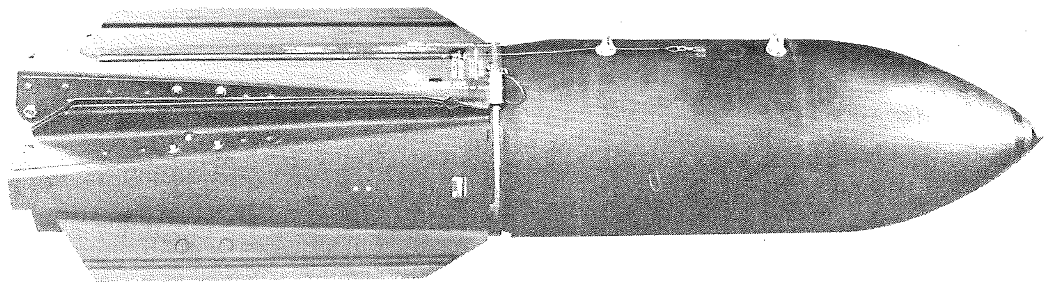
INTERNAL SUSPENSION EQUIPMENT		
EQUIPMENT	WEIGHT/ STATION	TOTAL WEIGHT
SHACKLES AND CHOCKS	12.5	50

MAXIMUM LOAD CONFIGURATION			
DRAG INDEX	EXTERNAL WEIGHT	INTERNAL WEIGHT	TOTAL WEIGHT
28.0	3444	3250	6694



1-74449A

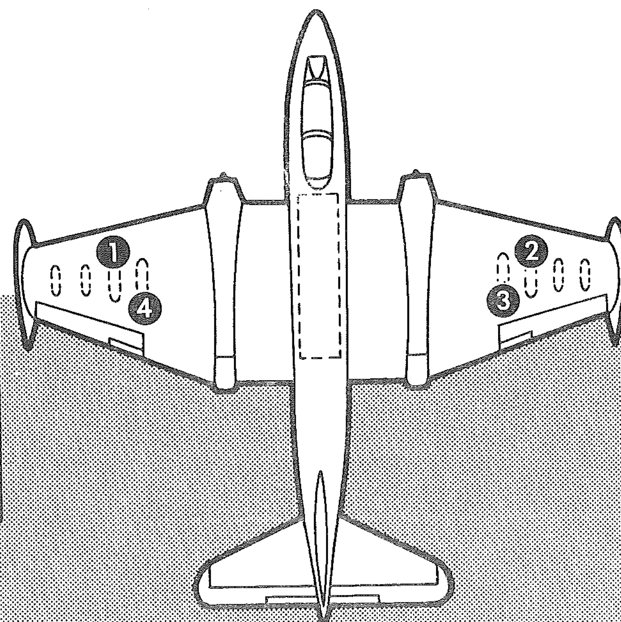
Figure 1-32



M-117/M117A1 GENERAL PURPOSE (RETARDED)

DRAG INDEX	3.2
WEIGHT FULL	857 lb.
LENGTH	84 in.
DIAMETER	16 in.
FIN SPAN (CLOSED)	22.4 in.
FIN SPAN (OPENED)	83.5 in.
SUSPENSION LUG DISTANCE.	14 in.
COMPONENTS OF COMPLETE ROUND:	
FUZE, NOSE.	*As Required
FUZE, TAIL	- - - - - - -
FIN ASSEMBLY	MAU 91A/B
PRIMER DETONATOR	*As Required
ARMING WIRE.	*As Required
ADAPTER BOOSTER	*As Required

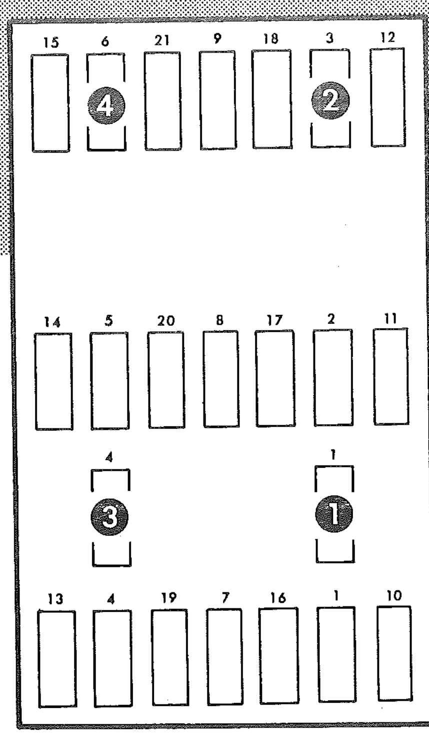
*SEE TABLE 1-2



EXTERNAL SUSPENSION EQUIPMENT			
EQUIPMENT	WEIGHT/ STATION	DRAG/ STATION	TOTAL WEIGHT
PYLON	61	4.3	244

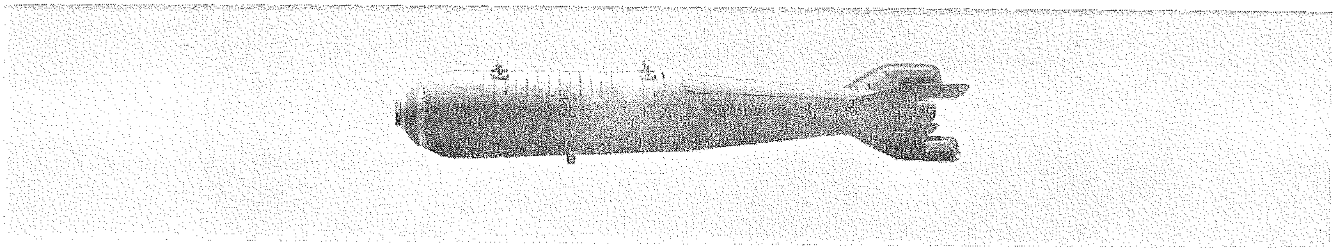
INTERNAL SUSPENSION EQUIPMENT		
EQUIPMENT	WEIGHT/ STATION	TOTAL WEIGHT
SHACKLES AND CHOCKS	12.5	50

MAXIMUM LOAD CONFIGURATION			
DRAG INDEX	EXTERNAL WEIGHT	INTERNAL WEIGHT	TOTAL WEIGHT
30.0	3672	3478	7150

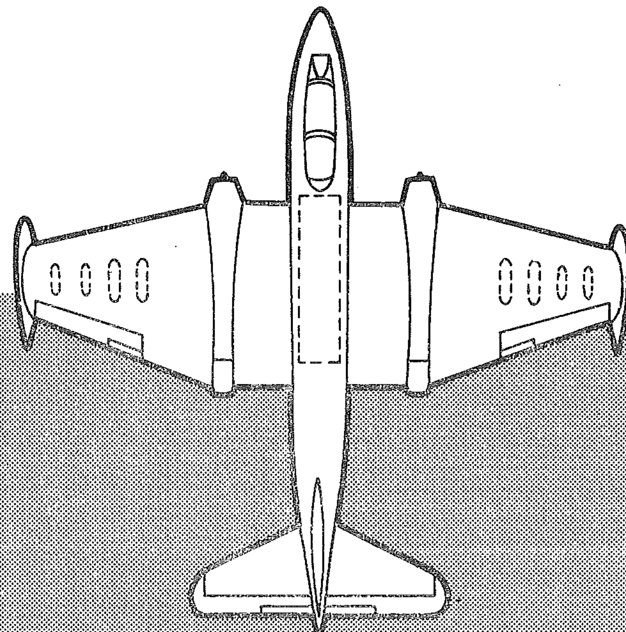


1-74850

Figure 1-33



M81 FRAGMENTATION BOMB

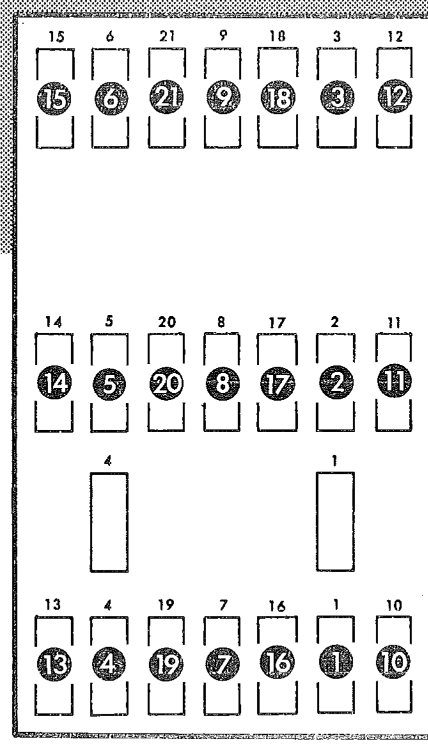


DRAG INDEX..........................
WEIGHT FULL........................ 278 lb.
LENGTH............................. 57.5 in.
DIAMETER........................... 8.13 in.
FIN SPAN........................... 11.2 in.
SUSPENSION LUG DISTANCE............ 14.0 in.
COMPONENTS OF A COMPLETE ROUND:
  FUZE, TAIL.................... As Required*
  FUZE, NOSE.................... As Required*
  FIN ASSEMBLY.................. M135
  ARMING WIRE AND SWIVEL........ As Required
  PRIMER-DETONATOR.............. As Required*
*SEE TABLE 1-2

EXTERNAL SUSPENSION EQUIPMENT			
EQUIPMENT	WEIGHT/ STATION	DRAG/ STATION	TOTAL WEIGHT
PYLON			

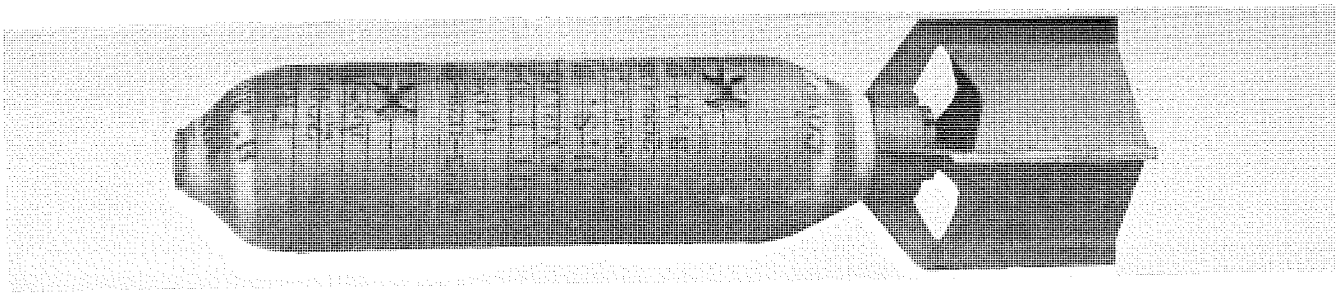
INTERNAL SUSPENSION EQUIPMENT		
EQUIPMENT	WEIGHT/ STATION	TOTAL WEIGHT
SHACKLES AND CHOCKS	12.5	264

MAXIMUM LOAD CONFIGURATION			
DRAG INDEX	EXTERNAL WEIGHT	INTERNAL WEIGHT	TOTAL WEIGHT
		6102	6102

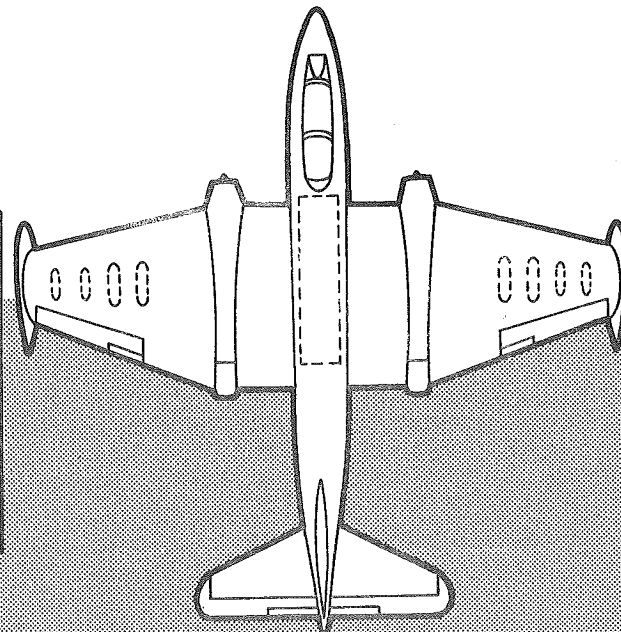


1-74575A

Figure 1-34



M81 FRAGMENTATION BOMB

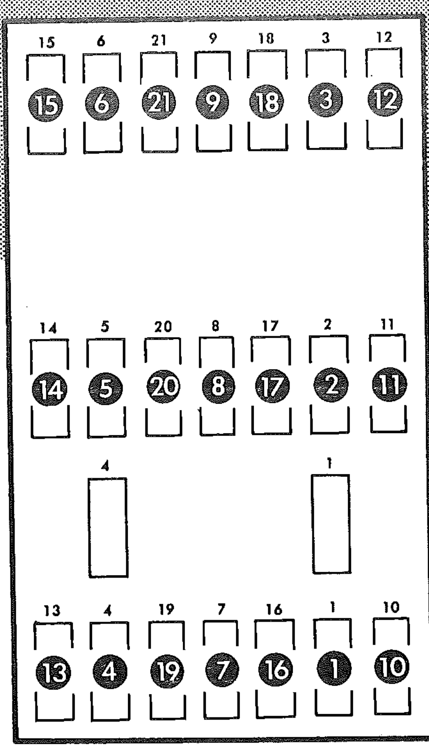


DRAG INDEX........................	
WEIGHT FULL........................	263 lb.
LENGTH........................	43.7 in.
DIAMETER........................	8.13 in.
FIN SPAN........................	11.0 in.
SUSPENSION LUG DISTANCE............	14.0 in.
COMPONENTS OF A COMPLETE ROUND:	
FUZE, TAIL....................	As Required*
FUZE, NOSE....................	As Required*
FIN ASSEMBLY................	M103
ARMING WIRE AND SWIVEL......	As Required
PRIMER-DETONATOR...........	As Required*
*SEE TABLE 1-2	

EXTERNAL SUSPENSION EQUIPMENT			
EQUIPMENT	WEIGHT/ STATION	DRAG/ STATION	TOTAL WEIGHT
PYLON			

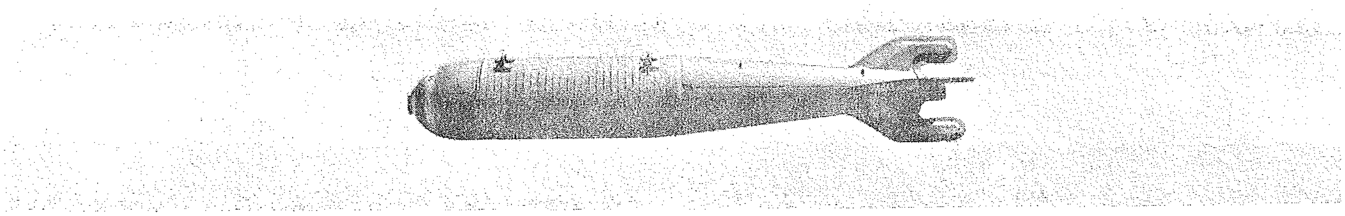
INTERNAL SUSPENSION EQUIPMENT		
EQUIPMENT	WEIGHT/ STATION	TOTAL WEIGHT
SHACKLES AND CHOCKS	12.5	264

MAXIMUM LOAD CONFIGURATION			
DRAG INDEX	EXTERNAL WEIGHT	INTERNAL WEIGHT	TOTAL WEIGHT
		5787	5787

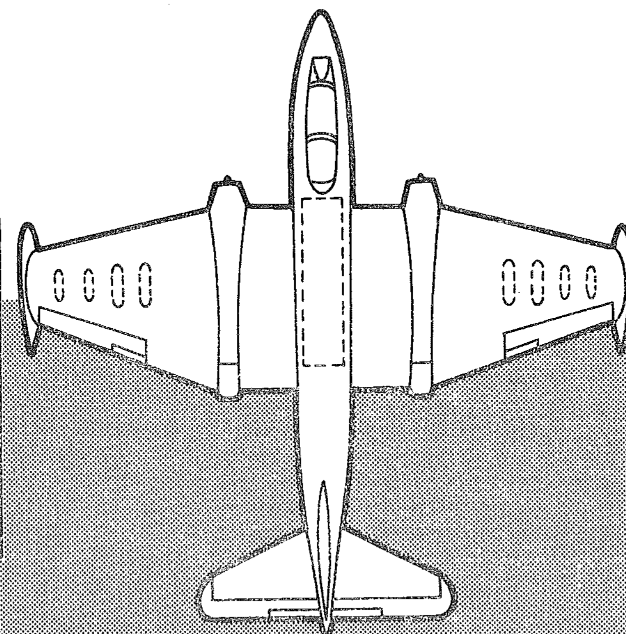


1-74445A

Figure 1-35



M88 FRAGMENTATION BOMB



DRAG INDEX	
WEIGHT FULL	231 lb.
LENGTH	58.0 in.
DIAMETER	8.12 in.
FIN SPAN	11.2 in.
SUSPENSION LUG DISTANCE	14.0 in.
COMPONENTS OF A COMPLETE ROUND:	
FUZE, TAIL	As Required*
FUZE, NOSE	As Required*
FIN ASSEMBLY	M135
ARMING WIRE AND SWIVEL	As Required
PRIMER-DETONATOR	As Required*

*SEE TABLE 1-2

EXTERNAL SUSPENSION EQUIPMENT

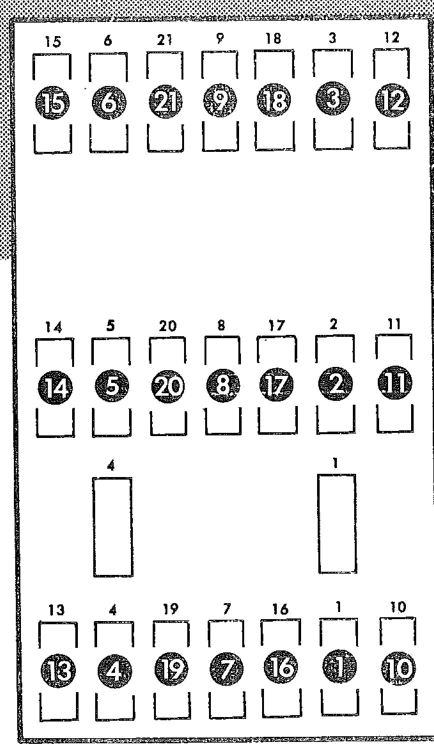
EQUIPMENT	WEIGHT/ STATION	DRAG/ STATION	TOTAL WEIGHT
PYLON			

INTERNAL SUSPENSION EQUIPMENT

EQUIPMENT	WEIGHT/ STATION	TOTAL WEIGHT
SHACKLES AND CHOCKS	12.5	264

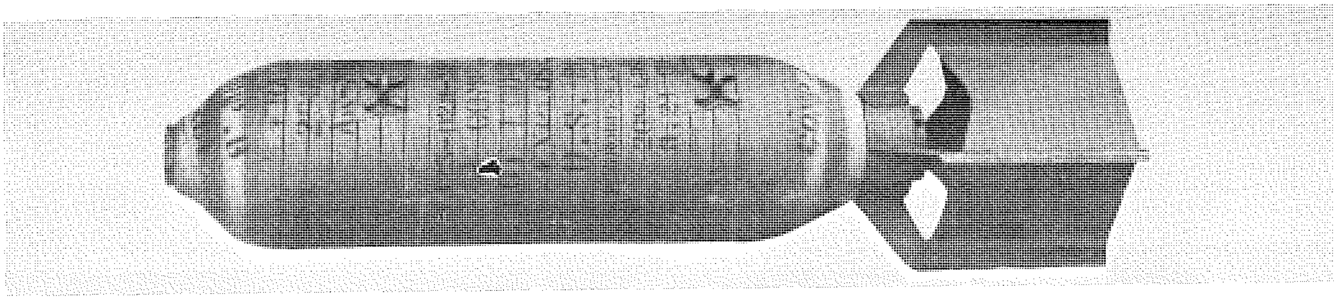
MAXIMUM LOAD CONFIGURATION

DRAG INDEX	EXTERNAL WEIGHT	INTERNAL WEIGHT	TOTAL WEIGHT
		5115	5115

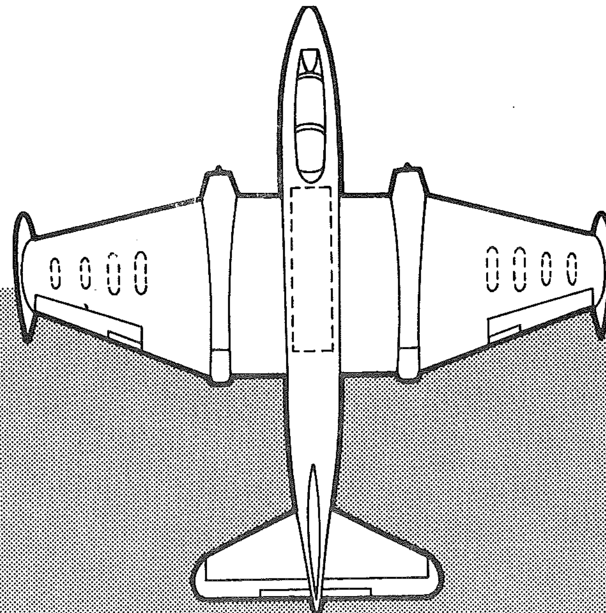


1-74574A

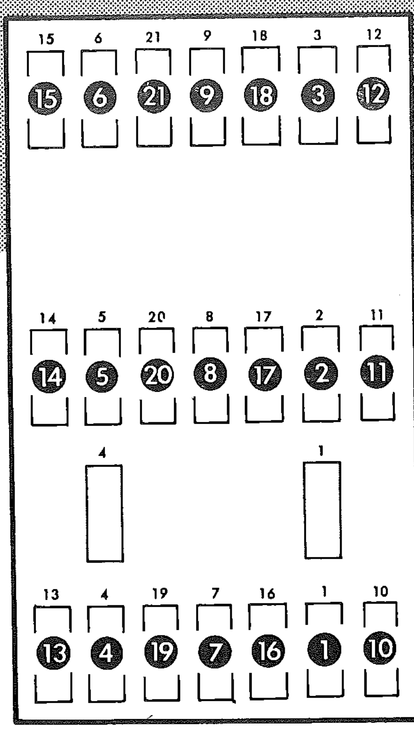
Figure 1-36



M88 FRAGMENTATION BOMB



DRAG INDEX...........................	
WEIGHT FULL..........................	216 lb.
LENGTH...............................	43.7 in.
DIAMETER	8.12 in.
FIN SPAN.............................	11.0 in.
SUSPENSION LUG DISTANCE	14.0 in.
COMPONENTS OF A COMPLETE ROUND:	
FUZE, TAIL....................	As Required*
FUZE, NOSE....................	As Required*
FIN ASSEMBLY	M103
ARMING WIRE AND SWIVEL......	As Required
PRIMER-DETONATOR...........	As Required*
*SEE TABLE 1-2	



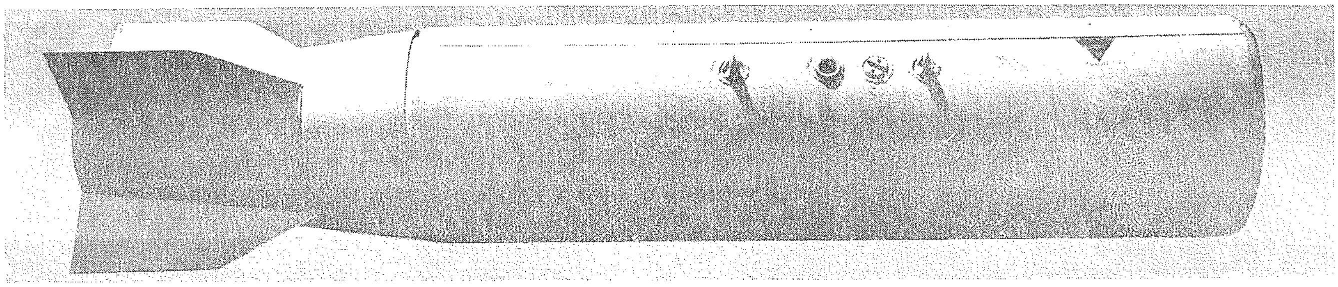
1-74852

EXTERNAL SUSPENSION EQUIPMENT			
EQUIPMENT	WEIGHT/ STATION	DRAG/ STATION	TOTAL WEIGHT
PYLON			

INTERNAL SUSPENSION EQUIPMENT		
EQUIPMENT	WEIGHT/ STATION	TOTAL WEIGHT
SHACKLES AND CHOCKS	12.5	264

MAXIMUM LOAD CONFIGURATION			
DRAG INDEX	EXTERNAL WEIGHT	INTERNAL WEIGHT	TOTAL WEIGHT
		4800	4800

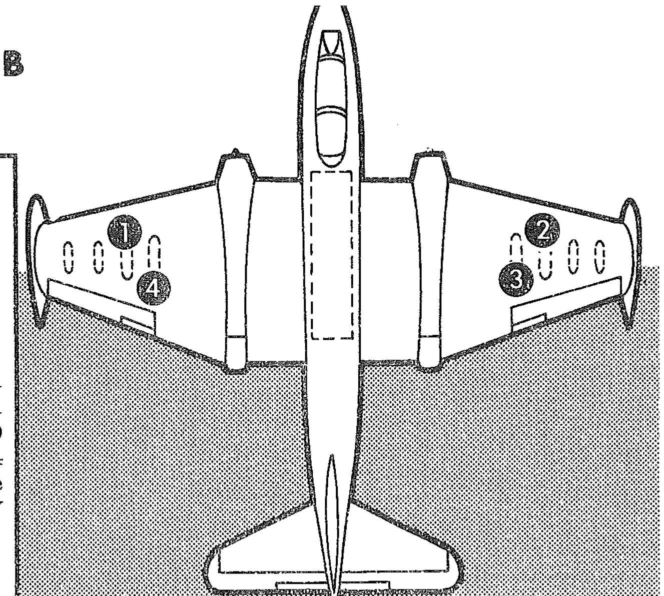
Figure 1-37



M35 INCENDIARY CLUSTER BOMB

DRAG INDEX	9.3
WEIGHT EMPTY	
WEIGHT FULL	690 lb.
LENGTH	89.0 in.
DIAMETER	16.3 in.
FIN SPAN	23.0 in.
SUSPENSION LUG DISTANCE	14.0 in.
COMPONENTS OF A COMPLETE ROUND:	
BOMBS (57 EACH)	M74A1
FUZE	M152A1
CLUSTER ADAPTER	M30
CLUSTER FIN	M14
FIN TIE-ROD	One
DETONATING CORD	TYPE IV

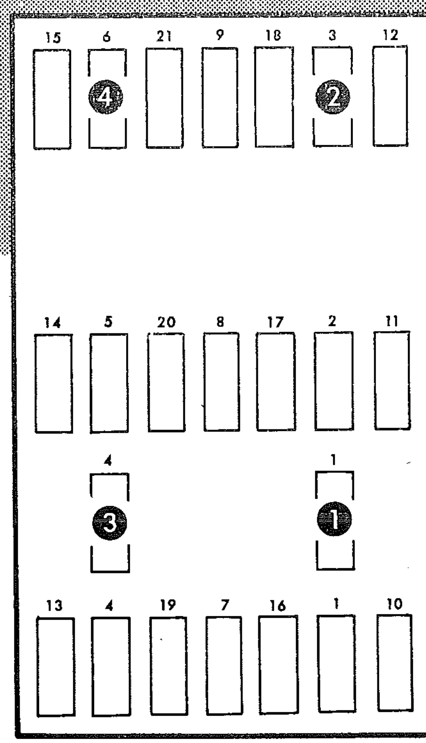
REMOVE CONDUIT AND SHORT TWO WIRES IN ACCORDANCE WITH EXISTING DIRECTIVES IN ORDER TO LOAD STATION 6 ON BOMB DOOR.



EXTERNAL SUSPENSION EQUIPMENT			
EQUIPMENT	WEIGHT/ STATION	DRAG/ STATION	TOTAL WEIGHT
PYLON	61	4.3	244

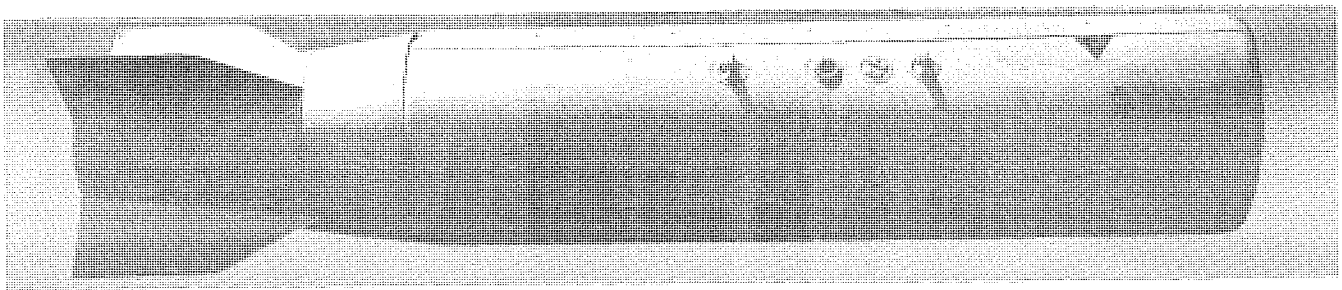
INTERNAL SUSPENSION EQUIPMENT		
EQUIPMENT	WEIGHT/ STATION	TOTAL WEIGHT
SHACKLES AND CHOCKS	11.3 FWD / 12.5 AFT	48.0

MAXIMUM LOAD CONFIGURATION			
DRAG INDEX	EXTERNAL WEIGHT	INTERNAL WEIGHT	TOTAL WEIGHT
54.4	3004	2808	5812

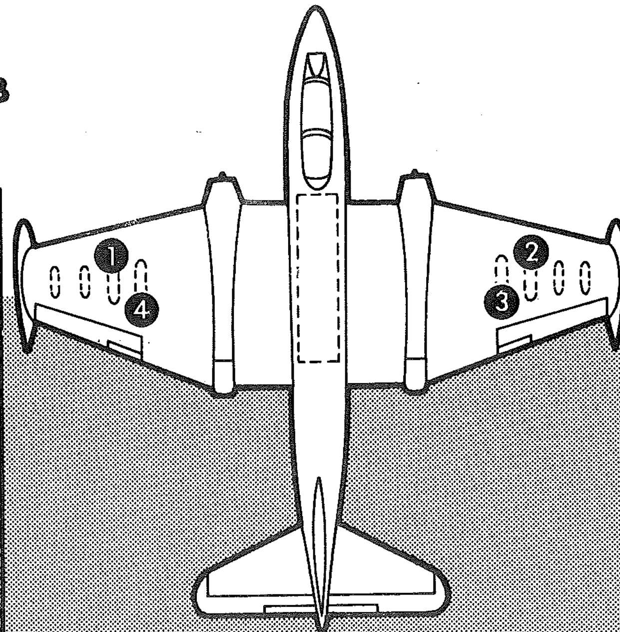


1-74435A

Figure 1-38



M36 INCENDIARY CLUSTER BOMB



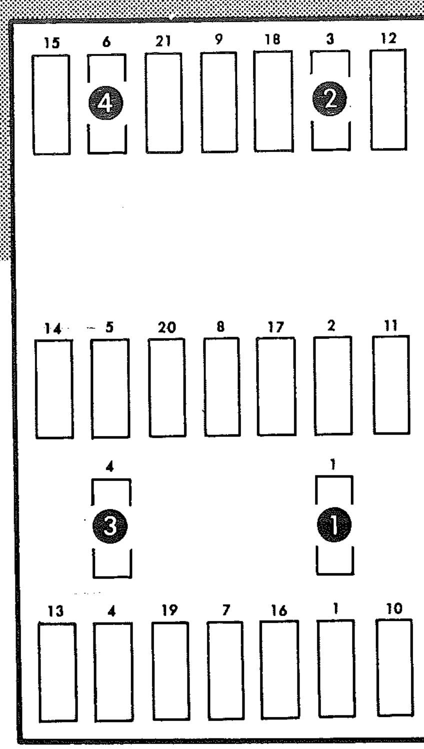
DRAG INDEX	9.3
WEIGHT EMPTY	
WEIGHT FULL	900 lb.
LENGTH	89.0 in.
DIAMETER	16.3 in.
FIN SPAN	23.0 in.
SUSPENSION LUG DISTANCE	14.0 in.
COMPONENTS OF A COMPLETE ROUND:	
BOMBS (182 EACH)	M126
FUZE	M152A1
CLUSTER ADAPTER	M30
CLUSTER FIN	M14
FIN TIE-ROD	One
DETONATING	TYPE IV

REMOVE CONDUIT AND SHORT TWO WIRES IN ACCORDANCE WITH EXISTING DIRECTIVES IN ORDER TO LOAD STATION 6 ON BOMB DOOR.

EXTERNAL SUSPENSION EQUIPMENT			
EQUIPMENT	WEIGHT/ STATION	DRAG/ STATION	TOTAL WEIGHT
PYLON	61	4.3	244

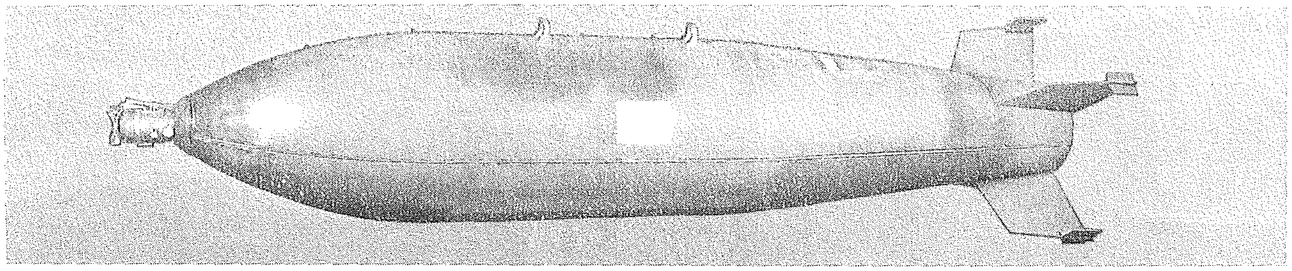
INTERNAL SUSPENSION EQUIPMENT		
EQUIPMENT	WEIGHT/ STATION	TOTAL WEIGHT
SHACKLES AND CHOCKS	11.3 FWD / 12.5 AFT	48.0

MAXIMUM LOAD CONFIGURATION			
DRAG INDEX	EXTERNAL WEIGHT	INTERNAL WEIGHT	TOTAL WEIGHT
54.4	3844	3648	7492

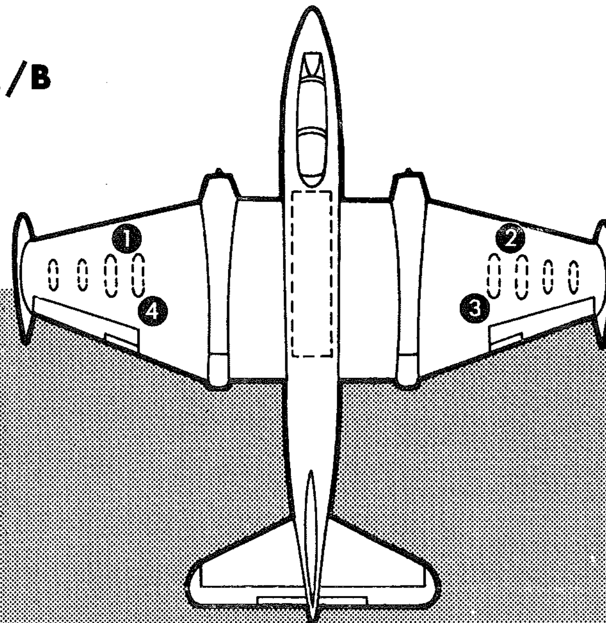


1-74906

Figure 1-39



CBU-24A/B, CBU-29A/B, CBU-49A/B (SUU-30A/B)



DRAG INDEX (SUU-30A/B)	2.9
WEIGHT FULL	830 lb
LENGTH	88 in.
DIAMETER	16 in.
SUSPENSION LUG DISTANCE	14 in.
COMPONENTS OF COMPLETE ROUND:	
FUZE (SUU-30A/B)	M907
BOMBLET (CBU-24A/B)	BLU-26
(CBU-29A/B)	BLU-36
(CBU-49A/B)	BLU-59
BOMBLET FUZE (CBU-24A/B)	M219
(CBU-29A/B)	M218
(CBU-49A/B)	M224

EXTERNAL SUSPENSION EQUIPMENT			
EQUIPMENT	WEIGHT/ STATION	DRAG/ STATION	TOTAL WEIGHT
PYLON	61	4.3	244

INTERNAL SUSPENSION EQUIPMENT		
EQUIPMENT	WEIGHT/ STATION	TOTAL WEIGHT
Shackles and Chocks	12.5	25

MAXIMUM LOAD CONFIGURATION			
DRAG INDEX	EXTERNAL WEIGHT	INTERNAL WEIGHT	TOTAL WEIGHT
30.8	3564	1685	5249

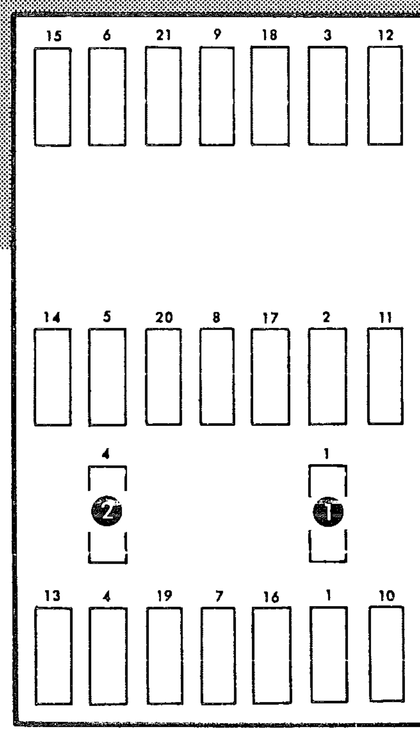
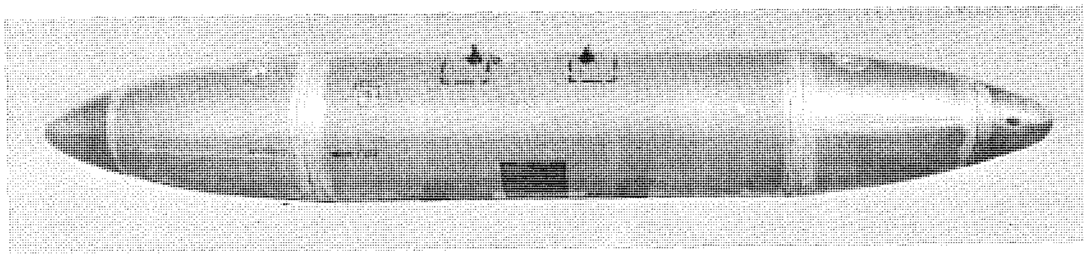
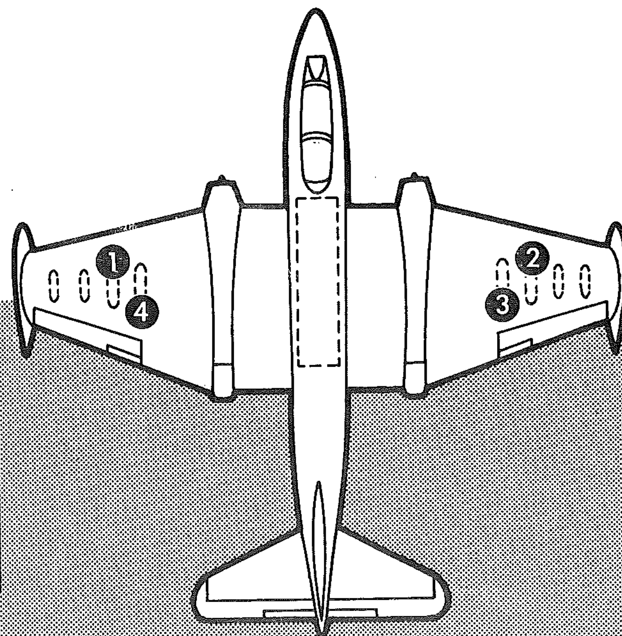


Figure 1-40



BLU-10/B & A/B FIRE BOMB

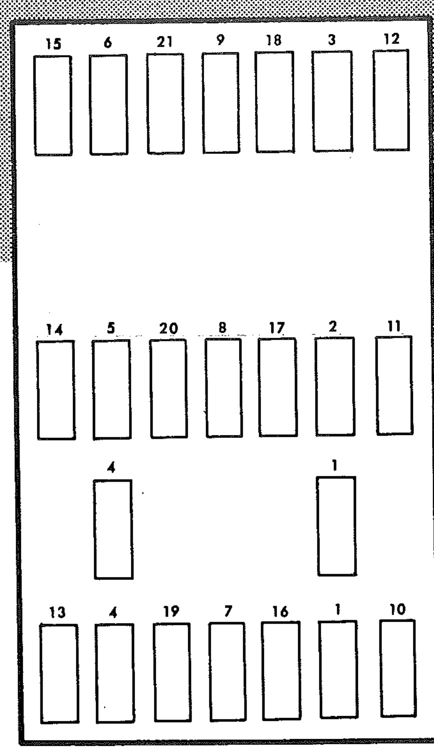
DRAG INDEX	1.0
WEIGHT FULL	250 lb.
LENGTH	88.0 in.
DIAMETER	12.5 in.
SUSPENSION LUG DISTANCE	14.0 in.
COMPONENTS OF A COMPLETE ROUND:	
FUZE	FMU-7B or FMU-7A/B
INITIATOR ASSEM.	FMU-7B or FMU-7A/B
CABLE ASSEM.	FMU-7B or FMU-7A/B
IGNITORS (WP)	M23A1
NOSE CAP	
TAIL CAP	



EXTERNAL SUSPENSION EQUIPMENT			
EQUIPMENT	WEIGHT/ STATION	DRAG/ STATION	TOTAL WEIGHT
PYLON	61	4.3	244

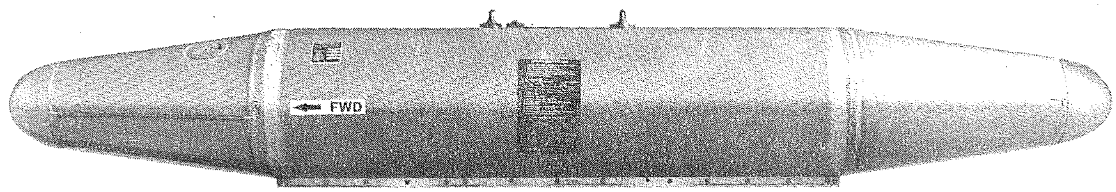
INTERNAL SUSPENSION EQUIPMENT		
EQUIPMENT	WEIGHT/ STATION	TOTAL WEIGHT
--	--	--

MAXIMUM LOAD CONFIGURATION			
DRAG INDEX	EXTERNAL WEIGHT	INTERNAL WEIGHT	TOTAL WEIGHT
21.2	1244	--	1244

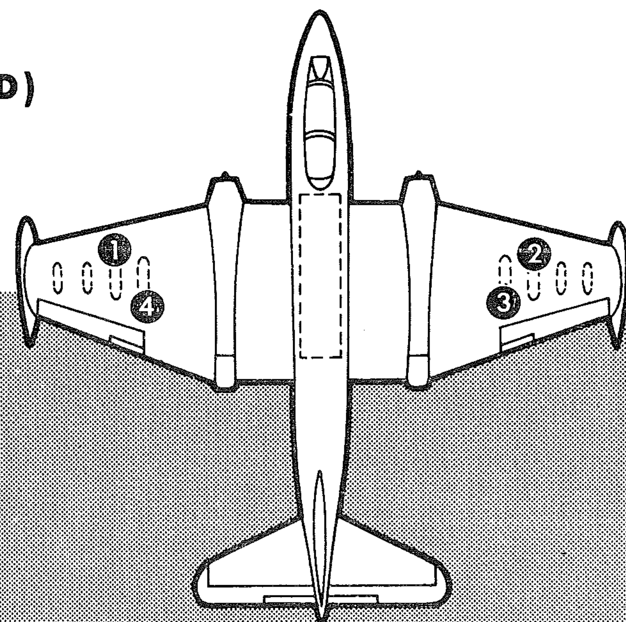


1-74536A

Figure 1-43



BLU-23/B FIRE BOMB (UNFINNED)

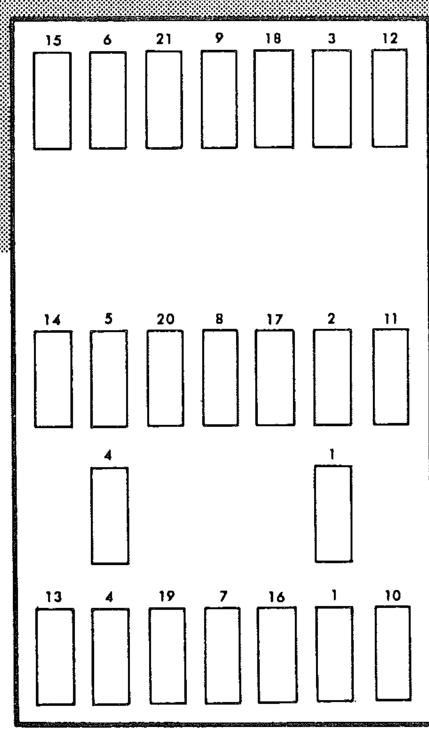


DRAG INDEX	1.3
WEIGHT FULL	500 lb.
LENGTH	119.0 in.
DIAMETER	15.75 in.
SUSPENSION LUG DISTANCE	14 in.
COMPONENT OF COMPLETE ROUND:	
FUZES.....2 ea	FMU-7A/B
INITIATOR	FMU-7A/B
IGNITATORS (2 ea) WP	M23A1
CABLE ASSEM (One)	

EXTERNAL SUSPENSION EQUIPMENT			
EQUIPMENT	WEIGHT/ STATION	DRAG/ STATION	TOTAL WEIGHT
PYLON	61	4.3	244

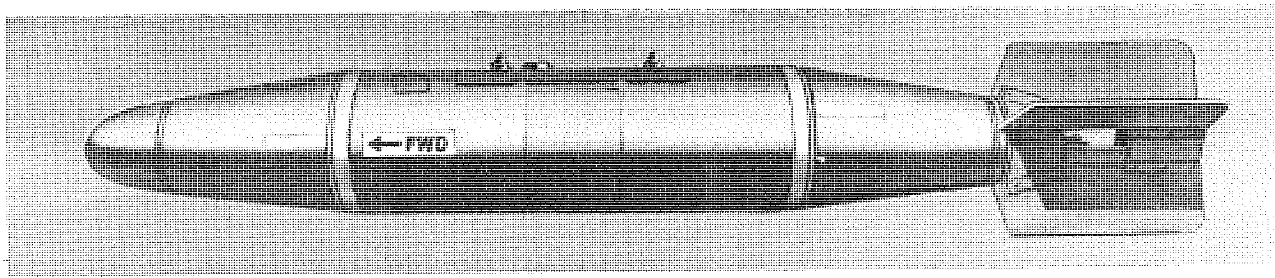
INTERNAL SUSPENSION EQUIPMENT		
EQUIPMENT	WEIGHT/ STATION	TOTAL WEIGHT
--	--	--

MAXIMUM LOAD CONFIGURATION			
DRAG INDEX	EXTERNAL WEIGHT	INTERNAL WEIGHT	TOTAL WEIGHT
22.4	2244	--	2244

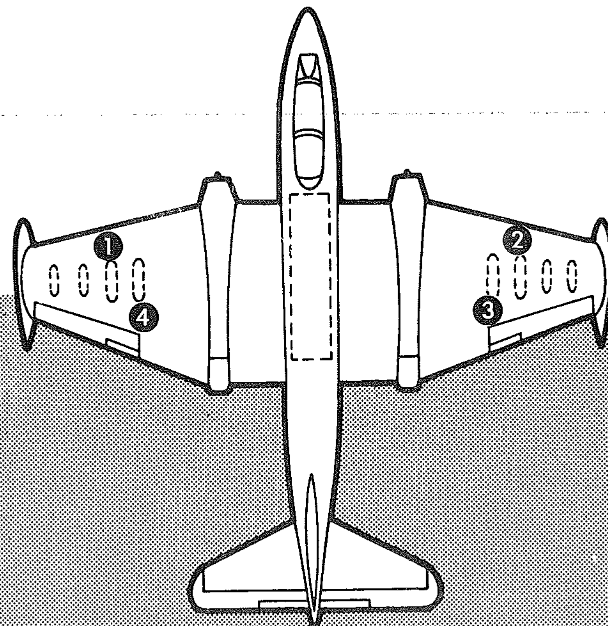


1-74853A

Figure 1-44



BLU-23/B FIREBOMB (FINNED)

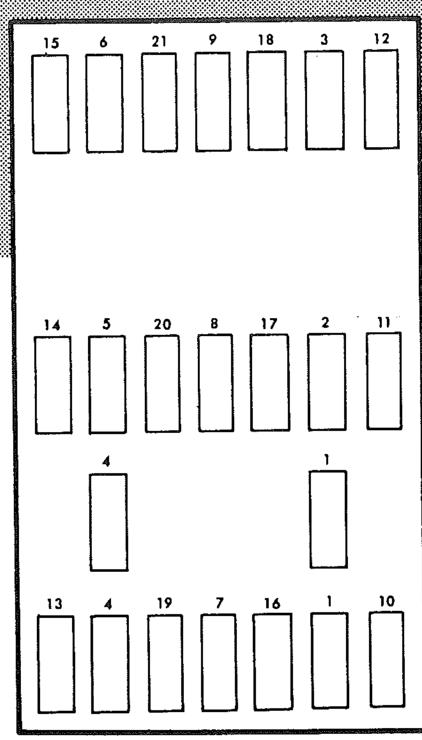


DRAG INDEX	4.6
WEIGHT FULL	500 lbs
LENGTH	129 in.
DIAMETER	15.75 in.
FIN SPAN	24 in.
SUSPENSION LUG DISTANCE	14 in.
COMPONENTS OF COMPLETE ROUND:	
FIN	MXU 467
FUZE	(2 required) FMU 7/B, A/B or B/B
INITIATOR ASSEM	FMU 7/B, A/B or B/B
IGNITOR	ANM 23 or 23 A1
CABLE ASSEM.	FMU A/B, B/B

EXTERNAL SUSPENSION EQUIPMENT			
EQUIPMENT	WEIGHT/ STATION	DRAG/ STATION	TOTAL WEIGHT
PYLON	61	4.3	244

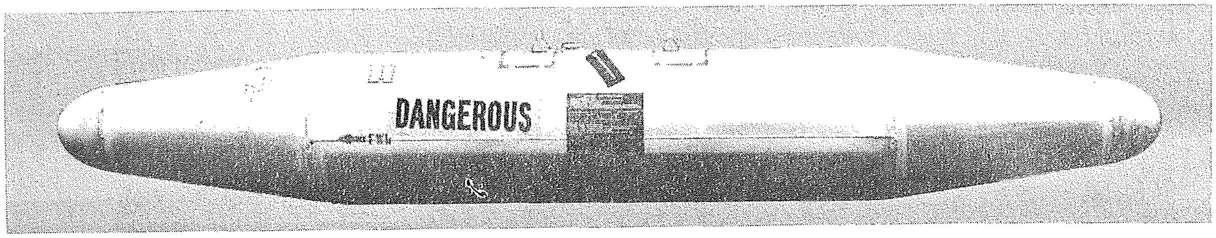
INTERNAL SUSPENSION EQUIPMENT		
EQUIPMENT	WEIGHT/ STATION	TOTAL WEIGHT
--	--	--

MAXIMUM LOAD CONFIGURATION			
DRAG INDEX	EXTERNAL WEIGHT	INTERNAL WEIGHT	TOTAL WEIGHT
35.6	2244	--	2244

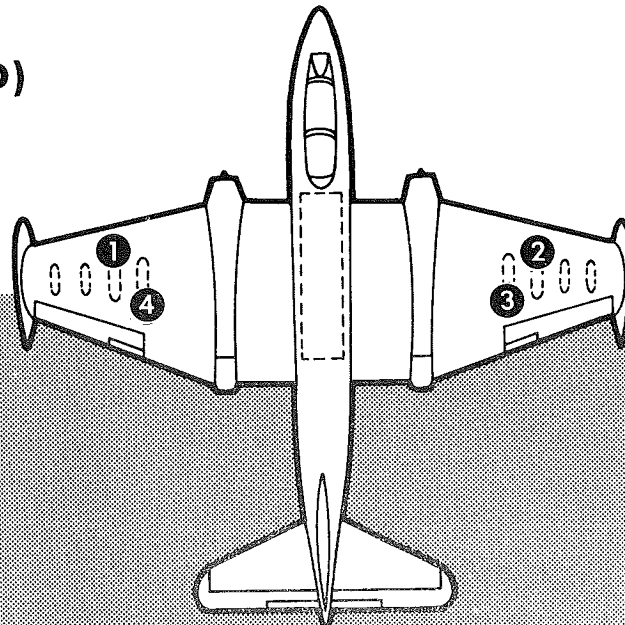


1-75003

Figure 1-45



BLU-32/B FIRE BOMB (UNFINNED)

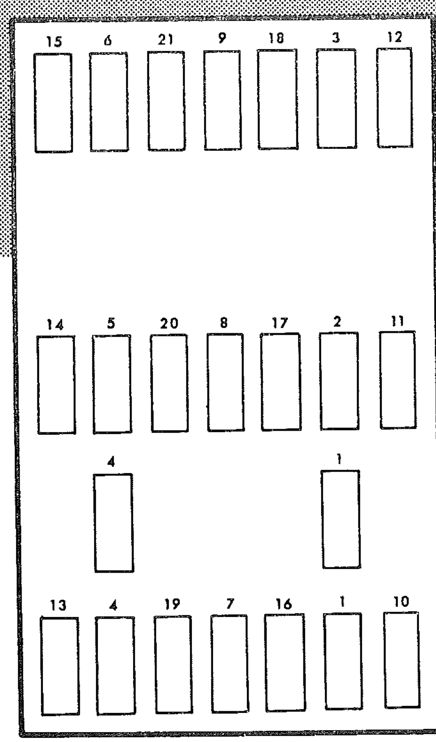


DRAG INDEX	1.3
WEIGHT FULL	600 lb.
LENGTH	119 in.
DIAMETER	14.75 in.
SUSPENSION LUG DISTANCE	14 in.
COMPONENTS OF A COMPLETE ROUND:	
FUZES (2 ea)	FMU-7A/B
IGNITER (2 ea)	
WHITE PHOSPHORUS	M23A1
INITIATOR (One)	FMU-7A/B
CABLE ASSEM (One)	

EXTERNAL SUSPENSION EQUIPMENT			
EQUIPMENT	WEIGHT/ STATION	DRAG/ STATION	TOTAL WEIGHT
PYLON	61	4.3	244

INTERNAL SUSPENSION EQUIPMENT		
EQUIPMENT	WEIGHT/ STATION	TOTAL WEIGHT
--	--	--

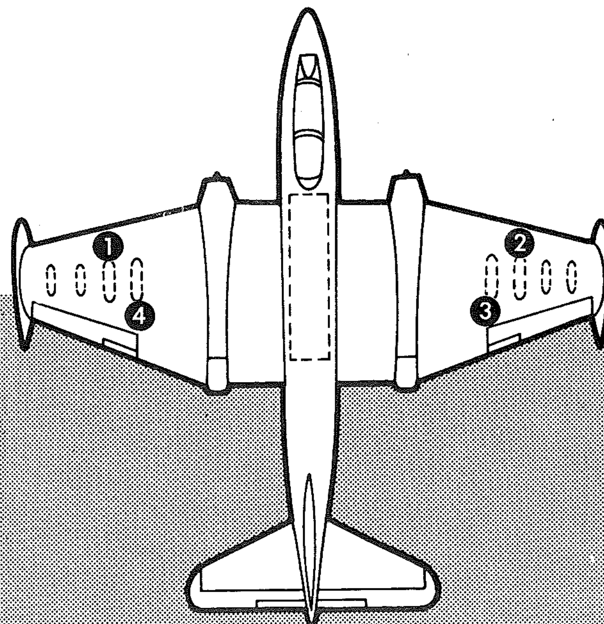
MAXIMUM LOAD CONFIGURATION			
DRAG INDEX	EXTERNAL WEIGHT	INTERNAL WEIGHT	TOTAL WEIGHT
22.4	2644	--	2644



1-74854

Figure 1-46

BLU-32/B FIREBOMB (FINNED)

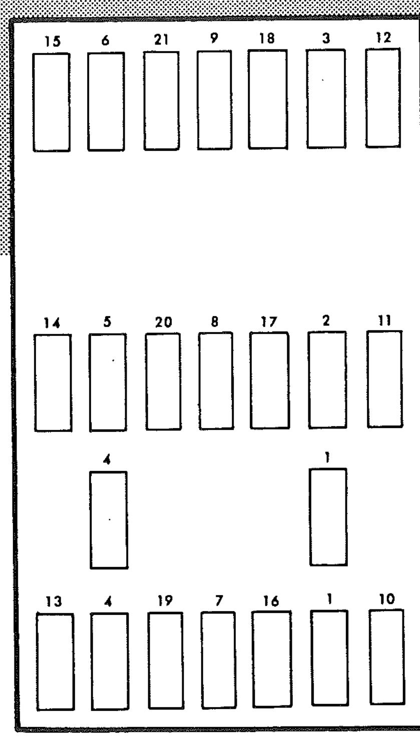


DRAG INDEX 4.6
WEIGHT FULL.................... 500 lbs
LENGTH .... 129 in.
DIAMETER .... 15.75 in.
FIN SPAN .... 24 in.
SUSPENSION LUG DISTANCE .... 14 in.
COMPONENTS OF A COMPLETE ROUND:
FIN .... MXU 467
FUZE...... (2 required) FMU 7/B, A/B or B/B
INITIATOR ASSEM ......FMU 7/B, A/B or B/B
IGNITOR.................. ANM 23 or 23A1
CABLE ASSEM .... FMU 7A/B

EXTERNAL SUSPENSION EQUIPMENT			
EQUIPMENT	WEIGHT/ STATION	DRAG/ STATION	TOTAL WEIGHT
PLYON	61	4.3	244

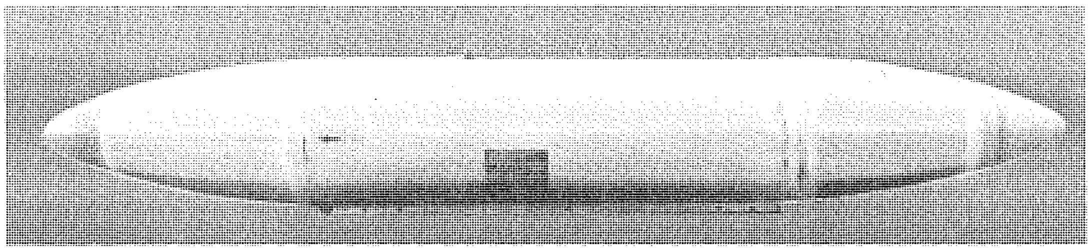
INTERNAL SUSPENSION EQUIPMENT		
EQUIPMENT	WEIGHT/ STATION	TOTAL WEIGHT
--	--	--

MAXIMUM LOAD CONFIGURATION			
DRAG INDEX	EXTERNAL WEIGHT	INTERNAL WEIGHT	TOTAL WEIGHT
35.6	2244	--	2244



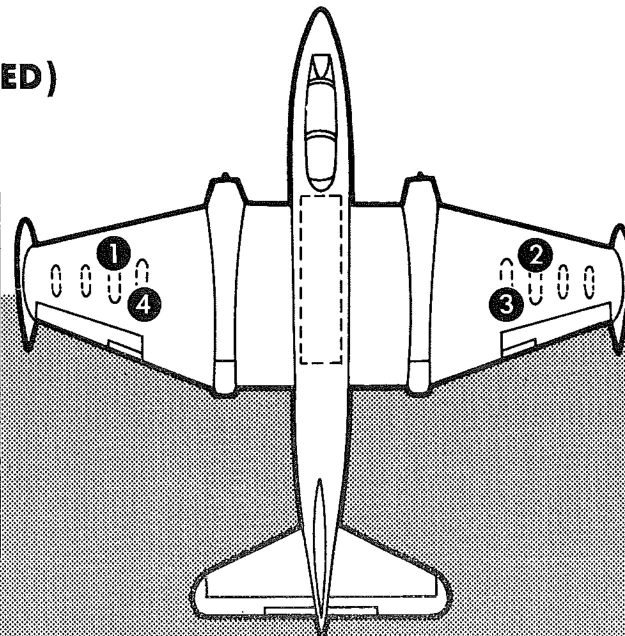
1-75004

Figure 1-47



BLU-1/SERIES FIRE BOMB (UNFINNED)

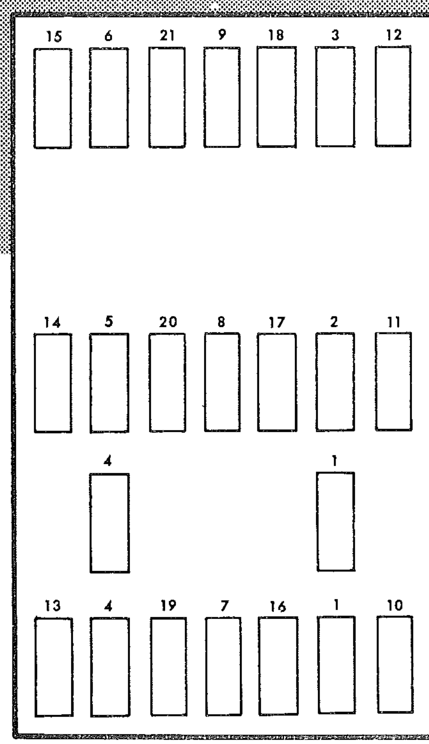
DRAG INDEX	1.5
WEIGHT FULL	698 lb.
LENGTH	130 in.
DIAMETER	18.5 in.
FIN SPAN	--
SUSPENSION LUG DISTANCE	14.0 in.
COMPONENTS OF A COMPLETE ROUND:	
FUZE	FMU-7B or FMU-7A/B
INITIATOR ASSEM.	FMU-7B or FMU-7A/B
CABLE ASSEM	FMU-7B or FMU-7A/B
FILLER	Incendiary



EXTERNAL SUSPENSION EQUIPMENT			
EQUIPMENT	WEIGHT/ STATION	DRAG/ STATION	TOTAL WEIGHT
PYLON	61	4.3	244

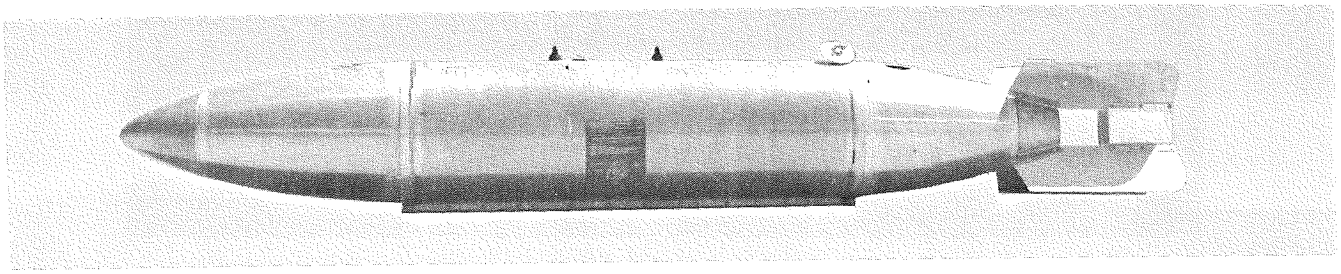
INTERNAL SUSPENSION EQUIPMENT		
EQUIPMENT	WEIGHT/ STATION	TOTAL WEIGHT
--	--	--

MAXIMUM LOAD CONFIGURATION			
DRAG INDEX	EXTERNAL WEIGHT	INTERNAL WEIGHT	TOTAL WEIGHT
23.2	3036	--	3036

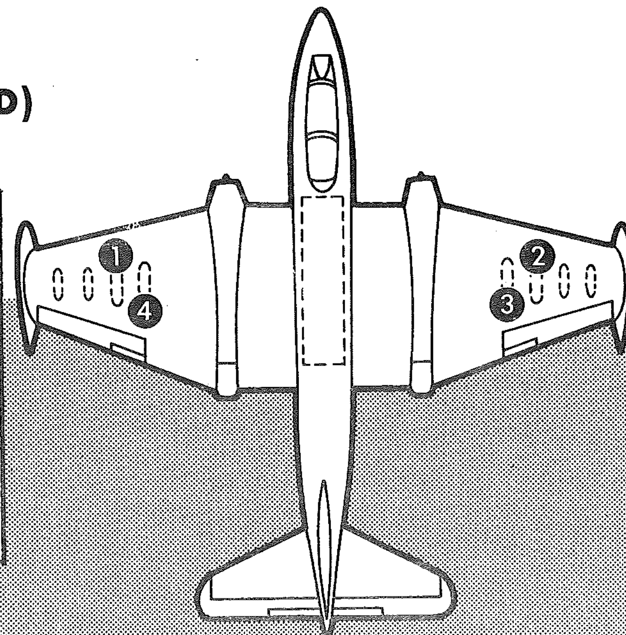


1-74570A

Figure 1-48



BLU-1/SERIES FIRE BOMB (FINNED)

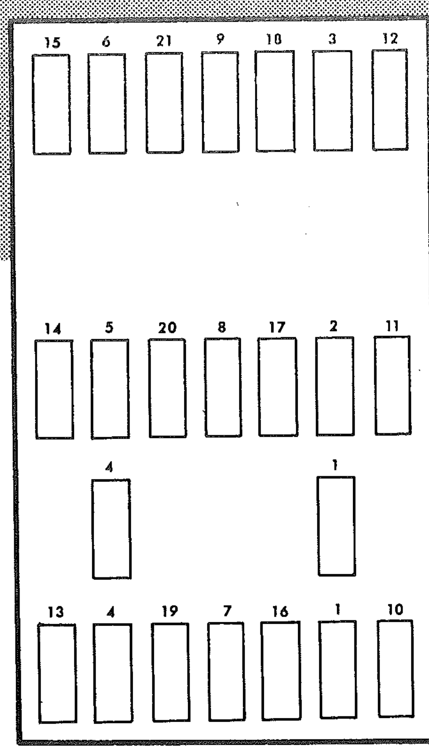


DRAG INDEX	4.2
WEIGHT FULL	712 lbs
LENGTH	147.9 in.
DIAMETER	18.5 in.
FIN SPAN	
SUSPENSION LUG DISTANCE	14.0 in.
COMPONENTS OF A COMPLETE ROUND:	
FUZE	FMU-7B or FMU-7A/B
INITIATOR ASSEM.	FMU-7B or FMU-7A/B
CABLE ASSEM.	FMU-7B or FMU-7A/B
FILLER	Incendiary

EXTERNAL SUSPENSION EQUIPMENT			
EQUIPMENT	WEIGHT/ STATION	DRAG/ STATION	TOTAL WEIGHT
PYLON	61	4.3	244

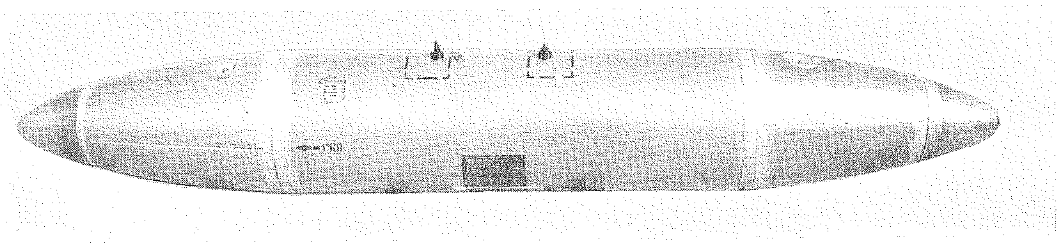
INTERNAL SUSPENSION EQUIPMENT		
EQUIPMENT	WEIGHT/ STATION	TOTAL WEIGHT
--	--	--

MAXIMUM LOAD CONFIGURATION			
DRAG INDEX	EXTERNAL WEIGHT	INTERNAL WEIGHT	TOTAL WEIGHT
34.0	3092	--	3092



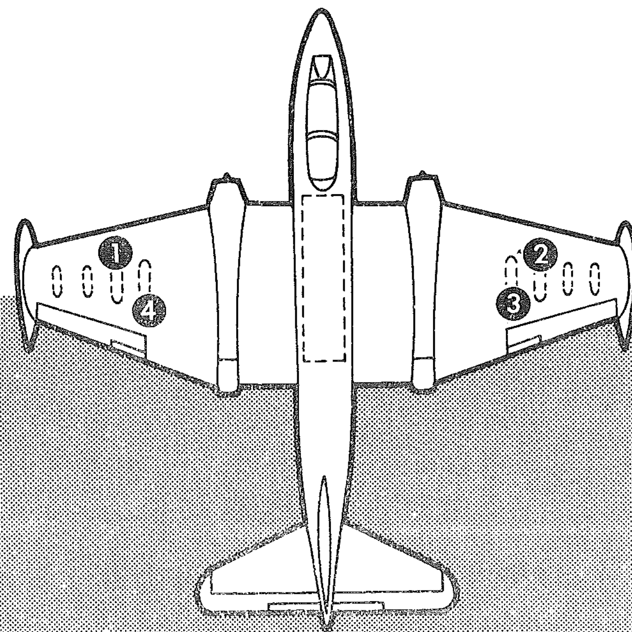
1-74541A

Figure 1-49



BLU-27/B FIRE BOMB (UNFINNED)

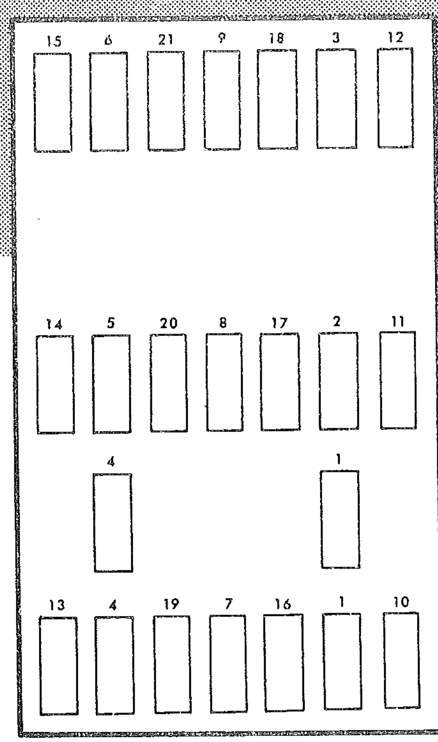
DRAG INDEX	1.5
WEIGHT FULL	870
LENGTH	129.9 in.
DIAMETER	18.5 in.
SUSPENSION LUG DISTANCE	14 in.
COMPONENTS OF A COMPLETE ROUND:	
FUZE	FMU-7B OR FMU 7A/B
INITIATOR ASSEM	FMU-7B OR FMU 7A/B
CABLE ASSEM	FMU-7B OR FMU 7A/B
IGNITOR	WHITE PHOSPHORUS AN M23A-1



EXTERNAL SUSPENSION EQUIPMENT			
EQUIPMENT	WEIGHT/ STATION	DRAG/ STATION	TOTAL WEIGHT
PYLON	61	4.3	244

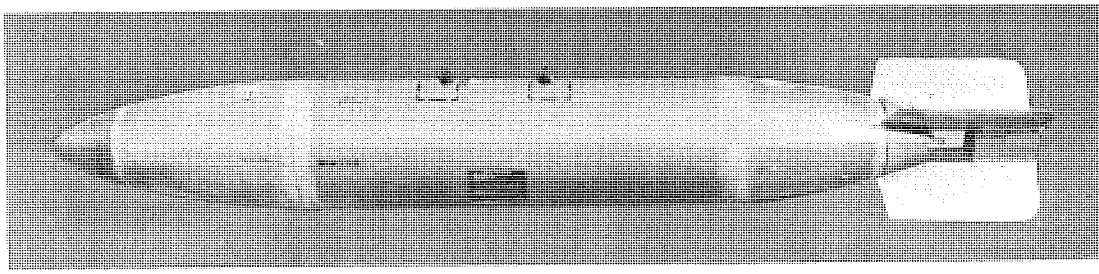
INTERNAL SUSPENSION EQUIPMENT		
EQUIPMENT	WEIGHT/ STATION	TOTAL WEIGHT
--	--	--

MAXIMUM LOAD CONFIGURATION			
DRAG INDEX	EXTERNAL WEIGHT	INTERNAL WEIGHT	TOTAL WEIGHT
23.2	3724	--	3724

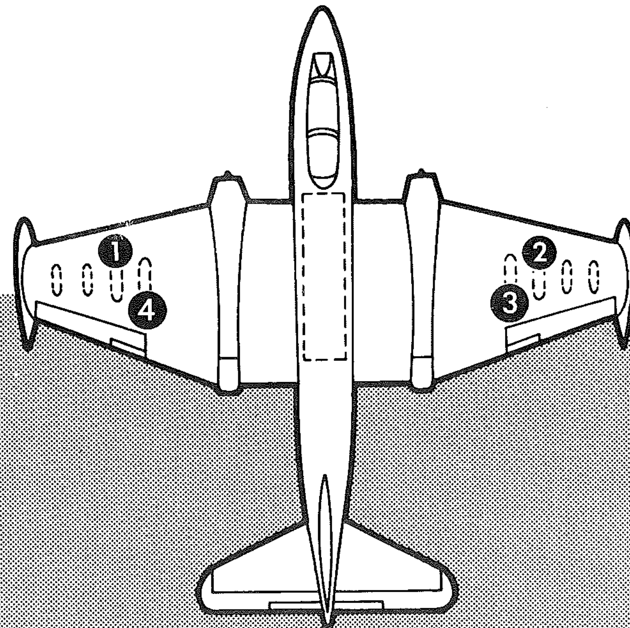


1-74892

Figure 1-50



BLU 27/B FIRE BOMB (FINNED)

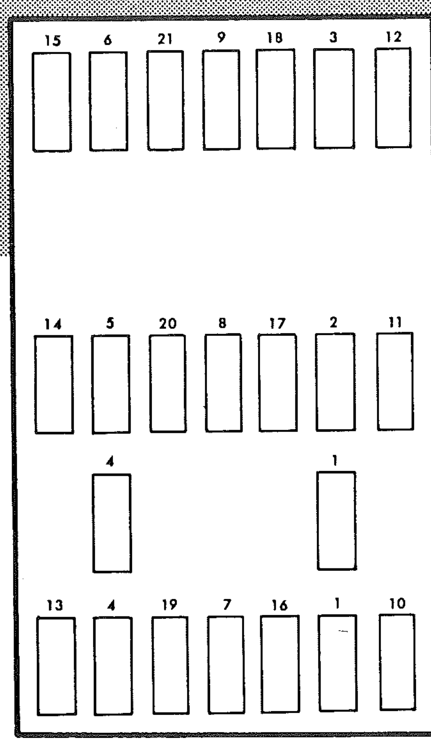


DRAG INDEX 3.1
WEIGHT FULL . . . . 885 lbs.
LENGTH . . . . 147.9 in.
DIAMETER . . . . 18.5 in.
FIN SPAN . . . .
SUSPENSION LUG DISTANCE . . . . 14 in.
COMPONENTS OF A COMPLETE ROUND:
FIN . . . . MXU 469/B
FUZE (2 ea) . . . . FMU7B or FMU7A/B
INITIATOR ASSEM
IGNITOR (2 ea)
WHITE PHOSPHORUS M23A1
CABLE ASSEM . . . FMU7B or FMU7A/B

EXTERNAL SUSPENSION EQUIPMENT			
EQUIPMENT	WEIGHT/ STATION	DRAG/ STATION	TOTAL WEIGHT
PYLON	61	4.3	244

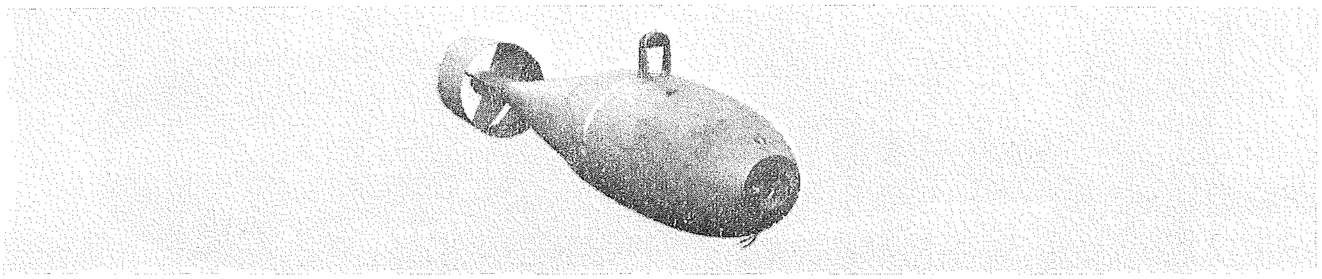
INTERNAL SUSPENSION EQUIPMENT		
EQUIPMENT	WEIGHT/ STATION	TOTAL WEIGHT
--	--	--

MAXIMUM LOAD CONFIGURATION			
DRAG INDEX	EXTERNAL WEIGHT	INTERNAL WEIGHT	TOTAL WEIGHT
29.6	3784	--	3784

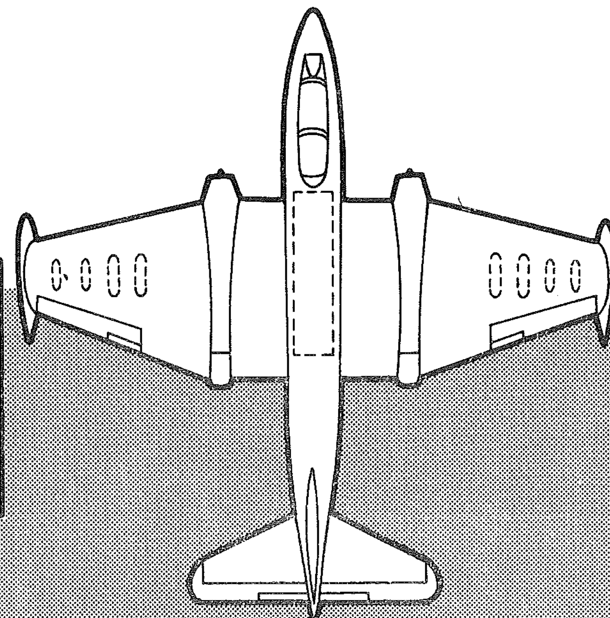


1-74891

Figure 1-51



BDU-33/B PRACTICE BOMB

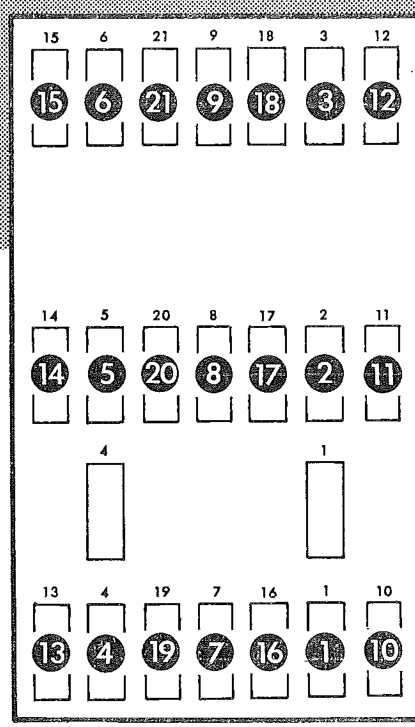


DRAG INDEX	--
WEIGHT FULL	23.7 lb.
LENGTH	22.5 in.
DIAMETER	4.0 in.
FIN SPAN	4.0 in.
SUSPENSION LUG DISTANCE	Single
COMPONENTS OF A COMPLETE ROUND:	
COTTER PIN	One
FIRING PIN	MK1 MOD0
SIGNAL	MK4 MOD3

EXTERNAL SUSPENSION EQUIPMENT			
EQUIPMENT	WEIGHT/ STATION	DRAG/ STATION	TOTAL WEIGHT
PYLON	--	--	--

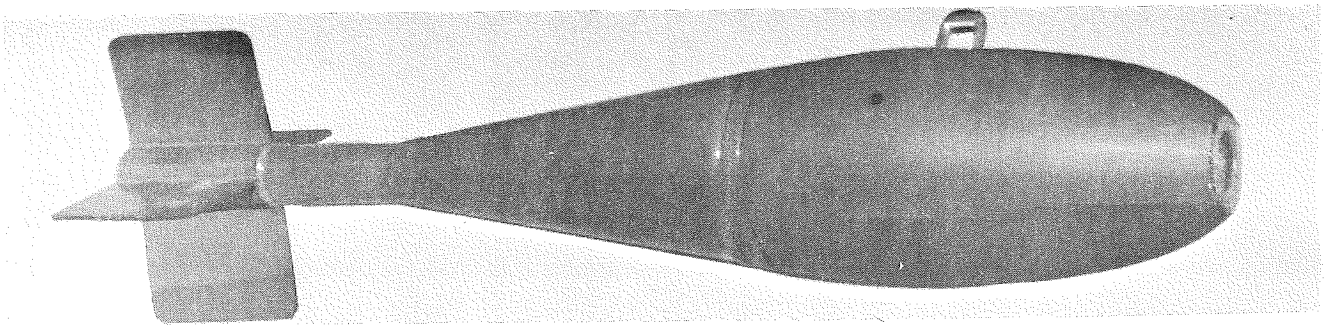
INTERNAL SUSPENSION EQUIPMENT		
EQUIPMENT	WEIGHT/ STATION	TOTAL WEIGHT
SHACKLES	7	147

MAXIMUM LOAD CONFIGURATION			
DRAG INDEX	EXTERNAL WEIGHT	INTERNAL WEIGHT	TOTAL WEIGHT
--	--	644.7	644.7



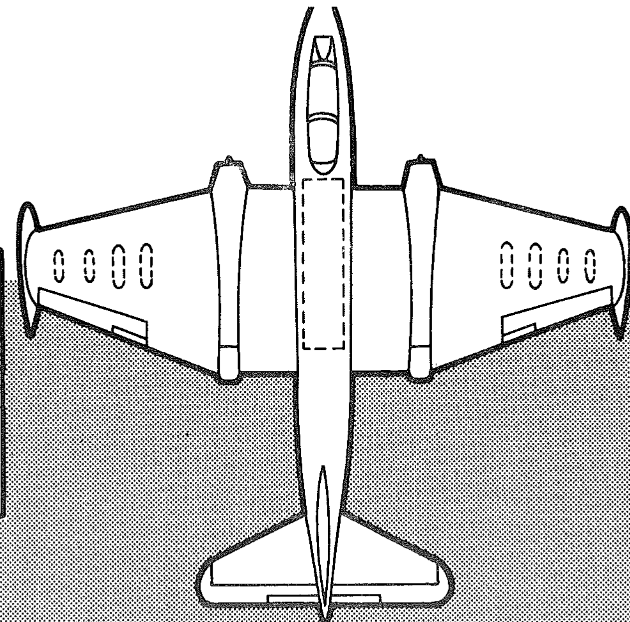
1-74533A

Figure 1-52



BDU-33A/B PRACTICE BOMB

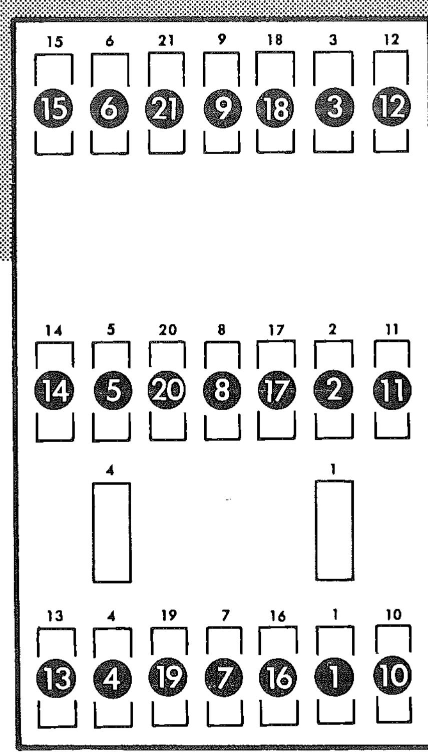
DRAG INDEX	--
WEIGHT FULL	23.7 lb.
LENGTH	22.5 in.
DIAMETER	4.0 in.
FIN SPAN	4.5 in.
SUSPENSION LUG DISTANCE	Single
COMPONENTS OF A COMPLETE ROUND:	
COTTER PIN	One
FIRING PIN	MK1 MOD0
SIGNAL	MK4 MOD3



EXTERNAL SUSPENSION EQUIPMENT			
EQUIPMENT	WEIGHT/ STATION	DRAG/ STATION	TOTAL WEIGHT
PYLON	--	--	--

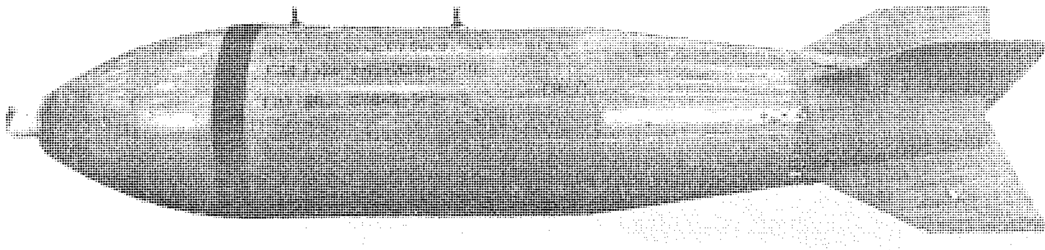
INTERNAL SUSPENSION EQUIPMENT		
EQUIPMENT	WEIGHT/ STATION	TOTAL WEIGHT
SHACKLES	7	147

MAXIMUM LOAD CONFIGURATION			
DRAG INDEX	EXTERNAL WEIGHT	INTERNAL WEIGHT	TOTAL WEIGHT
--	--	644.7	644.7

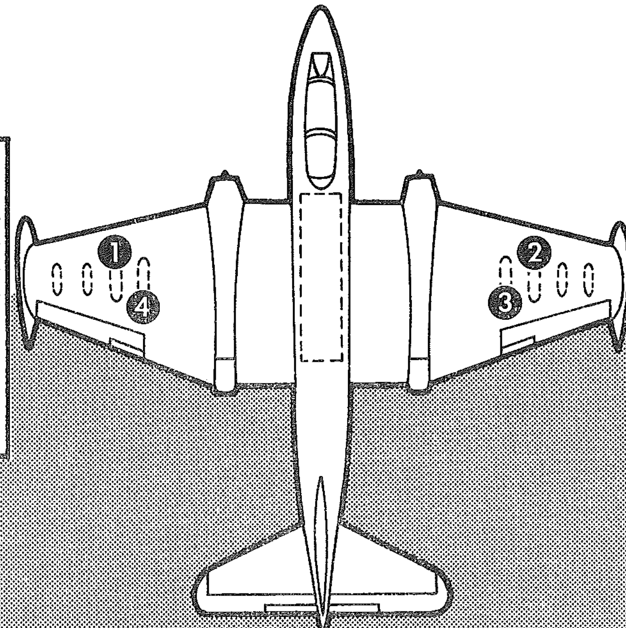


1-75005

Figure 1-53



M129/M129E1 LEAFLET BOMB

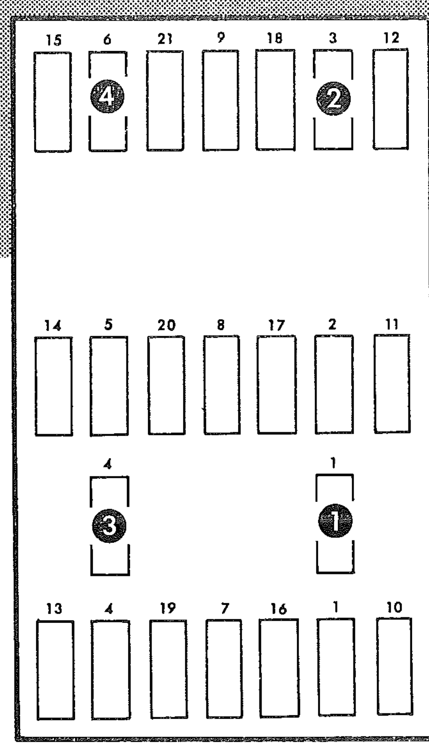


DRAG INDEX	3.3
WEIGHT FULL	750 lb.
LENGTH	90.02 in.
DIAMETER	16.02 in.
FIN SPAN	22.78 in.
SUSPENSION LUG DISTANCE	14.0 in.
COMPONENTS OF A COMPLETE ROUND:	
FUZE	M147A1
FIN ASSEMBLY	M148
DETONATING CORD	TYPE IV
LEAFLETS	P110
ADAPTER BOOSTER	T59

EXTERNAL SUSPENSION EQUIPMENT			
EQUIPMENT	WEIGHT/ STATION	DRAG/ STATION	TOTAL WEIGHT
PYLON	61	4.3	244

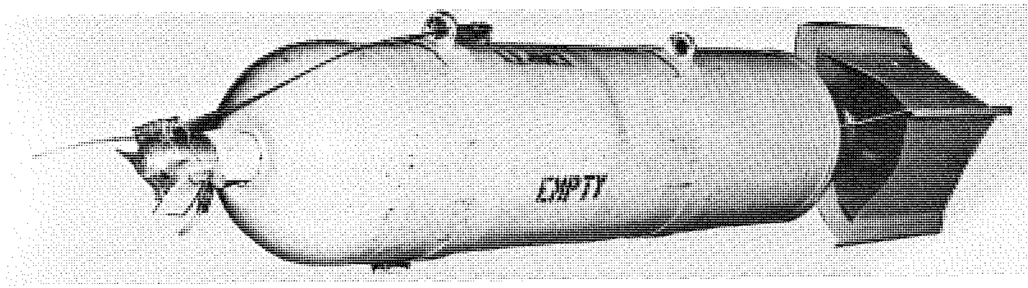
INTERNAL SUSPENSION EQUIPMENT		
EQUIPMENT	WEIGHT/ STATION	TOTAL WEIGHT
SHACKLES AND CHOCKS	12.5	50

MAXIMUM LOAD CONFIGURATION			
DRAG INDEX	EXTERNAL WEIGHT	INTERNAL WEIGHT	TOTAL WEIGHT
30.4	3244	3050	6294



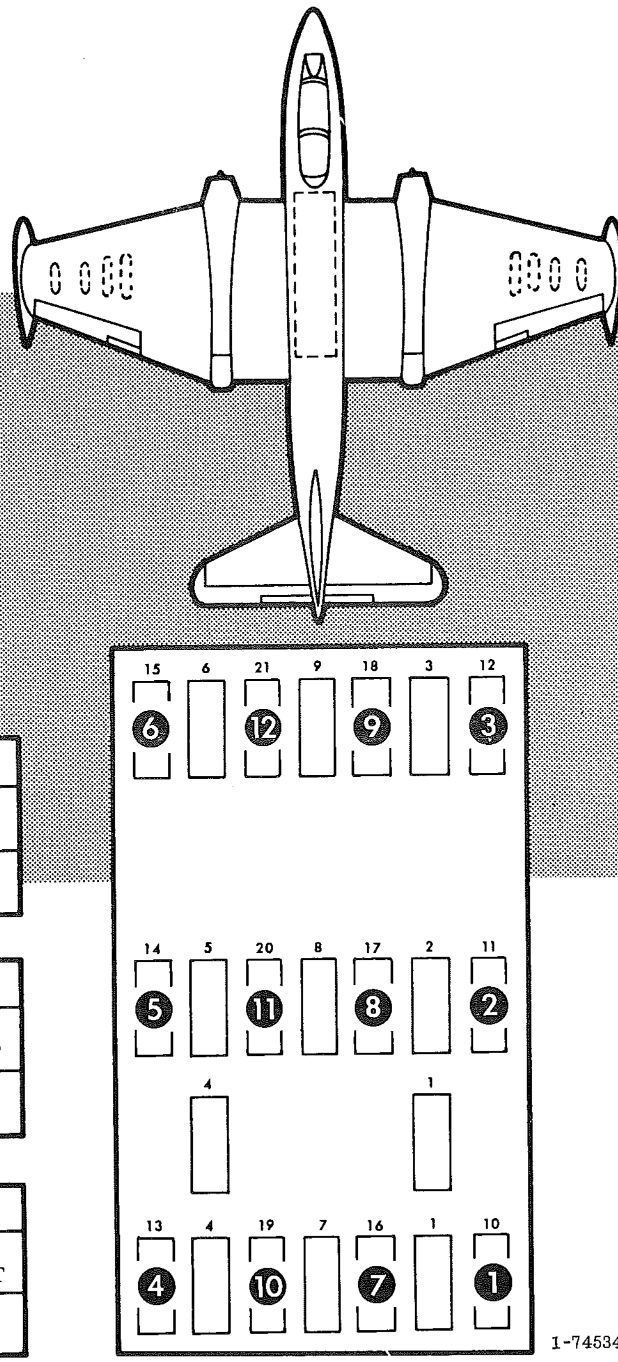
1-74438A

Figure 1-54



M47A4 SMOKE BOMB

DRAG INDEX	- -
WEIGHT FULL (PWP)	105 lb.
WEIGHT FULL (WP)	131 lb.
LENGTH	52.6 in.
DIAMETER	8.5 in.
FIN SPAN	11.0 in.
SUSPENSION LUG DISTANCE	14 in.
COMPONENTS OF COMPLETE ROUND:	
FILLER PWP OR WP	
FUZE, NOSE	AN-M-159 or AN-M/126A1
ARMING WIRE	CC type A



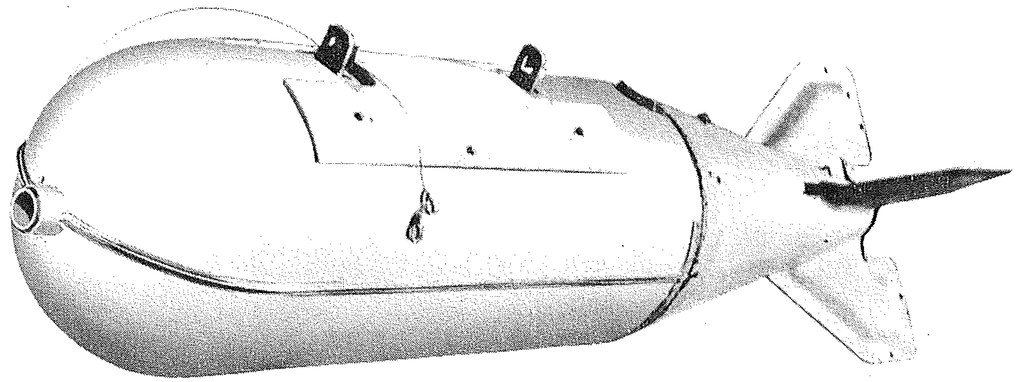
EXTERNAL SUSPENSION EQUIPMENT			
EQUIPMENT	WEIGHT/ STATION	DRAG/ STATION	TOTAL WEIGHT
PYLON			

INTERNAL SUSPENSION EQUIPMENT		
EQUIPMENT	WEIGHT/ STATION	TOTAL WEIGHT
SHACKLES & CHOCKS	12.5	150

MAXIMUM LOAD CONFIGURATION			
DRAG INDEX	EXTERNAL WEIGHT	INTERNAL WEIGHT	TOTAL WEIGHT
--	--	1260	1410

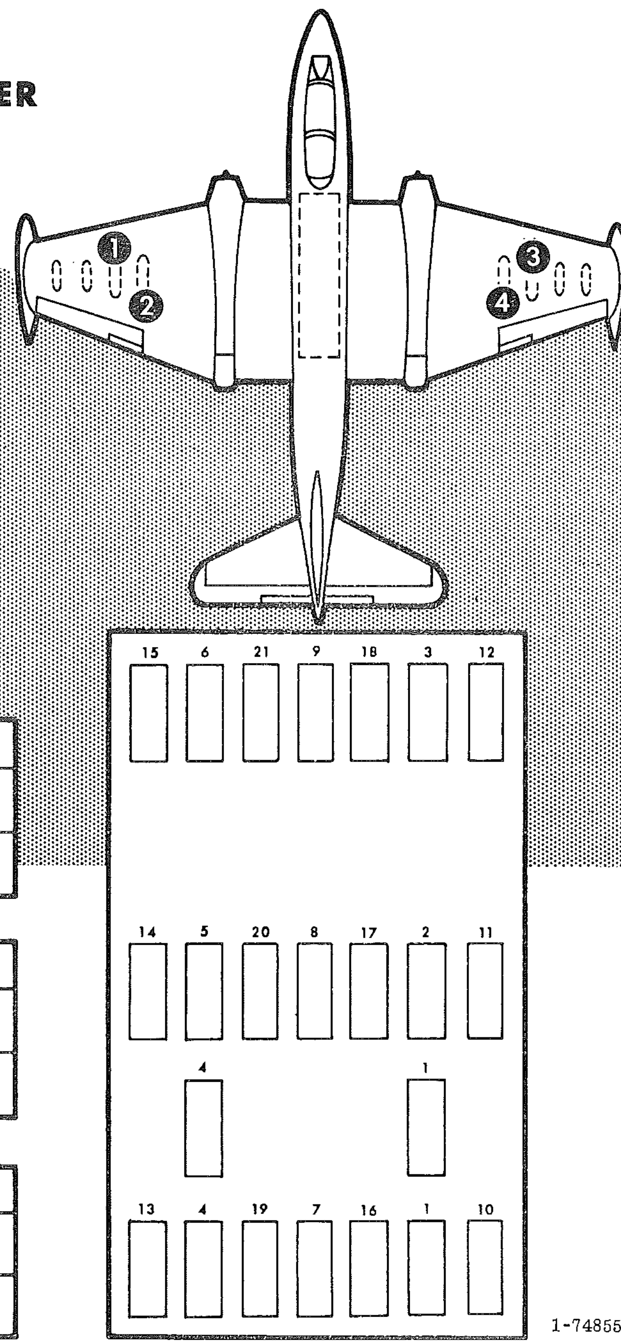
1-74534A

Figure 1-55



MK-44 MISSILE ADAPTER CLUSTER

DRAG INDEX	
WEIGHT FULL	625 lb.
LENGTH	69.9 in.
DIAMETER	14.2 in.
SUSPENSION LUG DISTANCE	14 in.
COMPONENTS OF COMPLETE ROUND:	
FUZE.	AN-M146A1
ARMING WIRE ASSEM	



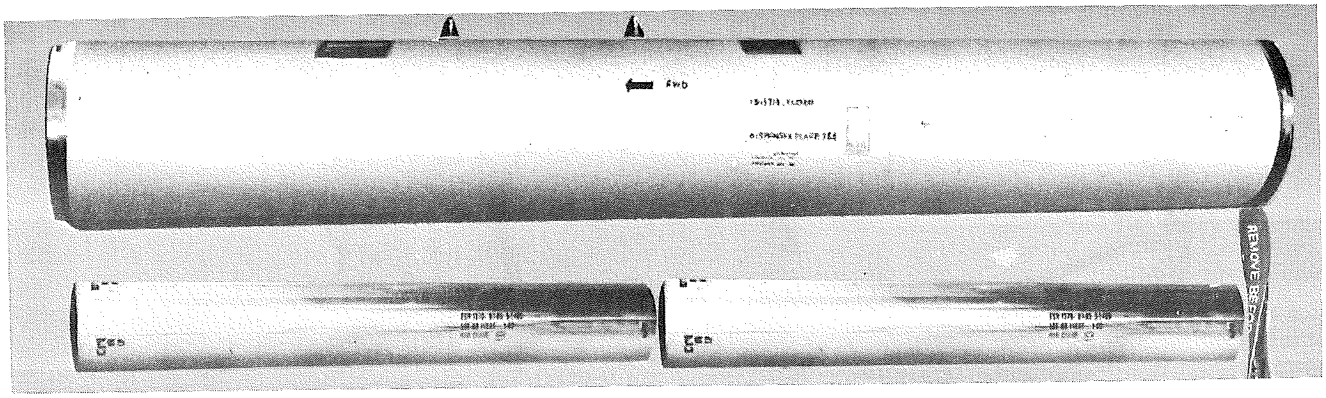
EXTERNAL SUSPENSION EQUIPMENT			
EQUIPMENT	WEIGHT/ STATION	DRAG/ STATION	TOTAL WEIGHT
PYLON	61	4.3	244

INTERNAL SUSPENSION EQUIPMENT		
EQUIPMENT	WEIGHT/ STATION	TOTAL WEIGHT

MAXIMUM LOAD CONFIGURATION			
DRAG INDEX	EXTERNAL WEIGHT	INTERNAL WEIGHT	TOTAL WEIGHT
	3476		3476

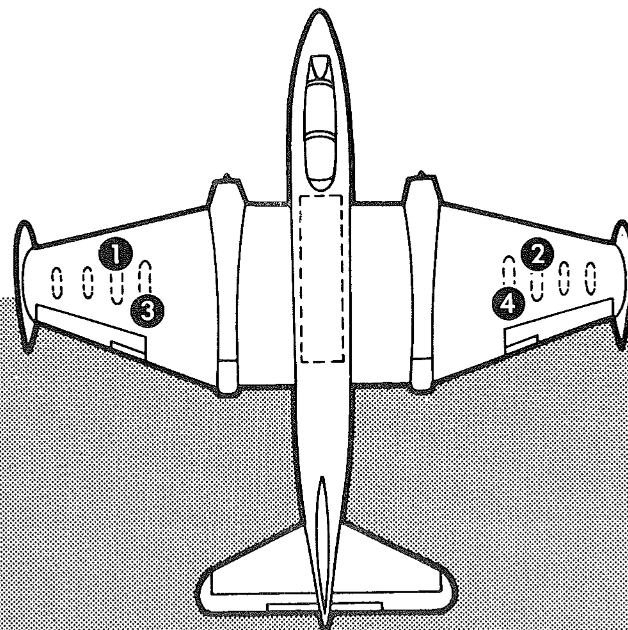
1-74855

Figure 1-56



SUU-25 AND MK-24 FLARE

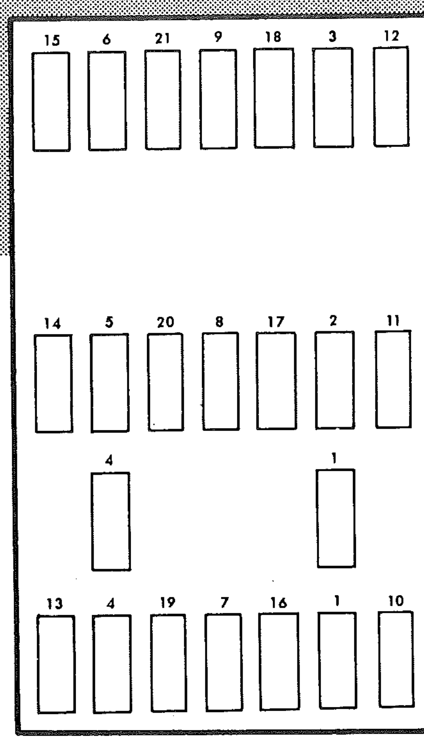
DRAG INDEX (LOADED)..............	11.7
DRAG INDEX (EMPTY)	9.4
WEIGHT EMPTY	121 LB
WEIGHT FULL......................	340 LB
LENGTH...........................	95 IN.
DIAMETER	14 IN.
SUSPENSION LUG DISTANCE..........	14 IN.
COMPONENTS OF A COMPLETE ROUND:	
(FLARE MK-24)..................	
ILLUMINANT	
EJECTION AND IGNITION DELAY...	INTEGRAL
PARACHUTE AND SPLIT TUBE.....	
ARMING LANYARD...............	INTEGRAL



EXTERNAL SUSPENSION EQUIPMENT			
EQUIPMENT	WEIGHT/ STATION	DRAG/ STATION	TOTAL WEIGHT
PYLON	61	4.3	244

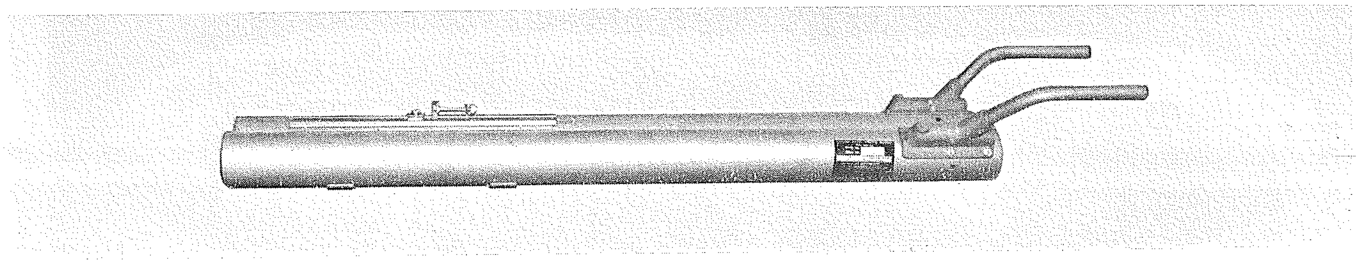
INTERNAL SUSPENSION EQUIPMENT		
EQUIPMENT	WEIGHT/ STATION	TOTAL WEIGHT
--	--	--

MAXIMUM LOAD CONFIGURATION			
DRAG INDEX	EXTERNAL WEIGHT	INTERNAL WEIGHT	TOTAL WEIGHT
64.	1604	--	1604

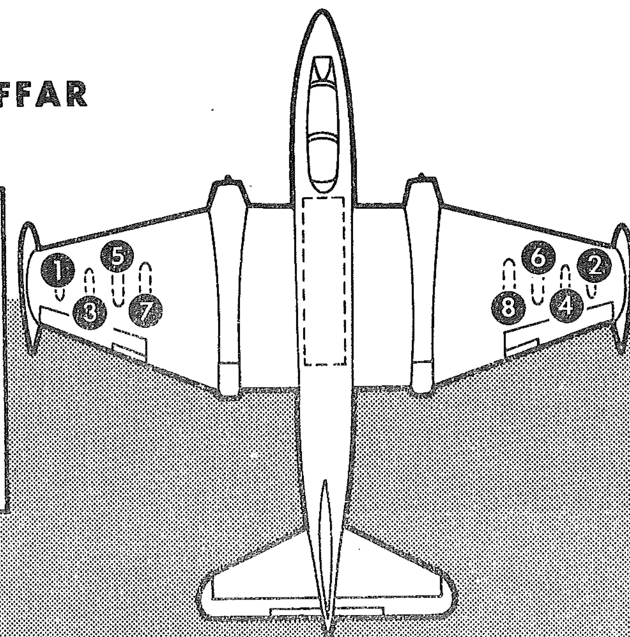


1-74538A

Figure 1-57



MA2 ROCKET LAUNCHER 2.75'' FFAR

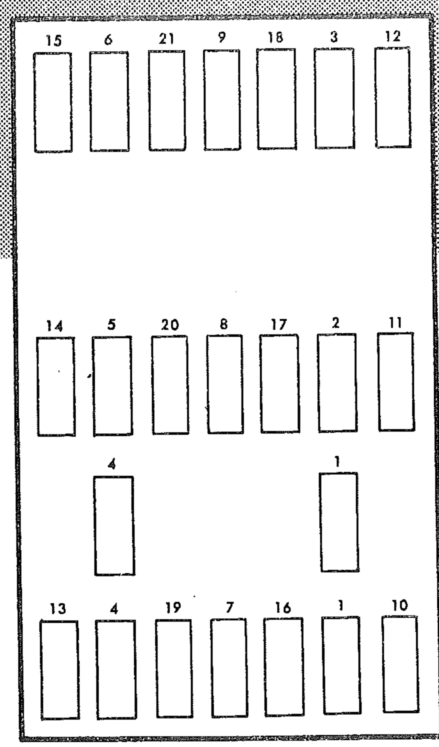


DRAG INDEX	0.5
WEIGHT EMPTY	
WEIGHT FULL	63 lb.
LENGTH	47 in.
DIAMETER	6.5 x 7.0
FIN SPAN	--
SUSPENSION LUG DISTANCE	--
COMPONENTS OF A COMPLETE ROUND:	
LAUNCHER TUBE	2
FORWARD SUPPORT	1
AFT SUPPORT	1
SAFETY PIN	2

EXTERNAL SUSPENSION EQUIPMENT			
EQUIPMENT	WEIGHT/ STATION	DRAG/ STATION	TOTAL WEIGHT
PYLON	18	1.5	144

INTERNAL SUSPENSION EQUIPMENT		
EQUIPMENT	WEIGHT/ STATION	TOTAL WEIGHT
--	--	--

MAXIMUM LOAD CONFIGURATION			
DRAG INDEX	EXTERNAL WEIGHT	INTERNAL WEIGHT	TOTAL WEIGHT
16	648	--	648

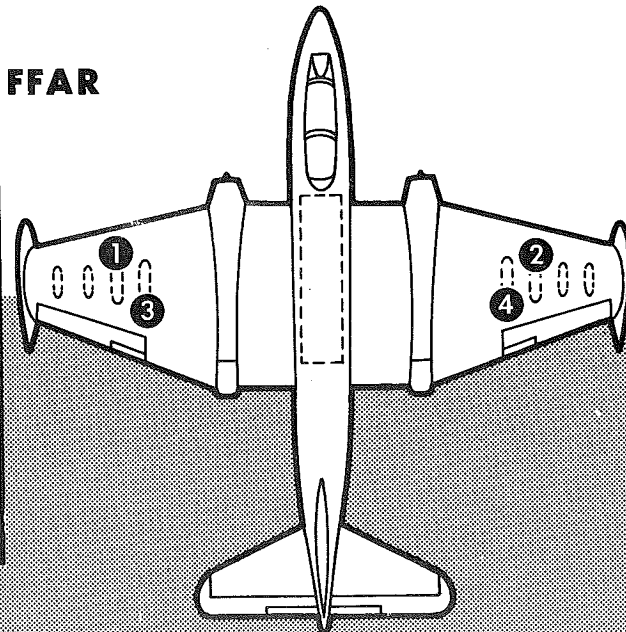


1-74532

Figure 1-58

LAU-3A ROCKET LAUNCHER 2.75 FFAR

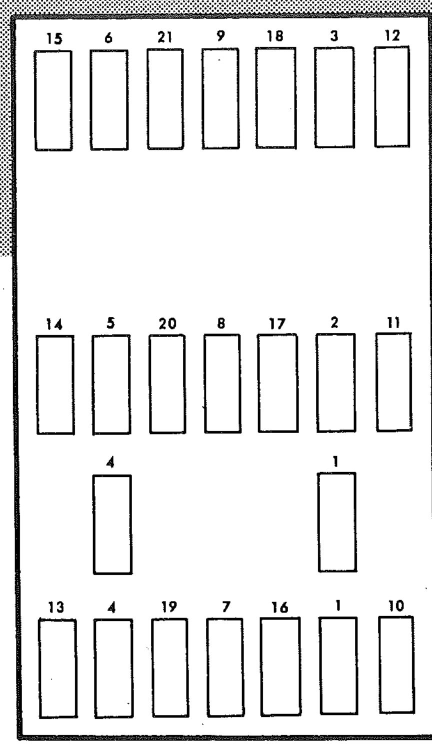
DRAG INDEX (CAPPED)	1.3
DRAG INDEX (UNCAPPED)	10.5
WEIGHT EMPTY	
WEIGHT FULL	427 lb.
LENGTH	94.5 in.
DIAMETER	15.75 in.
SUSPENSION LUG DISTANCE	14.0 in.
COMPONENTS OF A COMPLETE ROUND:	
CENTER SECTION	1
FORWARD HANGAR	1
AFT HANGAR	1
NOSE CAP	1
TAIL CONE	1
ROCKETS	19



EXTERNAL SUSPENSION EQUIPMENT			
EQUIPMENT	WEIGHT/ STATION	DRAG/ STATION	TOTAL WEIGHT
PYLON	61	4.3	244

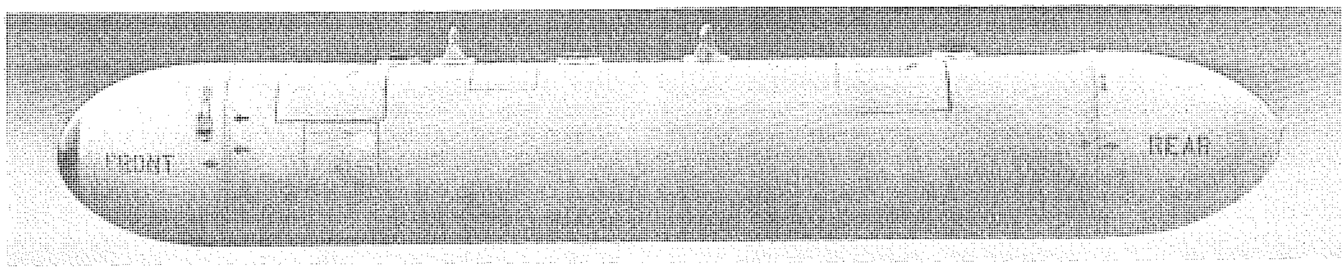
INTERNAL SUSPENSION EQUIPMENT		
EQUIPMENT	WEIGHT/ STATION	TOTAL WEIGHT
--	--	--

MAXIMUM LOAD CONFIGURATION			
DRAG INDEX	EXTERNAL WEIGHT	INTERNAL WEIGHT	TOTAL WEIGHT
22.4	1952	--	1952

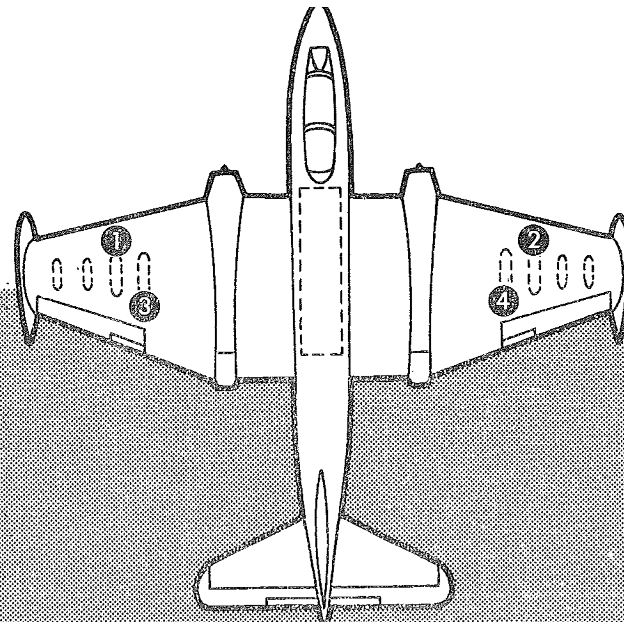


1-74441A

Figure 1-59



LAU-32 SERIES, LAU-59 ROCKET LAUNCHER 2.75 FFAR

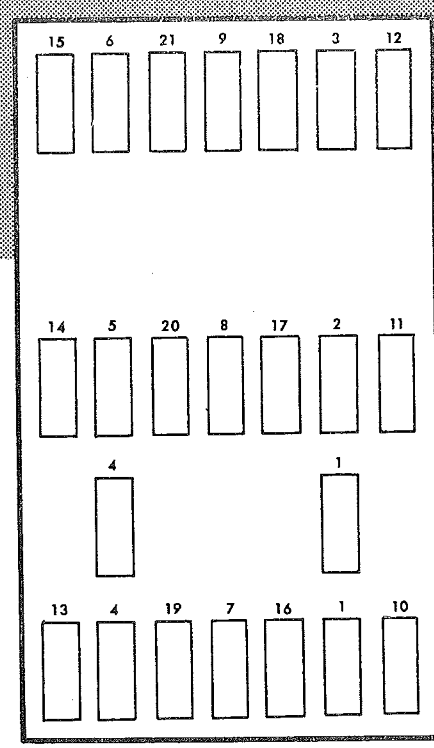


DRAG INDEX (CAPPED)	0.9
DRAG INDEX (UNCAPPED)	4.9
WEIGHT EMPTY	--
WEIGHT FULL	166 lb.
LENGTH	80.84 in.
DIAMETER	9.93 in.
SUSPENSION LUG DISTANCE	14.0 in.
COMPONENTS OF A COMPLETE ROUND:	
ROCKETS	7
CENTER SECTION	1
FORWARD HANGER	1
AFT HANGER	1
NOSE CAP	1
TAIL CONE	1

EXTERNAL SUSPENSION EQUIPMENT			
EQUIPMENT	WEIGHT/ STATION	DRAG/ STATION	TOTAL WEIGHT
PLYON	61	4.3	244

INTERNAL SUSPENSION EQUIPMENT		
EQUIPMENT	WEIGHT/ STATION	TOTAL WEIGHT
--	--	--

MAXIMUM LOAD CONFIGURATION			
DRAG INDEX	EXTERNAL WEIGHT	INTERNAL WEIGHT	TOTAL WEIGHT
20.8	1572	--	1572



1-74894

Figure 1-60

A safety feature commonly found in tail fuzes is an arming stem which is screwed into the firing pin plunger. The detonator in this type of fuze is located immediately beneath the firing pin. Arming the fuze withdraws the arming stem from the firing pin plunger, thus freeing the plunger. An anti-creep spring prevents premature movement of the plunger. (See figure 1-63.)

SAFE TAIL FUZE

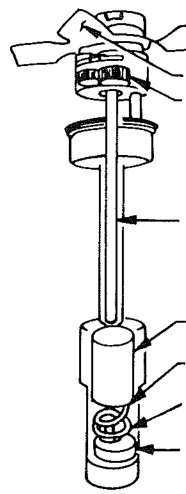


Figure 1-63

A safety feature (figure 1-64), safety-block commonly found in nose fuzes, consists of a ring of small steel blocks which are located between the striker and fuze body, thus preventing the firing pin from contacting the primer or detonator. The arming vane drives a gear train which, after a definite interval, permits the safety blocks to be ejected.

AN-M103A1, AN-M139A1, AN-M140A1, M163, M164, and M165 Nose Fuzes.

Nose fuzes of this type (figure 1-66) are vane operated and delay armed. Fuzes AN-M103A1, AN-M139A1, and AN-M140A1 are fast arming and should not be used on high-performance type aircraft presently in use. Action can be either instantaneous or delayed by presetting a setting pin. The air travel to arm distance is governed by the size of the bomb and the type of arming vane used. Structurally similar, these fuzes differ only in their firing delay elements. Fuzes M163, M164 and M165 are similar to nose fuzes AN-M103A1, AN-M139A1, and AN-M140A1, respectively, except in point of increased arming time. Further increase in arming time can be

BLOCK AND DETONATOR

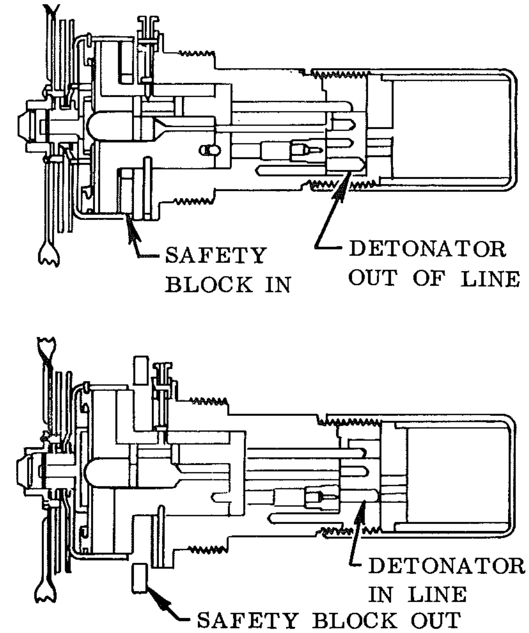


Figure 1-64

provided for fuze M163 by use of arming vane M3, which has its angle of vane surface twisted to 75°.

One of five arming vanes may be used on these fuzes. Differences in the degree of pitch of the vane are as follows; a standard vane, M1 (60° pitch); vane M2 (60° pitch at the ends and 90° pitch at the center); vane M3 (75° pitch); and a flat vane (30° pitch). The bomb in which the fuze is installed and the required arming distance will determine the vane to use. For general-purpose bombs, the stand vane M1 (60° pitch) is used for a short arming distance. At present, only vane M1 is shipped with these fuzes. Separate action is necessary to requisition other vanes. For flat-nosed depth bombs, where air travel to arm is necessarily shorter because of the low altitude release, the fuze is equipped with a flat arming vane (30° pitch). These fuzes also are used with certain fragmentation bombs in clusters.

The MK7 Mod 0 Arming Vane is issued separately for use with the AN-M103A1, AN-M139A1 and AN-M140A1 Nose Fuzes. This vane incorporates a constant speed governor which increases the arming time to 3.5 ± 0.5 seconds when fuze is set DELAY and 5.5 ± 1.0 seconds when fuze is set INSTANTANEOUS. The increase in arming time provides greater separation distance between the delivery aircraft and bomb at time of fuze arming. This vane is used in lieu of M1 vane on above fuzes when bombs are delivered by high performance jet aircraft or when greater arming time is required. The vane consists of two blades with a paddle secured by a coil spring on each blade. Variable pitch is controlled by centrifugal force and tension of the springs on the paddles. A figure seven (7) is stenciled on each paddle and MK7 Mod 0 and a Part No. is stenciled on one blade. A spring inside the vane hub is used to secure the vane to the fuze arming stem. Two index tabs align the vane hub with the fuze hub and key items together.

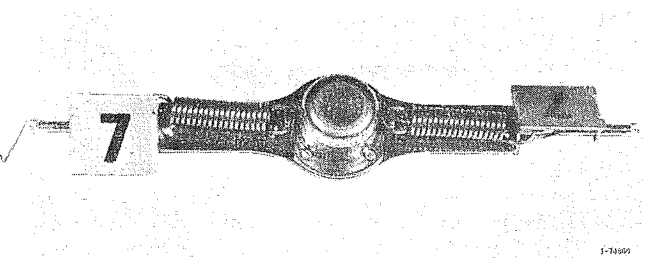


Figure 1-65

These fuzes differ in their firing delay elements. The AN-M103A1 and M163 have a 0.1-second delay; the AN-M139A1 and M164 have a 0.01-second delay; the AN-M140A1 and M165 have a 0.025-second delay. Black wedge markings on fuze heads of the AN-M139A1, AN-M140A1, M164 and M165 indicate fuze delay time. Approximately one-eighth of the heads of the AN-M139A1 and M164 and one-quarter of the fuzes AN-M140A1 and M165 are covered by black wedge markings.

These fuzes contain two explosive trains: one for delay action and another for instantaneous action. The delay action explosive train consists of a primer, a delay element, a relay, a detonator, a booster lead-in, and a booster. The primer and delay element assembly, containing the delay element and relay, are assembled in the fuze body and are sealed as a protection against moisture. The instantaneous explosive train consists of a detonator, a booster lead-in and a booster. The same detonator is used in both explosive trains. It is aligned with one of the explosive trains during arming operations; its final position depends upon the position of the setting pin.

A safety wire is threaded through holes in the vane hub, vane strap, and eyelet strap of fuzes being shipped or stored. The ends of this wire are secured through another set of holes in the eyelet strap and vane diametrically opposite the first set. The wire and cotter pin prevent operation of the arming mechanism. Instruction tags are attached to the seal wire, and to a wire attached to a pull ring through the eye of the cotter pin. As installed in a bomb, with arming wire in place, these fuzes are in the unarmed condition; delay and instantaneous explosive trains are broken by the detonators being out of alignment. The arming discs prevent premature firing of the explosive train by holding the striker away from the fuze body. These discs are not ejected until the fuze arms. Fuzes of this type are both detonator safe and shear safe.

Selection of either delay or instantaneous action is made by presetting the setting pin. The pin has two slots: a deep slot, for delay action; a shallow slot, for instantaneous action. Fuzes are shipped and stored with pins set for delay action. To set for instantaneous action lift the pin, rotate it one-quarter turn, and drop it into the shallow slot. The portion of the fuze body adjacent to the setting pin is stamped DEEP SLOT DELAY-SHALLOW SLOT INST. Fuzes used in fragmentation bombs should be set for INST only.

When the fuzed bomb is dropped, the arming wire is retained in the bomb rack. This frees the arming vane assembly, which rotates in the air stream to operate the delay arming mechanism. The air travel to arm these fuzes is approximately 510 to 5425 feet, depending on the fuze and pitch of vane used. Continued rotation of the arming vane assembly, after arming is completed, unscrews the arming mechanism from the fuze. Arming distance varies with the vane type and bomb used and with delivery altitude of the aircraft. Upon impact, the fuze will detonate instantaneously, or after its rated delay, exploding the bomb.

WARNING

No attempt should be made to disassemble this fuze. Armed or partially armed fuzes should be disposed of by authorized and qualified munitions personnel.

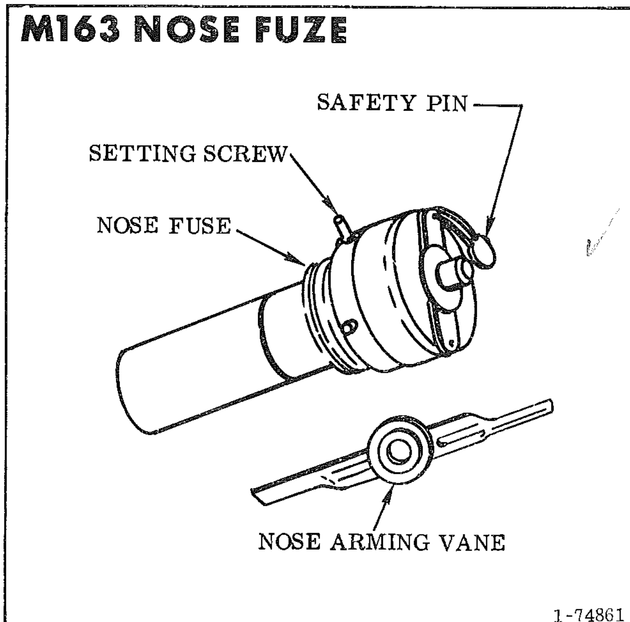


Figure 1-66

M904 Nose Fuze.

The M904 (figure 1-67) is a mechanical impact nose fuze commonly used with general purpose bombs. It is, approximately, 9-1/3 inches long and two inches in diameter at the fuze threads. The desired arming time is set on a calibrated dial with selective delay times of 4, 6, 8, 12, 16 and 20 seconds. It employs an arming vane to effect arming. The arming time is independent of release airspeed and is accomplished by the nose vane, a mechanical governor and a constant-speed rotating gear train. Impact functioning (detonation) delay times are provided by inserting a delay element (M9) in the cavity beyond the firing pin. The delay elements are available in the following delay increments: instantaneous, 0.001, 0.025, 0.05, 0.10 and 0.25 seconds. Safety features include a rotor containing the detonator, which is locked out of line with the rest of the explosive train until air arming is completed, and two warning windows. One window is located in the fuze body and one is just above the booster. If the fuze should accidentally become armed, the arming window in the body will show a red flag. The other window, above the booster, is not visible to the pilot. Fuze arming begins when the bomb is released from the aircraft. The arming wire is withdrawn from the vane and the vane spins in the airstream (operating range is 150 to 600 knots). Thirty (30) revolutions equals one second of selected arming time. After the selected arming time has expired, the spring-loaded rotor is permitted to rotate and align the detonator with the rest of the explosive train. The rotor is locked in position and the fuze is fully armed. When the bomb impacts, the fuze nose assembly moves rearward, causing the firing pin to strike the detonator, which in turn initiates the explosive train.

WARNING

If the window in the fuze body shows red, the fuze is unsafe and should not be touched. Call explosive ordnance disposal (EOD) personnel immediately.

WARNING

The M904 fuze has a manufacturing arming time tolerance of ±20%. The negative tolerance of the fuze must be used when determining the minimum arming separation between weapon and aircraft. The positive tolerance must be used to determine the minimum release altitude to ensure arming before impact.

M905 Tail Fuze.

The M905 (figures 1-68, 1-69) is a mechanical impact tail fuze commonly used with general purpose bombs. It is, approximately, 6-1/8 inches long and two inches in diameter at the fuze threads. Arming is effected by the M44 arming drive assembly through a flexible shaft, M40, instead of by an arming vane. Arming time is independent of release airspeed and is accomplished by the arming drive assembly, flexible shaft, mechanical governor and constant-speed rotating gear train. The desired arming time is set on a calibrated dial with selective delay times of 4, 6, 8, 12, 16 and 20 seconds. Impact functioning (detonation) delay times are provided by inserting a delay element (M9) in the cavity just beyond the firing pin. The delay

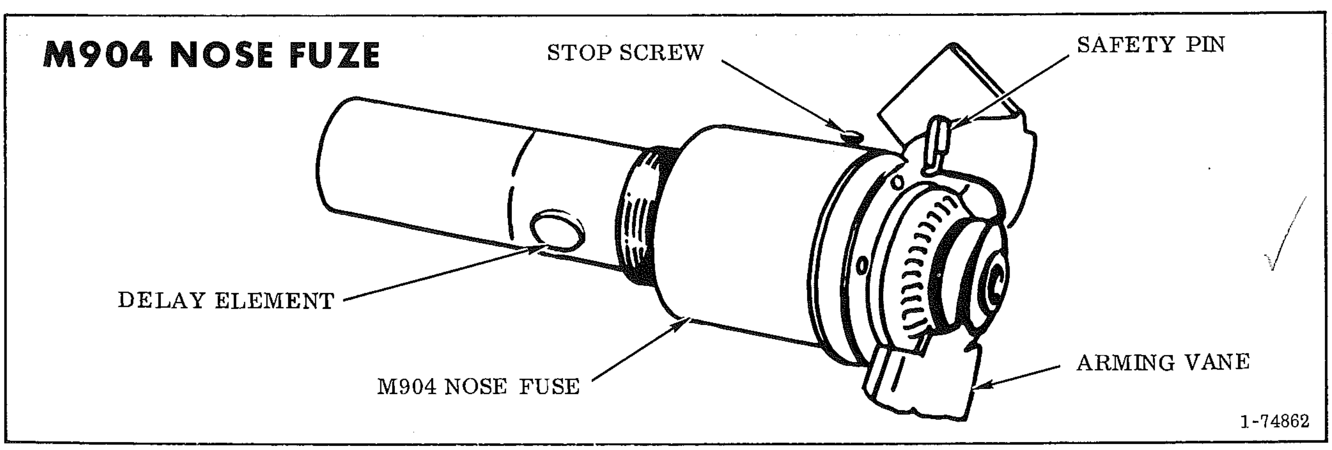


Figure 1-67

M905 TAIL FUSE

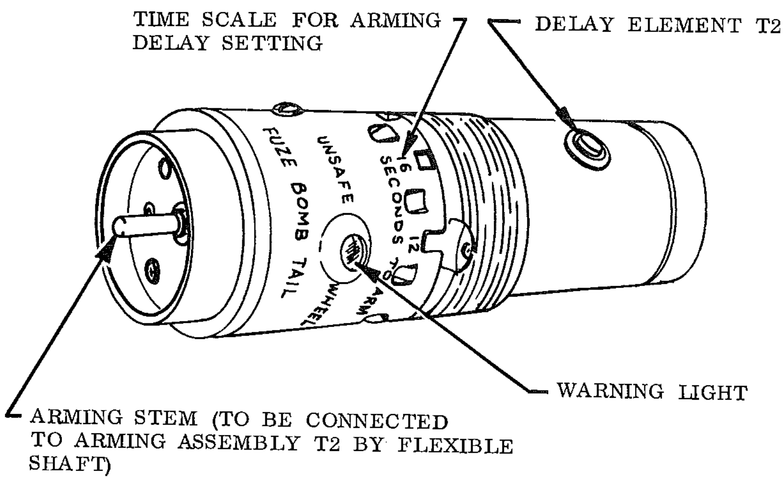


Figure 1-68

M905 TAIL FUSE ARMING

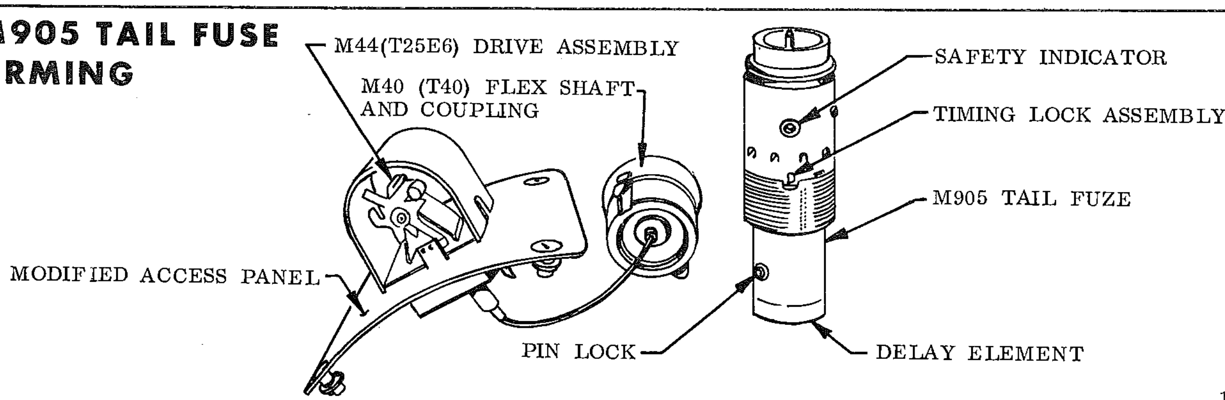


Figure 1-69

M906 TAIL FUSE

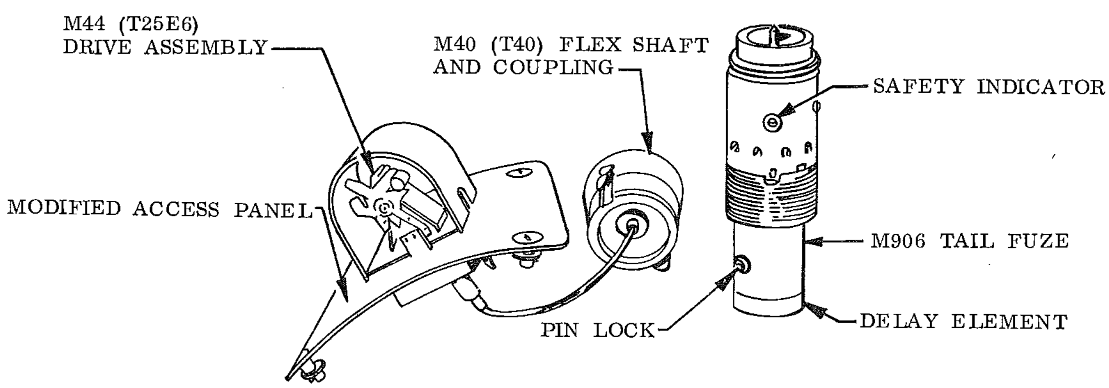


Figure 1-70

elements are available in the following delay increments: instantaneous, 0. 01, 0. 025, 0. 05, 0. 10, and 0. 25 second. Safety features include a rotor containing the detonator, which is locked out of line with the rest of the explosive train until air arming is complete, and two warning windows. One window is located in the fuze body and one is just above the booster. If the fuze should accidentally become armed, the warning window in the body will show a red flag. The other window, above the booster, is not visible to the pilot. Fuze arming starts when the bomb is released from the aircraft and the arming wire is withdrawn from the vane tab of the arming drive assembly. This permits the vane tab to rotate the inner parts of the fuze (operating range of the fuze is 150 - 600 knots). After the selected arming time has expired, the firing pin is free to move in the direction of flight upon sufficient deceleration of the fuze. An anti-creep spring prevents premature movement of the firing pin due to velocity changes of the bomb during free fall. At, approximately, the same time that the firing pin arms, the rotor containing the detonator is released so that it may rotate by spring action, bringing the detonator in line with the rest of the explosive train. A detent locks the rotor in the armed position, and the fuze is then armed. When the bomb impacts on target, the inertia generated by the bomb causes the firing pin assembly to move forward and strike the primer in the delay element, thus initiating the explosive train.

WARNING

If the window in the fuze body shows red, the fuze is unsafe and should not be touched. Call explosive ordnance disposal personnel (EOD) immediately. This fuze must not be used for skip-bombing operations.

CAUTION

The M905 fuze has a manufacturing arming time tolerance of ±20%. The negative tolerance of the fuze must be used when determining the minimum arming separation between weapon and aircraft. The positive tolerance must be used to determine the minimum release altitude to ensure arming before impact.

M906 Tail Fuze.

The M906 fuze (figure 1-70) was designed for use in tactical low-level bombing, requiring intermediate impact firing delay time to assure that the releasing aircraft could execute a safe exit from the vicinity of the lethal bomb prior to its initiation. This fuze may be used with most general purpose bombs. It is, approximately, 6. 6 inches long and two inches in diameter at the fuze threads. Arming is effected by the M44 drive assembly through a flexible shaft, M40, instead of by an arming vane. The arming time is independent of release airspeed and is accomplished by the arming drive assembly, flexible shaft, mechanical governor, and constant-speed rotating gear train. Complete arming of the fuze takes place in, approximately, two seconds. Impact functioning (detonation) delay times are provided by inserting a T5 or T6 delay element in the cavity just beyond the firing pin. The T5 has a firing delay of 4. 5 ± 0. 5 second and the T6 has a firing delay of 12. 5 ± 1. 5 seconds. The selection of the delay depends upon fuzing requirements for the particular bomb and target. Safety features include a rotor containing the detonator, which is locked out of line with the rest of the explosive train until air arming is complete, and two warning windows. One window is located in the fuze body and one just above the booster. If the fuze should accidentally become armed, the warning window in the body will show a red flag. The other window, above the booster, is not visible to the pilot. Fuze arming is initiated when the arming wire is pulled from the vane tab of the M44 arming drive assembly by release of the bomb. This permits the vane tab to rotate the inner parts of the fuze (operating range of 150 - 600 knots). After, approximately, two seconds, a plunger assembly is free to move longitudinally upon sufficient deceleration of the fuze. An anti-creep spring prevents the plunger from moving in response to velocity changes during free fall of the bomb. During release of the plunger assembly, the rotor is allowed to move by spring action and thus bring the detonator in line with the rest of the explosive train. A detent locks the rotor in the armed position and the fuze is thus armed. Release of the plunger and movement of the rotor to the armed position take, approximately, two seconds. When the bomb impacts the target, the plunger assembly moves forward and releases a spring-loaded firing pin. The firing pin, thus freed, is propelled into the primer, initiating the explosive train.

WARNING

If the window in the fuze body shows red, the fuze is unsafe and should not be touched. Call explosive ordnance disposal (EOD) personnel immediately.

CAUTION

When employing a weapon with this fuze, select a nominal release altitude that will ensure fuze arming prior to impact.

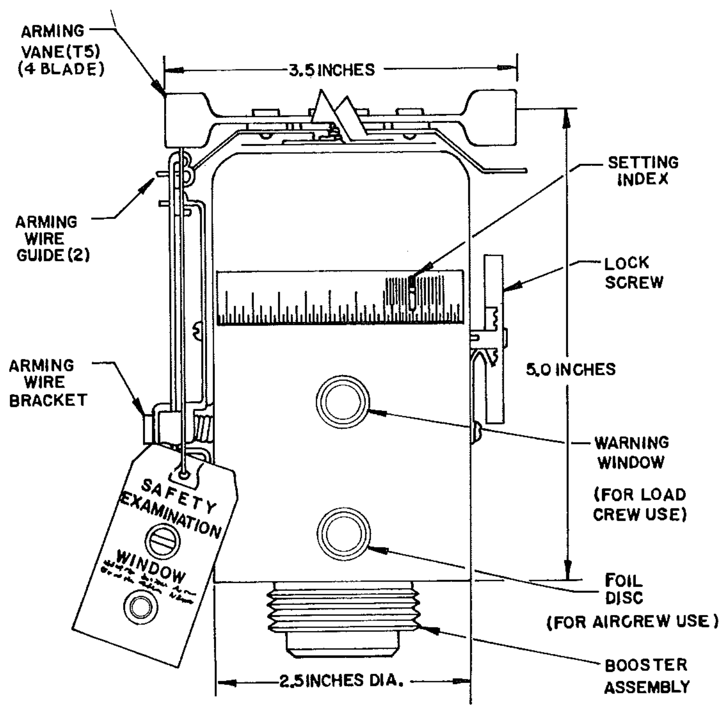
NOTE

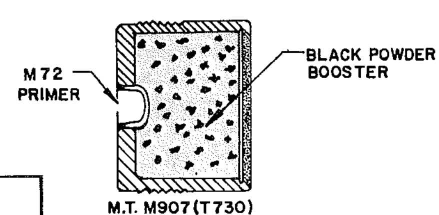
There are no selectable arming provisions for this fuze.

M907 Mechanical Time Fuze

The M907 (figure 1-71) is a mechanical time nose or tail fuze commonly used for airburst functioning of bomb clusters and leaflet bombs. The desired function time is set on a calibrated dial on the fuze body. The dial may be set at 1/2-second intervals between 4 and 92 seconds. There is an airburst functioning accuracy of plus or minus one second. The fuze employs a four-bladed arming vane to effect arming. The arming time is independent of release airspeed and is accomplished by the arming vane, a mechanical governor, and a constant speed rotating gear train. Arming time is automatically determined as one-half the preset time in the calibrated dial when the function time is greater than 10 seconds. For function times of 4 to 10 seconds, arming will occur before functioning but not less than one-half the set time. Delivery airspeeds encompasss the range of A26A capability. Safety features include a slider detonator block containing the detonator, which is locked out of line with the rest of the explosive train until arming is completed, and two arming (warning) indicators. One arming indicator is an aluminum foil disc located in the lower part of the fuze body. If the pin is extended through the window, the fuze is armed.

M907 MECHANICAL TIME FUZE





M907 BOOSTER ASSEMBLIES

Figure 1-71

WARNING

An armed fuze can be determined by checking the aluminum arming indicator. If the slider has punctured the aluminum foil disc, the fuze is armed. Do not touch the fuze. Call explosive ordnance disposal (EOD) personnel immediately.

Arming of the fuze starts when the bomb is released from the aircraft and the arming wire is withdrawn from the fuze. This permits an arming pin to be ejected and a movement assembly to begin operation. Rotational energy for air arming is provided by the arming vane which drives a constant-speed centrifugal governor. At the end of the arming cycle, a spring-loaded slider is allowed to move and bring the primer into line with the firing pin and booster. A spring-loaded detent retains the slider in the ARM position. The fuze is now armed.

Operation of the fuze starts upon release of the weapon as the arming pin is ejected. This action removes a projection from the slot in the disc assembly allowing the clockwork movement to start. Starting is assured by a spring-loaded starter which sweeps across the escape wheel, imparting motion to it. A timing disc lever rides the periphery of the disc assembly until the slot in the disc from which the arming pin was ejected indexes with the lever. The spring-loaded lever drops into the slot, releasing the system of levers which in turn releases a spring-loaded firing pin spring retainer. This retainer then drives the firing pin into the primer, firing the fuze. If impact occurs before the set time has expired, the firing pin is driven in, shearing the trigger mechanism and firing the primer.

M175 Tail Fuze.

The M175 is a mechanical impact tail fuze. It is, approximately, 25 inches long and 1.5 inches in diameter at the fuze threads. It employs a four-bladed vane to effect arming. Arming is accomplished by the arming vane, a bearing cup assembly, gear system and arming stem. The arming time is dependent upon release airspeed and type vane used. The M4 vane is a four-bladed vane with blades at 45° to the plane of rotation. It requires 1,420 feet of air travel to arm and is identified as "fast-arming." For a release airspeed of 400 knots TAS, arming time is, approximately, 2.11 seconds. The M5 vane is a four-bladed vane with blades at 75° to the plane of rotation. It requires 3,200 feet of air travel to arm and is identified as "slow-arming." For a release airspeed of 400 knots TAS, arming time would be, approximately, 4.8 seconds. Safety features include the arming-stem-safe principle. Impact functioning (detonation) delay times are provided by use of an M14 primer-detonator assembly (figure 1-72). This assembly is a separate interchangeable component, and constitutes the explosive train. There are 5 different M14 primer-detonators, each having a different delay train and color coding to indicate the delay time. Fuze arming starts when the bomb is released from the aircraft and the arming wire is withdrawn. The vane is free to rotate in the airstream, thus turning the bearing cup assembly. Through a gear system, the arming stem is rotated and withdrawn, freeing the plunger assembly and firing pin. The fuze is then armed. An anti-creep spring prevents premature movement of the plunger assembly during weapon free-fall. Upon bomb impact, the plunger assembly is driven forward by inertia, causing the firing pin to strike the primer, initiating the explosive train.

WARNING

The M4 arming vane is "fast-arming" and is unpainted. The M5 arming vane is "slow-arming" and can be identified by the M5 stamping and the vane tips which are painted red. Make sure that the M5 arming vane is installed.

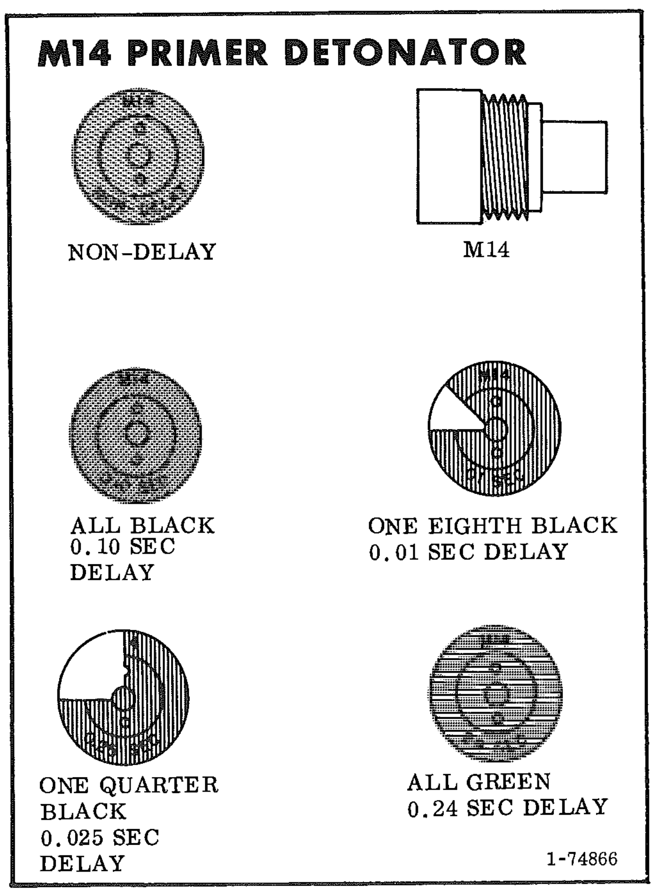


Figure 1-72

NOTE

The only exterior evidence of fuze arming is the length of stop rod exposed. When the fuze is armed, the length of stop rod exposed is shortened by, approximately, 0.6 inch.

M123A1 Tail Fuze.

The M123A1 fuze (figure 1-73) is a vane operated tail fuze which must be regarded as armed at all times. It acts to detonate the bomb after a delay of 1 hour to 6 days from the time of release or immediately upon any attempt to unscrew the fuze from the bomb. The M123A1 is designed to provide a specific delay for an individual fuze; the amount of delay, 1, 2, 6, 12, 24, 36, 72, or 144 hours, is specified in the nomenclature and is stamped on the fuze body. However, it should be noted that, for obvious reasons, the nomenclature is not visible when the fuze is assembled to the bomb. This type fuze is particularly responsive to heat and cold; high temperatures accelerate its action, low temperatures retard it. The amount of delay desired is obtained by choosing a fuze of that particular delay and taking into consideration the effect of temperature upon the delay action. After withdrawal of the arming wire, a short air travel will initiate the delay action. As little as a 1/4 turn in unscrewing the fuze from the bomb causes the fuze body to separate from the fuze extension; this separation causes operation of the anti-removal device and detonation of the bomb. The M123A1 fuze is approximately 9.3 inches long. It is authorized for use in GP bombs of 100 to 300 pounds. Bombs fuzed with long delay impact tail fuzes normally do not have have companion nose fuzes.

This fuze consists of an eight-blade arming vane which acts directly (not through gear train) to rotate the arming stem and arm the fuze.

M124A1 Tail Fuze.

Except for difference in length of stem and corresponding differences in length, weight, and bombs authorized, this fuze is identical to the M123A1 and with the exceptions noted, all statements concerning the M123A1 apply equally to the M124A1. The M124A1 is approximately 12.3 inches long and is authorized for use in GP bombs of the 500-pound class.

M125A1 Tail Fuze.

Except for differences in length of stem and corresponding differences in length, weight, and bombs authorized, this fuze is identical to the M123A1 described above, and with the exceptions just noted, all statements concerning the M123A1 apply equally to the M125A1. The M125A1 is approximately 16.3 inches long and is authorized for use in GP bombs of 100 pounds and over.

M123A1 TAIL FUZE

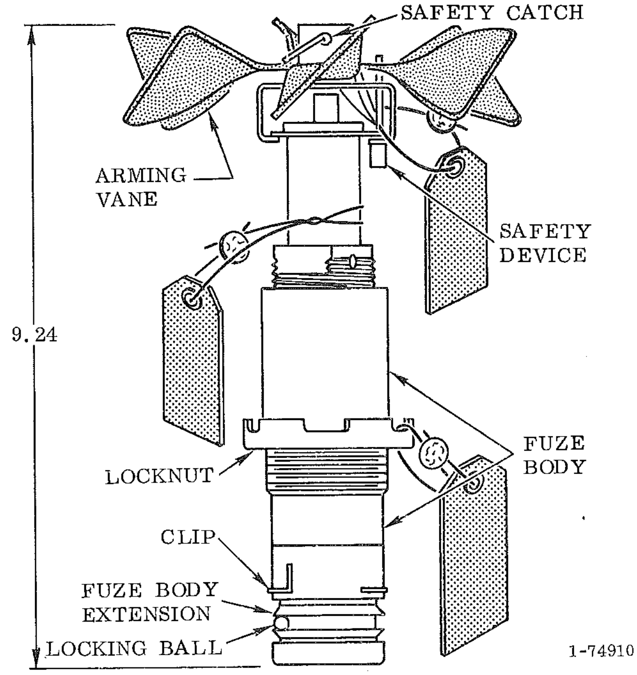


Figure 1-73

M190 Tail Fuze.

The M190 (figure 1-74) is a mechanical impact tail fuze used with the M117 GP bomb. It is, approximately, 20.5 inches long and 1.5 inches in diameter at the fuze threads. The fuze consists of a body, an arming assembly with a flexible shaft, and a vane assembly. The flexible shaft adapts the arming mechanism for mounting on the fin cone of the bomb. Arming is accomplished by the arming vane (anemometer type) arming assembly (including reduction gears) and an arming stem. The arming time is dependent upon release airspeed. It requires 4, 120 feet of air travel (657 revolutions of the arming vane) and is identified as a "slow-arming fuze." For a release airspeed of 400 knots TAS, arming time would be, approximately, 6.25 seconds. Safety features include the arming-stem-safe principle. Impact functioning (detonation) delay times are provided by use of an M14 primer-detonator assembly (figure 1 72. This assembly is a separate interchangeable component, and constitutes the explosive train. There are 5 different M14 primer-detonators, each having a different delay train and color coding to indicate the delay time. Arming of the fuze starts when the bomb is released from the aircraft and the arming wire is withdrawn. The vane is free to rotate in the airstream, thus turning the arming assembly (gear system) and flexible shaft. The arming stem is rotated and withdrawn, freeing the plunger assembly in the fuze body. The fuze is then armed. Upon bomb impact, the plunger

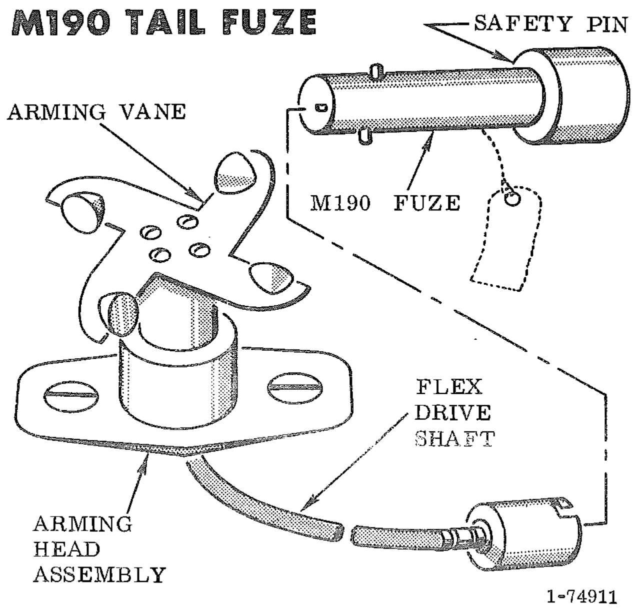


Figure 1-74

assembly (containing a firing pin) is driven forward by inertia, causing the firing pin to strike the primer, initiating the explosive train.

NOTE

The M14 primer-detonator is installed in the base of the fuze; therefore, the pilot cannot check this item on weapon preflight.

M147A1 Nose Fuze.

The M147A1 (figure 1-75) is a mechanical time nose fuze used to open clustered bombs and the M129E1 Leaflet Bomb. It is, approximately, 5. 74 inches long and 1. 5 inches in diameter at the fuze threads. The desired functioning (detonation) time for an airburst is set on a calibrated dial located on the fuze body. The dial may be set at 1/2 second intervals between 5 and 92 seconds. Safety features include an arming pin, an out-of-line detonator and the safety-block-safe principle. The fuze requires both mechanical arming and time arming to function. Mechanical arming is accomplished by a two-bladed arming vane assembly, and a gear train. The time of mechanical arming is dependent upon release airspeed, size of bomb, release dive angle, and occurs after 260 revolutions of the arming vane. Time arming occurs 4. 5 $\pm$ 1. 5 seconds after release through a timing disc and arming assembly. Fuze arming, both mechanical and time, begins when the bomb is released from the aircraft. As the arming wire is withdrawn from the arming vane, the vane is free to rotate and turn the arming hub assembly and gear train. This operation releases the safety block after 260 revolutions of the arming vane and the fuze is mechanically armed. Time arming also commences at release by the withdrawal of the arming wire which permits the arming pin to be spring ejected. After 4. 5 + 1. 5 seconds, the out-of-line detonator slider is released. The slider is moved into position by spring action and locked in place by a spring detent. This completes the time arming, and the fuze is fully armed. The functioning of the fuze occurs after the preset time on the calibrated dial has elapsed. A timing disc, using the principle of a common alarm clock (figure 1-76), begins turning at a uniform rate when the arming pin is ejected. After the preset time has elapsed, a spring-loaded firing pin is released and initiates the explosive train. If impact occurs before the set time has expired, the firing pin is driven in, shearing the trigger mechanism, and firing the detonator.

WARNING

Evidence of an armed fuze is indicated by the absence of the safety block, by complete or partial ejection of arming pin, and by failure of trigger mechanism to position the striker clear of the safety block. If any of these conditions are noted, call explosive ordnance disposal (EOD) personnel immediately.

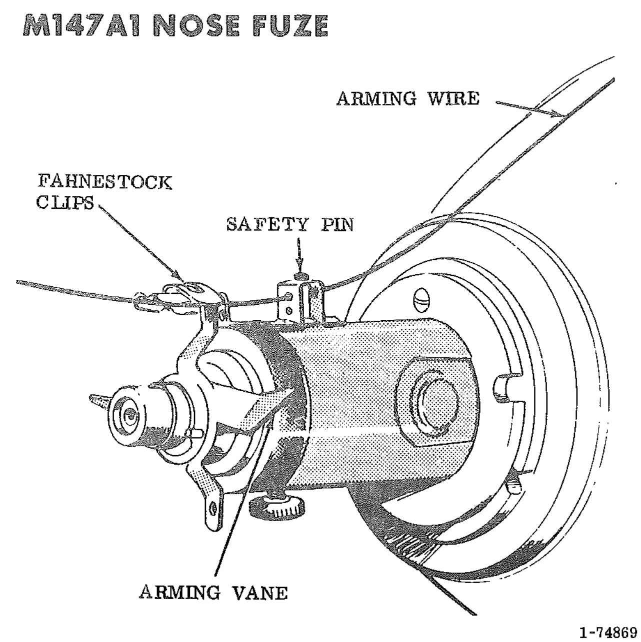


Figure 1-75

PRINCIPLES OF OPERATION-TIME FUZE

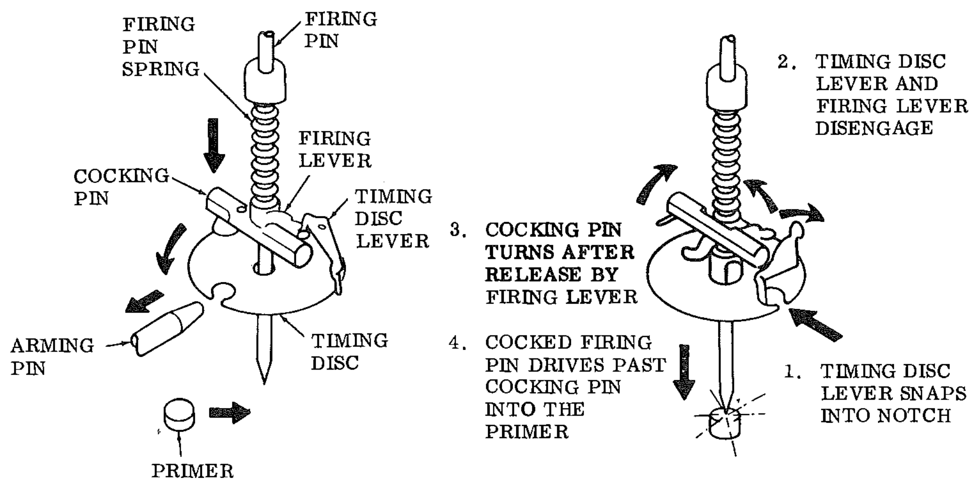


Figure 1-76.

M188 (VT) Nose Fuze.

The M188 (figure 1-77) is a variable time proximity nose fuze commonly used with general purpose and fragmentation bombs. The fuze causes the weapon to airburst on approach to a target. No fuze setting is required except for extended arming distances when an arming delay is employed. Use of a VT bomb fuze is advantageous in any air-ground application where airbursting the weapon at heights of 10 to 250 feet above ground will increase the operational effectiveness. The M188 is, in effect, an automatic time fuze containing a radio transmitting-and-receiving unit, which detonates the weapon on approach to the target at the most effective point in its trajectory. In flight, the fuze broadcasts a radio signal, and when the signal is reflected from an object to the armed fuze, it interacts with the transmitted wave to produce ripples or beats. When the beat reaches a pre-determined intensity, it trips an electronic switch which permits an electric charge to flow through an electric detonator. A VT fuze is similar to a timed fuze in the production of airbursts but the timed fuze is governed by the distance from origin, while the VT fuze is governed by its proximity to the target. Safety features include an electrical detonator which is out of line and electrically disconnected when the fuze is in the unarmed condition; a safety pin (the presence of which verifies the safe position of the detonator), and a vane lockpin which prevents the arming vane from turning until the arming wire is removed. Unless this vane is turned, the fuze cannot arm mechanically and unless the vane is rotated at a high speed, the energy needed to fire the detonator is not available. Arming of the fuze commences upon release of the bomb as the arming wire is withdrawn and the vane locking arm is expelled from the fuze. The vane begins rotating in the airstream and, by means of a coupling and rotor shaft, its rotation is transmitted to a reduction gear which rotates a slow-speed gear shaft. Through a coupling, an electric detonator is moved from the SAFE to the ARM position. After proper alignment, the rotor is disengaged and locked in the ARM position. Electrical arming is accomplished by the rotating vane which drives a generator and supplies electrical energy. The generator must be subjected to an airstream created by a speed of, approximately, 87 knots. By, basically, the same means that the mechanical arming causes the detonator to come into alignment, detonator terminal screws are brought into alignment with contacts contained in the rotor housing. The fuze functions on approach to the target by closure of an electronic switch (thyratron) and subsequent firing of the detonator. Under all conditions, the bomb must travel a safe distance equivalent to a number of revolutions of the arming vane. This distance is measurable on the trajectory of the bomb and is called safe air travel (SAT). The SAT for the M188 is 3,600 feet. For a 400 KTAS release, the minimum SAT is equivalent to, approximately, 5.3 seconds.

FMU-7 Series Nose and Tail Fuze.

The FMU-7 series (figure 1-78) is an electrically armed bomb igniter fuze. It functions through mechanical impact on any angle of impact and can be used as either a nose or a tail fuze. In the Fire Bombs, the FMU-7 fuze is enclosed in an AN-M23A1 igniter, and forms part of the fuzing network consisting of an arming lanyard and initiator and electric cabling. The fuze is 2 inches in diameter at the fuze threads and 4-3/16 inches long. Arming is accomplished by the initiator through a spring-loaded firing pin and thermal battery assembly. The fuze functions instantaneously upon impact, and has no provisions for delayed functioning. Safety features are of the arming-stem-safe principle and the fuze includes a red-tipped indicator pin per-

M188 NOSE FUZE

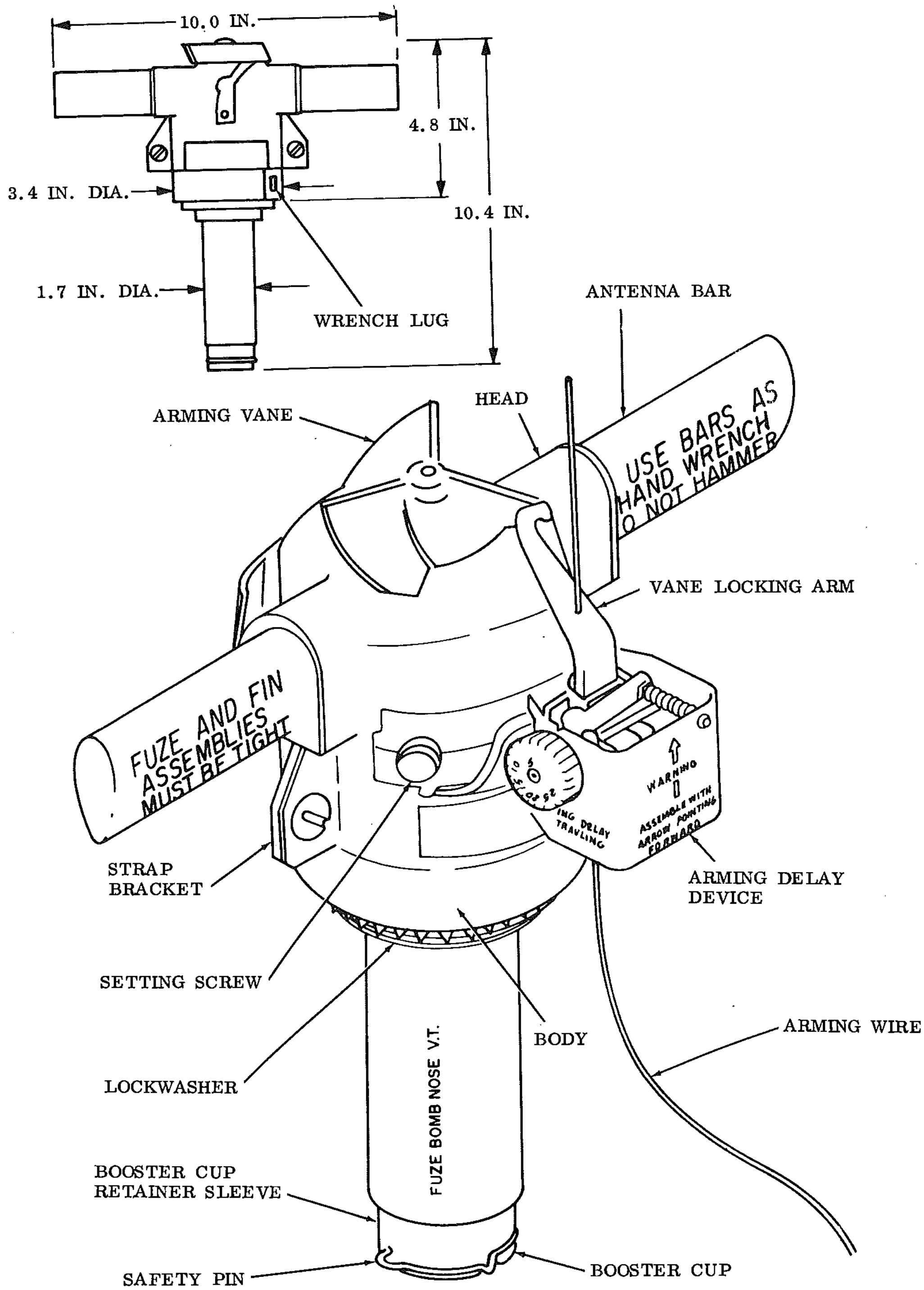


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Figure 1-77

FMU-7/B NOSE FUZE

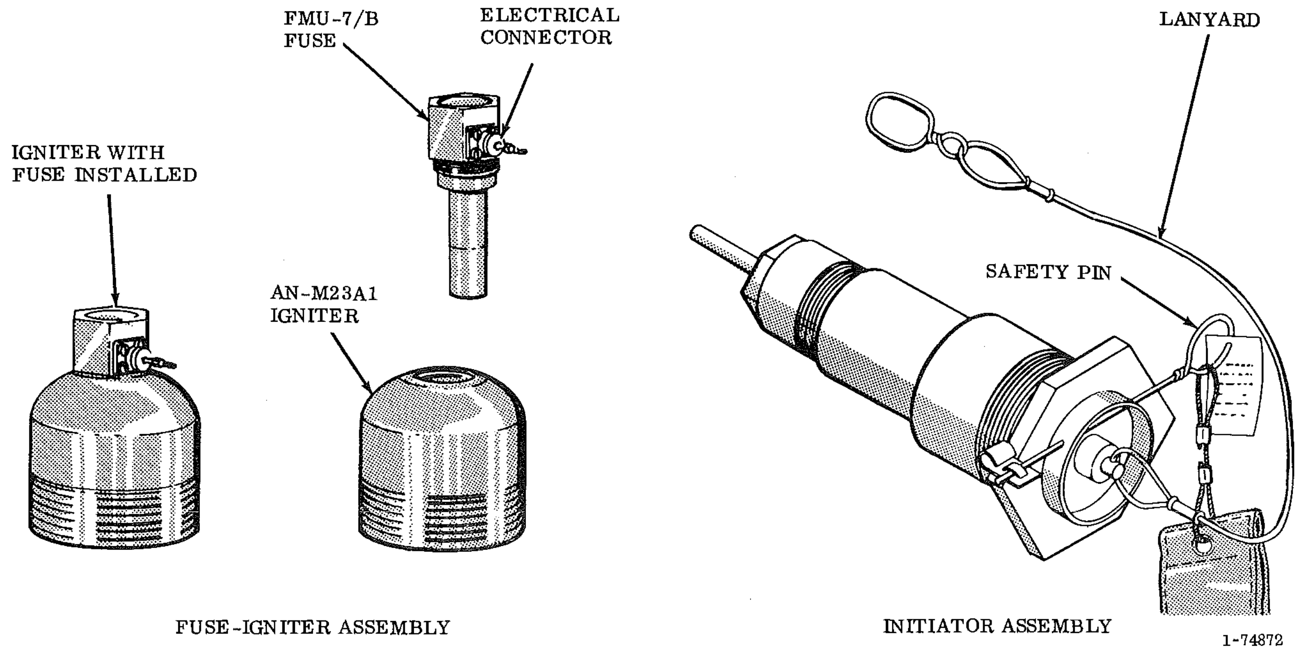

Figure 1-78

mitting visual inspection. The initiator assembly is located on the top of the Fire Bomb between the suspension lugs. It consists of an arming lanyard, spring-loaded firing pin and 1.5 volt thermal battery. Electric cabling connects the initiator to the fuzes through internal channels in the Fire Bombs. Arming is initiated as the weapon is ejected from the aircraft pylon. The arming lanyard (retained by the pylon arming solenoid) pulls the initiator cap from the initiator. As a result, a spring-loaded firing pin is released, forcing it against the primer, and activating the thermal battery. After a 0.6 second delay (modified initiator), the battery produces a 1.5 volt pulse. This pulse is passed through the electrical cabling in the fire bomb to an arming device in the fuze. The arming device withdraws the arming pin and permits the firing pin to be freed. The fuze is now armed. When armed, red-tipped indicator pins attached to the piston protrude, approximately, 5/16 inch through the fuze head to give a visual indication of the fuze condition. Once armed, the fuze cannot be reset. Upon impact (at any angle), the firing pin and firing pin holder are forced together, firing the primer. Functioning of the fuze causes ignition of the AN-M23A1 phosphorus igniter which, in turn, ignites the napalm mixture.

WARNING

If a red-tipped pin protrudes through hole in center of head of fuze, treat fuze as armed. Do not touch fuze and notify explosive ordnance disposal (EOD) personnel immediately.

M23 (AN-M23A1) Igniter.

The M23 (AN-M23A1) igniter (figure 1-78) is approximately 3-7/8 inches in diameter and 3-7/8 inches long. It is cylindrical in shape and rounded at one end. In the rounded end is a fuze well, designed to receive the FMU-7 series bomb fuze. The body of the igniter is filled with 1-1/4 pounds of white phosphorus (WP). When the FMU-7 series fuze impacts a target, the fuze functions and the booster in the fuze detonates, bursting the igniter and scattering the white phosphorus filling. The phosphorus ignites spontaneously upon exposure to the air and ignites the scattered filling of the bomb.

WARNING

The white phosphorus in the igniter liquefies at 111° Fahrenheit, and may leak through the filler plug if exposed to high temperatures. Leaking igniters can be determined by the presence of smoke and/or flame or by the presence of white material on the igniter. If any of these conditions are observed, notify explosive ordnance disposal (EOD) personnel immediately.

TABLE 1-2

BOMB/FUZE COMPATIBILITY

FUZE	TYPE NOSE	TYPE TAIL	FUNCTIONAL DELAY	BOMBS	ARMING (AIR TRAVEL) DELAY
M103A1 M139A1 M140A1	X X X		Selective instantaneous or 0.1 second delay Selective instantaneous or 0.01 second delay Selective instantaneous or 0.025 second delay	M30 M57 M81 M88 MK82 MK81 M117	Use MK7 Mod 0 arming vane Delay 3.5 ± 0.5 seconds Instantaneous 5.5 ± 1.0 seconds
M100A2 (Use with box finned bombs)		X	Selective with primer detonator M14, non-delay, 0.01 sec, 0.025 sec, 0.10 sec, 0.25 second delay	M57 M81 M88 M30	With M5 vane: 1335 feet
M123A1 (A2) M124A1 (A2) M125A1 (A2)		X X X	1, 2, 6, 12, 24, 36, 72 or 144 hours (anti-withdrawal device)	M117	Less than 100 feet
FMU-7 Series (2 ea)	X (1 each)	X (1 each)	Electrical impact-instantaneous	BLU-1 Ser BLU-27/B BLU-10 Ser BLU-23/B BLU-32/B	50 feet
M163	X		Selective instantaneous or 0.1 second delay	M30	With M1 vane: Delay - 1140, Inst - 1710 With M3 vane: Delay - 2690, Inst - 4035
M164	X		Selective instantaneous or 0.01 second delay	M57 M81 M88	With M1 vane: Delay - 1410, Inst - 2115 With M3 vane: Delay - 3330, Inst - 4995
M165	X		Selective instantaneous or 0.025 second delay	M117 MK82 MK81	With M1 vane: Delay - 1500, Inst - 2250 With M3 vane: Delay - 3525, Inst - 5275 MK7 Mod 0 vane may be used with M163, M164, M165 fuzes
M188 (VT)	X		Auto time, aerial burst 30 feet over normal soil	M30 M57 M81 M88 M117 MK82 MK81	3600[1] feet
M112A1		X	8-15 or 4-5 seconds after impact	M30 M57	90 feet
FMU-72/B	X	X	Selective, 20 minutes to 5 hours, 5 hours to 16 hours, 16 hours to 30 hours, 30 hours to 36 hours.	MK81 MK82 M117	6 seconds

TABLE 1-2 (Cont)

FUZE	TYPE		FUNCTIONAL DELAY	BOMBS	ARMING (AIR TRAVEL) DELAY
	NOSE	TAIL			
M175 (For use with conical finned bombs)		X	Selective with primer detonator M14, non-delay, 0.01 sec, 0.025 sec, 0.10 sec, 0.25 sec delay	M30 M57 M88 M81	With M4 vane: 1150 feet With M5 vane: 3200 feet With M4 vane: 1250 feet With M5 vane: 3480 feet
M904 E1 M904 E2	X X		Selective with delay elements M9, instantaneous, 0.01 sec, 0.025 sec, 0.05 sec, 0.10 sec, 0.25 second delay	M30 M57 M117 MK82 MK82(Snakeye I) MK81 M81 M88	904 E1: Selective delay times of 4, 6, 8, 12, 16 and 20 seconds 904 E2: Selective delay times of 2, 4, 6, 8, 10, 12, 14, 16 and 18 seconds MK81, MK82, MK82 (Snakeye I) and M117 RET compatible with M904 E2
M905		X	Selective with delay elements M9, instantaneous, 0.01 sec, 0.025 sec, 0.05 sec, 0.10 sec, 0.25 second delay	M117 MK82 MK81	Selective delay times of 4, 6, 8, 12, 16 and 20 seconds
M906		X	Selective with delay elements T5 element 4.5 second delay T6 element 12.5 second delay	M117 MK82 MK81	Two (2) seconds. The T6 delay element assures safe exit for delivery aircraft
M907	X		Airburst	SUU-30A/B	4-92 seconds
M190		X	Selective with primer M14, 0.01, 0.025, 0.10, 0.24 second delay	M117	4100 feet
M914 (VT)	X		75 milliseconds	M30 M57 M117 MK82 M81 M88 MK81	2300^2 feet
FMU-26/B	X	X	Impact short delay, selective, non-delay 0.01, 0.02, 0.05, 0.10, 0.25 seconds. Impact medium delay: selective 6.0, 10.0, 12.0, 16.0, 20.0 seconds	MK82 M117 MK82 (Snakeye I) M117 RET MK81	2-20 seconds in 2 second increments, 1 second after release
FMU-26A/B	X	X	Airburst Impact short delay, selective, nondelay 0.01, 0.02, 0.05 0.10, 0.25 seconds. Impact medium delay: selective 6.0, 10.0, 12.0, 16.0, 20.0 seconds.	MK82 M117 MK82 (Snakeye I) M117 RET MK81 SUU-30B/B	19 to 1.9 seconds

TABLE 1-2 (Cont)

FUZE	TYPE NOSE	TYPE TAIL	FUNCTIONAL DELAY	BOMBS	ARMING (AIR TRAVEL) DELAY
FMU-54/B		X	Instantaneous only	MK82 (Snakeye I) M117 RET	Selective delay times of 0.75 to 3.5 seconds in 0.25 second intervals[3]
FMU-56/B	X		Airburst	SUU-30B/B	See T.O. 1B-57B-34-1-1A
M147A1	X		Airburst	M129/ M129E1	5-92 seconds
M152A1 (2 each)		X	Airburst	M35 M36	5-92 seconds
M158 (6 each)	X		Arming vane, mechanical, impact instantaneous	M1A2 M1A4	1200 feet
M160 (use with box fins)		X	Selective with primer detonator M14, non-delay, 0.01 sec, 0.025 sec, 0.10 sec, 0.25 second delay	M30 M57 M81 M88	With M4 vane: 1780-2680 feet With M5 vane: 4500-5850 feet
M172 (use with conical fins)		X	Selective with primer detonator M14, non-delay, 0.01 sec, 0.025 sec, 0.10 sec, 0.25 second delay	M30 M57 M81 M88	With M4 vane: 445-550 feet With M5 vane: 1225-1510 feet
M155A1	X		Air burst	MK44	5-92 seconds
M126A1 M159	X		Impact instantaneous	M47	725 feet

[1]The optimum expected value of SAT is 4600 feet without the M1A1 arming delay. With the M1A1 arming delay setting of two units, the expected air travel to arm distance is 6000 feet.

[2]With the M1A1 arming delay setting of two (2) units the expected air travel to arm distance is 3700 feet.

[3]Even though the fuze arming delay may be set to a value as low as 0.75 seconds, a minimum of 2.5 seconds is recommended to assure safe escape during low level operations. This requires a minimum bomb time of flight of 2.8 seconds.

WARNING: For jet aircraft, use of the M1A1 arming delay with a minimum setting of two (2) units is required for M188 and M914 VT employment.

M100A2 Tail Fuze.

The M100A2 is a mechanical impact tail fuze used with box fins on GP and fragmentation bombs of 100 to 300 pounds. This fuze is similar to the M112A1. The fuze has a large arming head, with a carrier stop (small rod extending from underneath the arming head parallel to the arming stem).

Nomenclature is stamped into the fuze body and is visible when assembled to the bomb. It is about 9 inches long and weighs 2.7 pounds. The fuze employs the arming stem safe principle. It uses the M14 PDU, the particular delay depending on mission requirements; generally speaking a delay should be used which either matches or is slightly longer than the nose fuze delay. With the 220 or 260-pound fragmentation bomb, use the M14 PDU labelled "non-delay." The M5 vane is the preferred vane currently authorized for use with the M100A2, as the M4 vane yields a very short air travel to arm (approximately 500 feet). Arming is accomplished by the arming vane, bearing cup assembly, gear system, and arming stem. Air travel to arm with the M5 vane, when installed in the 250-pound GP bomb is 1335 feet (158 revolutions of the vane).

WARNING

The only exterior evidence of fuze arming is the progress of the arming head out of the vane cup, shortening the amount of the carrier stop exposed by 0.6 inch.

M112A1 Tail Fuze.

The M112A1 tail fuze (figure 1-79) is an arming stem safe, arming vane type tail fuze which arms after 18 revolutions of the arming vane (73 feet). The vane is a four-blade type. It acts to detonate the bomb 8 to 15 seconds or 4 to 5 seconds after impact, depending upon the primer-detonator used. The fuze is issued with the primer-detonator, M16A1, 4- to 5-second delay or 8- to 15-second delay. These primer-detonators are interchangeable. The fuze is equipped with a cocked type firing pin which, once the fuze is armed, is extremely sensitive. The M112A1 fuze is 9.6 inches long, weighs 2.3 pounds and is authorized for use with GP bombs of 100 to 300 pounds. This is a very fast arming fuze for low altitude (skip) bombing. Nose fuzes are not used with this fuze. Aircraft rely upon the medium delay in this tail fuze to leave the target safely prior to detonation of the bomb.

WARNING

When the arming stem has progressed enough so that the two plates forming the vane stop (arming head) are separated by 0.5 inch or more, the fuze is armed. Since this fuze contains a cocked firing pin, it is extremely sensitive and will function even with the slightest jar.

M112A1 TAIL FUZE

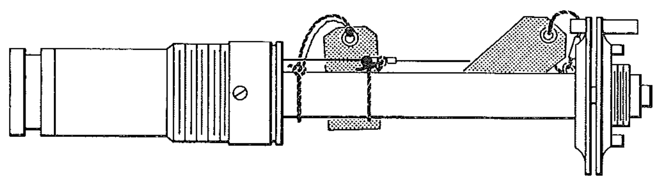

Figure 1-79

M126, M158, M159 Nose Fuze.

Nose fuzes of this type (figure 1-80) are vane operated and delay armed. They detonate the bomb instantaneously upon impact.

Fuze M126A1 (or M126) is an impact-type vane operated and delay armed nose fuze. It detonates the bomb instantaneously upon impact. Instead of a booster, this fuze has a steel cylinder. The cylinder contains a firing train consisting of a primer, an upper detonator and a lower detonator. The M126, the earlier model, has more teeth on the gears than the M126A1 and requires 570 vane revolutions to arm as opposed to 325 revolutions in the M126A1. Fuze M126 has three safety blocks, each a 120° segment. In the unarmed position, the arming sleeve fits into a groove in the blocks. This prevents the blocks from falling out. Fuze M126A1 has one safety block.

M126 TYPE FUZE

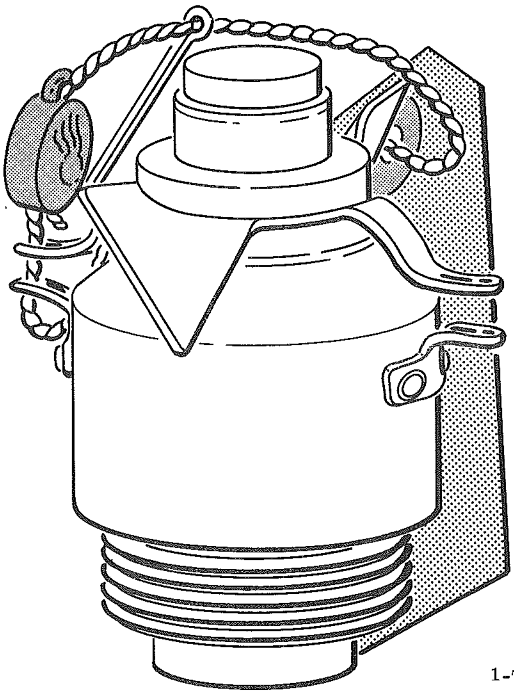

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Figure 1-80

Fuzes M158 and M159 are vane operated and delay armed. They detonate the bomb instantaneously upon impact. The air travel (1200 feet) necessary to arm fuzes M158 and M159 makes them suitable for use with land-based and carrier aircraft. Fuzes M158 and M159 differ only in that the former has a booster containing 0.6 ounce of tetryl, whereas the latter has a smaller metal holder containing a column of tetryl. This difference in booster volume has resulted in a variance in fuze length. Fuzes M158 and M159 do not have safety blocks under the striker. In the unarmed condition, the striker is snug against the vane nut.

WARNING

Never attempt to disarm a fuze suspected of being armed, as reserve rotation of the arming vane will force the firing pin into the detonator and fire the fuze.

M152A1 Tail Fuze.

This is a mechanical time tail fuze used in clusters only. Except that the body is reinforced, the arming hub bearings are modified to accommodate the reversed direction of thrust, the pitch of the vanes is reversed, and the vanes are painted red, fuze M152A1 is the same as the 155A1. The vanes are painted red specifically to aid in differentiating between the M152A1 and the M146A1. The M152A1 has a time scale of 5 to 92 seconds, and will function on impact if armed.

WARNING

Upon removal of the striker stop, if the striker snaps down tight against the safety block, or if the safety block should fall out, consider the fuze hazardous. If the armed pin is completely or partially ejected, consider the fuze armed and dangerous.

M155A1 Nose Fuze.

In appearance the M155A1 resembles the M152A1 mechanical fuze (figure 1-81). The detonator is in line (i.e., not detonator safe) and no detonator slide cover is present on the outside of the body. It employs the safety block principle and has a striker stop which is removed before takeoff. This fuze arms very rapidly, releasing the safety block after 6 to 9 revolutions of the vane (approximately 50 feet of air travel). Nomenclature is stamped on side of body and is visible when assembled to the bomb. Once the fuze is armed, it will function on impact if impact occurs before the set time or in event of failure of the time mechanism. It weighs 1.4 pounds and is 4.5 inches long.

WARNING

If, when the striker stop is removed, there is no clearance between the striker and the safety block, or if the striker snaps down on the block, consider the fuze armed. At any time the safety block is missing, or the arming pin is completely or partially ejected, consider the fuze armed and dangerous.

M155A1 TAIL FUZE

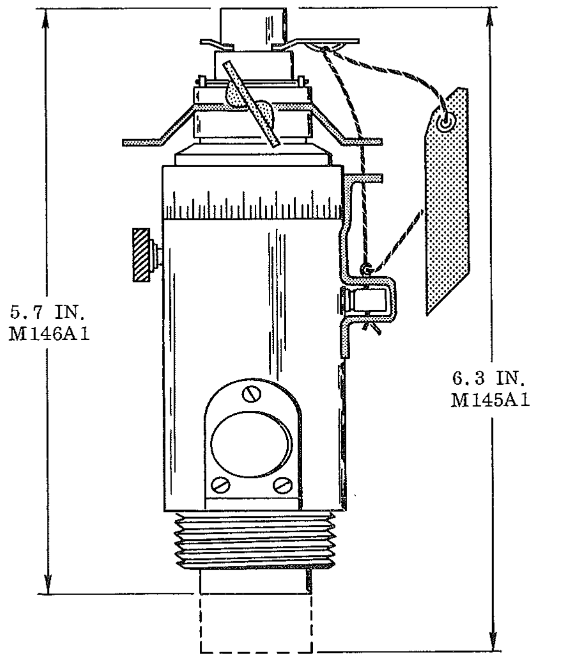


Figure 1-81

M160 Tail Fuze.

The M160 is identical to the M100A2 in all respects (including bombs used on) except markings, nomenclature, and the longer air travel required to arm (due to finer threading of the arming stem). This type fuze was provided to decrease the chances of bombs, which might bump each other when released in salvo or rapid train, from detonating too close to the aircraft. The M4 vane is normally used with it, which will yield an air travel to arm on the 250-pound GP bomb of 1950 feet. By way of comparison, the M5 vane used under the same conditions would yield an air travel to arm of 5350 feet. The arming stem is painted yellow to indicate its slower arming characteristics. As with the M100A2, an M14 PDU should have an equal or longer delay than the nose fuze delay. When installed on a fragmentation bomb, use an M14 marked "non-delay."

M172 Tail Fuze.

This fuze is vane armed and inertia fired. Arming is mechanically delayed by reduction gearing. When issued, the fuzes are equipped with either a nondelay or a 0.025-second delay primer detonator M14, which can be interchanged with other primer detonators to give a selection of time delays. Air travel to arm this fuze ranges from 445 to 550 feet with vane M4, and 1225 to 1510 feet with vane M5. This fuze is used with conical fin assemblies.

WARNING

Under no circumstances should an attempt be made to disarm the fuze by turning the arming vane backwards.

M914(VT) Fuze.

This fuze is a modification of the M188 VT fuze. This modification consisted of substituting a delay detonator for the instantaneous detonator normally used, and changing the minimum safe air travel (min SAT) to 2300 feet. The modified fuze is thus tailored for use over dense jungles where the burst is desired under the canopy rather than in the air above it. The fuze is electrically initiated upon coming into proximity with the foliage, and the delay detonator allows an additional 40 to 50 feet of travel before bomb burst. It may be used with GP and fragmentation bombs up through the M117 GP bomb size.

FMU-26/B or FMU-26A/B Fuze.

The FMU-26/B or FMU-26A/B fuze (figure 1-82) is an electric fuze powered by an internal thermal battery. The fuze can be used as a nose fuze or tail fuze and used to obtain an airburst or impact initiated burst. (The airburst mode is deactivated in the early production fuzes and marked AIRBURST INACTIVATED.) The fuze is cylindrically shaped, approximately three inches in diameter and 6.5 inches in length. The fuze is compatible with bombs that have internal plumbing (required to route the arming lanyard) and the standard three-inch fuze wells (nose and tail), which include:

a. M117 GP Bomb

b. MK82 Bomb.

c. CBU-24B/B, -29B/B, -49B/B dispenser and bomb.

The arming lanyard is routed from the center of the bomb, through the internal plumbing of the bomb, and to a battery firing device which is attached to the fuze in the nose or tail fuze well. The free end of the arming lanyard which is protruding from the center well of the bomb, is routed through a swivel loop and then into a lanyard lock which is installed in the center well and secured by a lanyard locknut.

When the bomb is loaded to the bomb rack, the swivel loop is installed in the bomb rack arming solenoid.

FMU-26/B AND FMU-26A/B FUZES

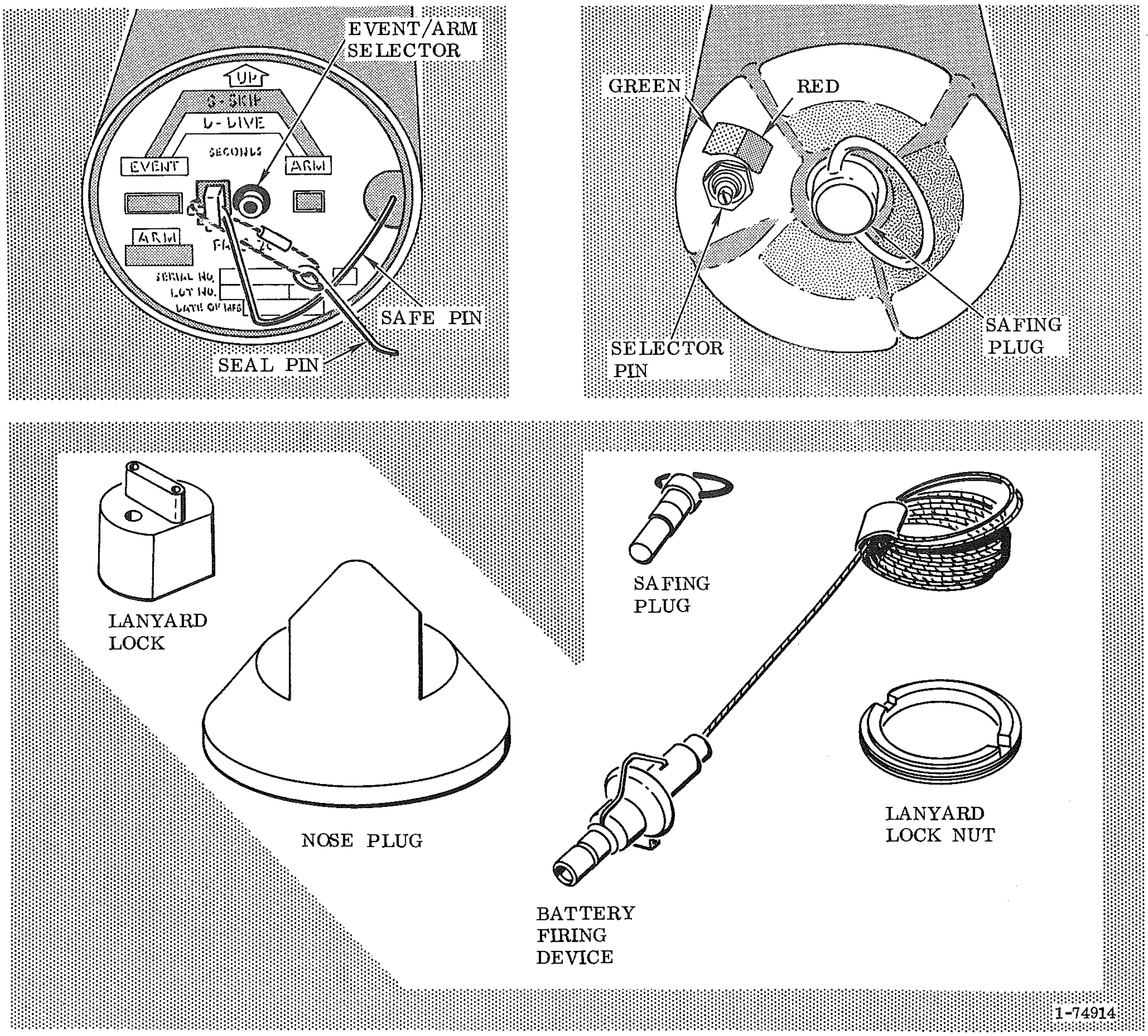


Figure 1-82

When the bomb is released armed, the arming solenoid holds the swivel loop which remains with the bomb rack as the arming lanyard is withdrawn through the swivel loop. The arming lanyard remains attached to the bomb by the lanyard lock. This action cocks and releases the firing pin which initiates the thermal battery in the fuze. The thermal battery provides the electrical power for fuze operation. The fuze timing and counting circuitry provides an arming signal at the set arming time. This arming signal is used to arm the fuze, that is, rotate the detonator from the out-of-line position to the in-line position or firing position. The fuze timing and counting circuitry also provides the firing or final event signal at the set event times for the airburst function and (FMU-26/B only) after impact functions. The fuze modes with available arming times and final event times are tabulated in table 1-3.

WARNING

When using the medium-delay mode against hard targets, select minimum release altitudes which will provide safe escape from bomb fragments for instantaneous or contact bursts. This is required to protect the aircraft and aircrew in the event of a premature bomb detonation at initial impact. To preclude ricochet and possible airburst during the ricochet, release conditions for general purpose bombs should provide a trajectory angle at impact in excess of 40 degrees.

CAUTION

- Since the fuze settings may not be visible to the aircrew for inspection, the munitions handling and loading personnel must be carefully briefed on the required settings.
- Rough handling of the fuze after it is removed from the shipping container and especially during the installation when the safe plug is removed, could result in a dud fuze. The munitions handling and loading personnel must be cautioned not to mishandle the fuze or install a fuze which has been inadvertently dropped.

NOTE

- The arming time tolerance for the short-delay mode is: ±0.25 sec. With this mode, the minimum allowable bomb time of flight (to prevent duds) will be the arming delay setting plus 0.25 sec.
- The fuze contains a safing device which duds the fuze in the event impact occurs prior to arming.

The event and arm time are set in the fuze with an allen wrench and displayed in the windows on the face of the fuze. The safe pin blocks the fuze rotor in the out-of-line position until after the fuze is installed in the bomb. The seal pin replaces the safe pin when removed and prevents moisture from entering the fuze. The aft end of the fuze (the booster end) has a pie-shaped section to accept a 45-gram RDX booster which is

TABLE 1-3

MODE	ARMING TIME	FINAL EVENT TIME	EVENT TOLERANCE
Airburst 1	Selectable 1.9 to 99.9 sec in 0.5 sec increments	Selectable Occurs 0.1 sec after arming	±0.3 sec
Impact 2 Short-Delay	Selectable 2.0 to 20.0 sec in 2.0 sec increments	Selectable Non-Delay, 0.010, 0.020, 0.050, 0.100, or 0.250 sec	±10% or 0.002 whichever is greater
Impact 3 Medium-Delay	Fixed 1.0 sec after Release	Selectable 6.0, 10.0, 12.0, 16.0 or 20.0 sec	±0.25 sec

secured by tape. The aft section of the fuze also has a safe plug and a safety switch. The safety plug is in the fuze only during shipping and handling and is removed prior to installing the fuze in the bomb. The battery firing device is installed in the position vacated by the safety plug. The safety switch has two positions, RED and GREEN (or normal). The GREEN or normal position keeps the firing circuit to the detonator disabled for 6.6 seconds after bomb release. The safety switch should be kept in the green position for all medium delay or skip mode settings. It should also be kept in the green position for all short-delay or dive mode settings except when operational delivery conditions are such that the time of bomb flight to impact will be less than 6.6 seconds. For release where the bomb time of flight to impact is less than 6.6 seconds, the safety switch must be set to the red position to obtain fuze event function at the set time.

The fuze can be used more advantageously in the nose fuze well. This permits easy access for aircrew inspection and for accomplishing arming and function time changes if required after initial loading. The inspection and changes can be accomplished by removal of the nose plug. If the tail fuze well is used, the initial fuze settings are most easily accomplished with the tail fin removed or by placing the settings in the fuze prior to installing the fuze in a finned bomb. To accomplish changes in tail fuze settings, removal of the fuze from the bomb or removal of the tail fin and closure plug is required. Further descriptive and procedural information is contained in T.O. 11A7 series.

FMU-54/B Tail Fuze.

The FMU-54/B fuze is a mechanically operated retardation sensing device with a predetermined arming delay of 0.75 to 3.50 seconds, settable in 0.25 second intervals. The fuze is for the tail fuze well only of the M117, MK81 and MK82 bombs equipped with high drag (retardation) fins. Upon release, the fin causes rapid deceleration of the bomb, initiates the fuze arming cycle and provides a safe escape distance from delivery aircraft. In the event of fin malfunction, the fuze will not arm. A properly armed fuze will function upon impact when a "G" weight releases the spring loaded firing pin. The fuze is mechanically initiated by a lanyard connected to the pylon swivel. As the bomb falls away, the lanyard pulls the fuze lanyard engaging shaft thus releasing the fuze components to operate if proper retardation is experienced. The lanyard assembly is routed such that the lanyard will go with the bomb after performing its function.

Upon removal of the tail fuze well plug, feed free end of the lanyard through the tail fuze well, into conduit, and out the bomb charging well. The lanyard assembly is seated in the fuze well. The lanyard lock is installed in the bomb charging well and held in place by the retaining ring. The lanyard is fed through the circular portion of the swivel assembly, then through the key lock holes in the lanyard lock. The fuze is removed from the container, safety pin pulled (waterproofing pin inserted in its place) and inserted into the fuze well. Slight movement of the lanyard protruding through the charging well will indicate the fuze has been seated. Rotate timing indicator counterclockwise one full turn and set to desired setting. If desired setting is passed, continue CCW rotation to the predetermined time setting. Install the rubber bumper in the bomb end cap recess and install the end cap. After fuze installation the accompanying red warning tag should be filled in and attached to the bomb.

Safe escape criteria must be observed in the selection of FMU-54/B arming delay settings. Even though the fuze arming delay can be set to a value as low as 0.75 sec, a minimum setting of 2.5 sec is recommended to assure safe escape during low level operations. Considering the Snakeye I and MAU-91/B retarder opening times, this would require the selection of release conditions which will provide a minimum bomb time of flight of 2.8 sec.

NOTE

- The selected arming delay setting should be recorded on the red warning tag which is filled in and attached to the bomb when the loading is completed. This should be checked during the pilot's pre-flight of the aircraft.
- Since the fuze settings are not visible to the pilot for inspection, the munitions handling and loading personnel must be carefully briefed on the required settings and the red warning tag procedures.

FMU-72/B Fuze.

The FMU-72/B fuse (see figure 1-83) is compatible with the nose and/or tail fuze wells of all bombs with internal plumbing and the standard 3-inch fuze well, which include the:

a. M117, 750 lb, GP Bomb.

b. MK81, 250 lb, GP Bomb.

c. MK82, 500 lb, GP Bomb.

The FMU-72/B can be used either in the nose or tail fuze well. Settings must be made prior to installing the fuze in the fuze well. If a change in a setting is required after installing the fuze, it must be removed from the bomb to make the change.

CAUTION

Since the fuze settings are not visible to the pilot for inspection, the munitions handling and loading personnel must be carefully briefed on required settings.

The FMU-72/B fuze is activated upon armed release. The swivel and loop assembly is held by the arming solenoid and stays with the aircraft. When the bomb is released, the lanyard is pulled. This pull (greater than 36 pounds) cocks and releases the firing pin which initiates the liquid ammonia battery in the fuze. The battery provides electrical power for fuze operation. The arming circuitry provides a fixed delay for the signal for arming. The arming signal is used to arm the fuze, that is, rotate the detonator from the out-of-line position to the in-line or firing position. To assure that the detonator does not fire at arming, it is grounded until impact occurs, and the power source which fires the detonator is not charged until 33 seconds after impact. The fuze timing and counting circuitry provide the firing or final event signal at the set event time after impact. The arming time and selectable event times are listed below:

a. Arming Time: 6.0 seconds with tolerances of +1.5 to -1.0 second.

b. Event Times: Selectable in 20-minute increments from 20 minutes to 5 hours; 1-hour increments from 5 hours to 16 hours; 2-hour increments from 16 hours to 30 hours; and 3-hour increments from 30 hours to 36 hours.

WARNING

- When the FMU-72/B fuze is used in general purpose bombs, select minimum release altitudes which will provide safe escape from bomb fragments for instantaneous or contact bursts. This is required to protect the aircraft and aircrew in the event of a premature bomb detonation at initial impact. To preclude ricochet, release conditions for general purpose bombs should provide a trajectory angle at impact in excess of 40°.

- For detail information concerning anti-disturbance features and impact spacing, refer to the Confidential supplement to this manual.

- The fuze contains a safing switch which duds the fuze in the event impact occurs prior to arming.

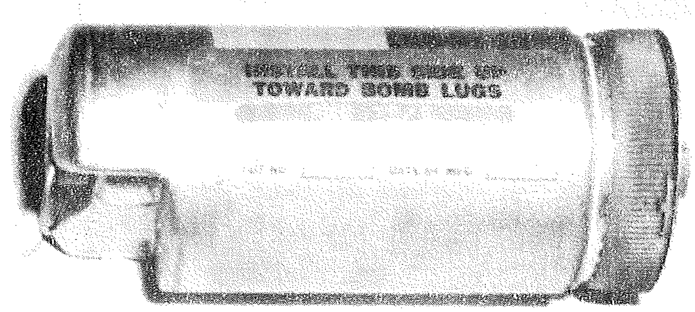
CAUTION

Rough handling of the fuze after it is removed from the shipping container and especially during the installation when the safe plug is removed, could result in a dud fuze. The munitions handling and loading personnel must be cautioned not to mishandle the fuze or install a fuze which has been inadvertently dropped.

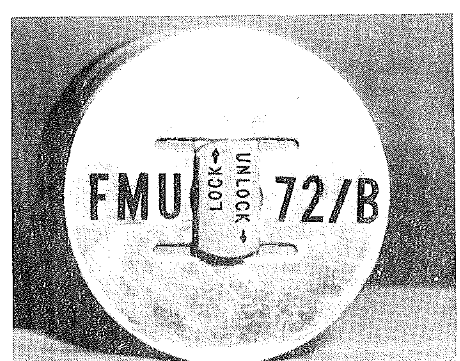
NOTE

To assure adequate time for the FMU-72/B fuze to arm prior to impact, use the minimum release altitudes as specified in the fuze arming time tables for the M904E2/M905 fuze with a 6-second arming delay setting.

FMU-72/B FUZE



SIDE VIEW



END VIEW

Figure 1-83

SECTION II

NORMAL AIRCREW PROCEDURES

TABLE OF CONTENTS

INTRODUCTION.

This Section contains the expanded aircrew normal delivery procedures. The abbreviated procedures are contained in the checklist which forms a part of this manual.

PREFLIGHT PROCEDURES.

EXTERIOR INSPECTION.

WARNING

Crew members will perform visual inspection only. Armament personnel will correct any discrepancies during exterior inspection.

Gun, M-3, .50 Caliber and M39, 20mm.

1. Air Bottle Precharge (50 Caliber) — CHECKED
   Check precharge in left gun bay for 1000 psi
2. Gun Bay Doors — CLOSED and LATCHED
3. Gun Access Doors — SECURED
   All airlock fasteners secured

NOTE

Before take-off insure that all 20 mm guns have been charged as there are no provisions for charging the guns in flight.

Bombs, General Purpose, 100 Pound (Internal), 250, 500, 750, 1000 Pound (Internal/External), Fragmentation, 220, 260 Pound (Internal). Miscellaneous: Bomb, Leaflet, 750 Pound (Internal/External), and Bomb, Smoke, 100 Pound (Internal).

1. Personnel Safety Switch SAFE
2. Bomb Door Electrical Connection SECURE
3. Bomb Fuzes CHECKED
   a. Nose Fuze
      (1) Arming Time (If applicable) CHECKED
      (2) Fuze Setting Pin CHECKED SET
      (3) Arming Vane SECURED
      (Fahnestock Clips) Approximately 4 inches of arming wire shall extend beyond each vane and be secured by three Fahnestock clips. (Steel Clip) 1 to 1-1/2 inches of arming wire shall extend beyond each vane and be secured by one steel clip.
      (4) Safety Cotter Pin (If applicable) REMOVED
   b. Tail Fuze

WARNING

Crew members will perform visual inspection only (do not touch long delay fuzes because of anti-withdrawal features). Armament personnel will correct any discrepancies.

      (1) Arming Vane SECURE
      (2) Locknut VISUALLY SECURE
      (Long delay fuze only)
      (3) Safety Cotter Pin REMOVED
4. Bomb SECURED
   When checking bomb secured, check for rack fully cocked and sway braces handtight. On external stations, check pylon for security.
5. Arming Wire Loop to Rack Solenoid INSTALLED

Bomb, General Purpose, MK82 (Snakeye I) and M117 (Retarded) (Internal/External).

1. Personnel Safety Switch SAFE
2. Bomb Door Electrical Connection SECURE
3. Fuze CHECKED

a. Arming Time (If applicable) — CHECKED

b. Fuze Setting Pin — SET

c. Arming Vane — SECURED
(Fahnestock Clips) Approximately 4 inches of arming wire shall extend beyond the vane and be secured by 2 Fahnestock clips.
(Steel Clip) 1 to 1-1/2 inches of arming wire shall extend beyond each vane and be secured by one steel clip.

d. Safety Cotter Pin — REMOVED

4. Release Band Latch — SECURE

5. Release Band Safety — REMOVED
MK82: the arming wire will terminate six inches beyond the end of fin for internal carriage and four inches beyond the fin for external carriage.
M117R: fin released lanyard safety wired.
No Fahnestock Clips are required.

WARNING

Arming wire shall not be dropped with the bomb but shall be installed in rack arming solenoid. This wire insures the fin will not open until the bomb clears the aircraft.

6. Bomb — SECURE
When checking bomb secured, check for rack fully cocked and sway braces handtight. On external stations, check pylon for security.

7. Arming Wires Loop to Rack Solenoid — INSTALLED

Bomb, Incendiary M-35 and M-36 (Internal/External).

1. Personnel Safety Switch — SAFE

2. Bomb Door Electrical Connection — SECURE

3. Fuze — CHECKED

a. Fuzing Time — SET

b. Arming Vane — SECURE
Two (Fahnestock Clips) Approximately 4 inches of arming wire shall extend beyond the vane and be secured by three Fahnestock clips. (Steel Clip) 1 to 1-1/2 inches of arming wire shall extend beyond each vane and be secured by one steel clip.

c. Safety Cotter Pin Striker Stop — REMOVED
Remove safety cotter pin striker as locally directed prior to flight.

4. Bomb — SECURE
When checking bomb secured, check for rack fully cocked and sway braces handtight.

5. Arming Wire Loop to Rack Solenoid — INSTALLED

Bomb, Fragmentation Cluster, M1A2/M1A4 (Internal).

WARNING

Never attempt to disarm a fuze suspected of being armed. Reverse rotation of the arming vanes assembly will force the firing pin into the detonator and fire the fuze.

1. Personnel Safety Switch — SAFE
2. Bomb Door Electrical Connection — SECURE
3. Fuzes — CHECKED
   a. Arming Vanes — SECURE

WARNING

Check that fuze vane retaining springs are not broken, bent, weak or missing.

WARNING

Fuze is armed when striker has advanced 1/8 inch or more from vane nut.

   b. Safety Wire — REMOVED
4. Cluster — SECURED
   When checking bomb secured check for rack fully cocked and sway braces handtight.
5. Arming Wire — CHECKED
   Check arming wire to insure that it is connected to solenoid and extends through cluster retainers.
6. Retaining Strap Clamp — CHECKED
   Insure cotter pins are removed from clamp. (Fahnestock Clips) Approximately 4 inches of arming wire shall extend beyond each clamp and be secured by two Fahnestock clips. (Steel Clip) 1 to 1-1/2 inches of arming wire shall extend beyond each clamp and be secured by one steel clip.

Bomb, Fire (External).

1. Tank — SECURED
2. Arming Wire Loop to Rack Solenoid — INSTALLED
3. Safety Pin — REMOVED
   Remove safety cotter pin as locally directed prior to flight.

Bomb, Practice, BDU-33/B and BDU-33A/B (Internal).

1.	Personnel Safety Switch	SAFE
2.	Bomb Door Electrical Connections	SECURE
3.	Bomb When checking bomb secured check for rack fully cocked and sway braces handtight.	SECURE
4.	Bomb	CHECKED
	a. Bomb Signal	INSTALLED
	b. Cotter Pin	SECURE
	c. Firing Pin	INSTALLED
	d. Bomb Tail Fin	SECURE

Dispenser SUU-25A, MK-24 Flares (External).

1.	Launcher and Pylon	SECURE
2.	Shorting Button Check that shorting button is installed in forward electrical receptacle.	INSTALLED
3.	Detents Check that 8 detents are installed two per tube.	CHECKED
4.	Ground Safety Pins	INSTALLED
5.	Single/Ripple Switch	SINGLE
6.	Shorting Button and Safety Pins Remove shorting button and safety pins as locally directed prior to flight.	REMOVED

Rocket Launcher MA-2A (External).

1.	Launcher and Pylon	SECURE
2.	Firing Contact Contact checked for spring tension and freedom of movement.	CHECKED

Rocket Launcher LAU Series (External).

1.	Launcher Pylon	SECURE
2.	Shorting Button/Safety Pin	INSTALLED
3.	Single/Ripple Switch (LAU-32 Series, LAU-59) Insure that single/ripple selector switch located on top of launcher is in the RIPPLE position.	RIPPLE

INFLIGHT PROCEDURES.

FIRING M-3 .50-CALIBER GUNS.

1.	Gun Compressor Circuit Breaker	ON
2.	Gunsight Tilting Knob	AS REQUIRED
3.	Master Gun Switch Gunsight light switch to GUNSIGHT ON or ALTERNATE ON. Adjust reticle light to desired brilliance.	GUNS

4. Gun Charger Switch — CHARGE
   Switch will be held in the CHARGE position for minimum of 2 seconds.
5. Gun Trigger — ACTUATED
6. Master Gun Switch — OFF

CAUTION

The gun charger switch must be in the BAT position prior to landing.

FIRING M39, 20mm GUNS.

NOTE

Before take-off insure that all guns have been charged as there are no provisions for charging the guns in flight.

1. Gunsight Tilting Knob — AS REQUIRED
2. Master Gun Switch — GUNS
   Gunsight light switch to GUNSIGHT ON or ALTERNATE ON. Adjust reticle light to desired brilliance.
3. Gun Trigger — ACTUATED
4. Master Gun Switch — OFF

EXTERNAL STORES RELEASE - TRAIN.

1. Master Gun Switch — SIGHT and RADAR, or GUNS

WARNING

Selection of GUNS position arms the guns.

2. Gunsight Tilting Knob — AS REQUIRED
3. Bomb Bay Door — CLOSED

WARNING

Do not open bomb door. If bomb door is opened, internal bombs may be released in train with external stores.

4. All Bay Switches — OFF
5. External Train/Normal Switch (if installed) — TRAIN

NOTE

The external train switch provides a train release of external stores as a separate selection; thereby, eliminating the possibility of internal stores releasing when operating in the TRAIN position.

6. All external STA switches (If external train/normal switch is not installed) — OFF

WARNING

External STA switches set to STA will release simultaneously when bomb/rocket release button is depressed. Extreme caution shall be exercised when setting armament panel when carrying mixed external loads since inadvertent release of other than planned release could be fatal.

7. Bomb Arming Switch — SAFE
8. Select Armament Switch — BOMBS INT
9. Intervalometer — SET
   a. Select Train Switch — TRAIN
   b. Bombs to be Released — SET
      Bomb counter will be set a number greater than the number of bombs to be released.
   c. Interval — SET AS REQUIRED

NOTE

Preset intervalometer a minimum of one minute prior to use.

10. Select Armament Switch (On turning final or on final, set select armament switch to BOMBS EXT and INT) — BOMBS EXT and INT
11. Bomb Arming Switch (NOSE and TAIL or TAIL ONLY) — AS BRIEFED
12. Bomb/Rocket Release Button — DEPRESSED

WARNING

Initiate recovery maneuver immediately after release of last bomb or at pre-briefed altitude, whichever is higher.

13. Bomb Arming Switch (after release) — SAFE
14. Select Armament Switch — BOMBS INTERNAL

EXTERNAL STORES RELEASE - SINGLE.

1. Master Gun Switch — SIGHT and RADAR, or GUNS
   Gunsight light to GUNSIGHT ON or ALTERNATE ON. Adjust reticle light to desired brilliance.

WARNING

Selection of GUNS position arms the guns.

2. Gunsight Tilting Knob — AS REQUIRED
3. Bomb Bay Door — CLOSED
4. All Bay Switches — OFF
5. All External STA Switches — OFF

WARNING

External STA switches set to STA will release simultaneously when bomb/rocket release button is depressed. Extreme caution shall be exercised when setting armament panel when carrying mixed external loads since inadvertent release of other than planned release could be fatal.

6. Bomb Arming Switch — SAFE
7. Intervalometer — SET
   a. Select Train Switch — SEL

   NOTE

   If Select Train switch is in TRAIN and counter is set to zero, external stores will not release.

   b. Bombs to be released — ZERO
8. Select Armament Switch — BOMBS EXT and INT
9. Bomb Arming Switch (NOSE and TAIL or TAIL ONLY) — AS BRIEFED
10. Bomb/Rocket Release Button — DEPRESSED
    One external store will release each time the button is depressed. Stores will release left outboard (L2); right outboard (R2); right inboard (R1); left inboard (L1).

WARNING

Initiate recovery maneuver immediately after release of last bomb or at pre-briefed altitude, whichever is higher.

11. Bomb Arming Switch (after release) — SAFE

12. Select Armament Switch — OFF
Turn select armament switch off after recovery maneuver has been initiated.

EXTERNAL STORES RELEASE - MULTIPLE.

1. Master Gun Switch — SIGHT and RADAR, or GUNS
Gunsight light switch to GUNSIGHT ON or ALTERNATE ON. Adjust reticle light to desired brilliance.

WARNING

Selection of GUNS position arms the guns.

2. Gunsight Tilting Knob — AS REQUIRED
3. Bomb Bay Door — CLOSED
4. All Bay Switches — OFF
5. External STA Switches — AS REQUIRED

WARNING

External STA switches set to STA will release simultaneously when bomb/rocket release button is depressed. Extreme caution should be exercised when setting armament panel when carrying mixed external loads since inadvertent release of other than planned release could be fatal.

6. Bomb Arming Switch — SAFE
7. Intervalometer — SET
   a. Select Train Switch — SEL

NOTE

If Select Train switch is in TRAIN and counter is set to zero, external stores will not release.

   b. Bombs to be Released — ZERO
8. Select Armament Switch (Turning final or on final) — BOMBS EXT or BOMBS EXT and INT
9. Bomb Arming Switch (NOSE and TAIL or TAIL ONLY) — AS BRIEFED
10. Bomb/Rocket Release Button — DEPRESSED

WARNING

Initiate recovery maneuver immediately after release of last bomb or at pre-briefed altitude, whichever is higher.

11. Bomb Arming Switch (after release) — SAFE

12. Select Armament Switch — OFF

INTERNAL STORES RELEASE.

1. Master Gun Switch — SIGHT and RADAR or GUNS
   Gunsight light switch to GUNSIGHT ON or ALTERNATE ON. Adjust reticle light to desired brilliance.

WARNING

Selection of GUNS position arms the guns.

2. Gunsight Tilting Knob — AS REQUIRED

3. Bomb Arming Switch — SAFE

4. Select Armament Switch — BOMB INT

5. Bay Switches (Desired Bays) — ON

6. Bomb Indicator Light Switch — AS REQUIRED

7. Intervalometer — SET

   a. Select train switch — AS REQUIRED

   NOTE

   Preset intervalometer a minimum of one minute prior to use. Turn off when not in use by setting switch in TRAIN and ZERO bombs.

   b. Bombs to be Released — SET or AS REQUIRED

   c. Interval — AS REQUIRED

8. Bomb Door — OPEN

9. Bomb Arming Switch — AS BRIEFED

10. Bomb/Rocket Release Button — DEPRESSED
    If select option is utilized, bomb/rocket button must be depressed once for each bomb released. If train option is selected it need only be depressed once.

WARNING

Initial recovery maneuver immediately after release of last bomb or at pre-briefed altitude, whichever is higher.

11. Bomb Arming Switch — SAFE
    Place the bomb arming switch to SAFE prior to closing the door to prevent arming wires from shorting bomb racks.

12. Bomb Door — CLOSED
    Door closed after recovery.

CAUTION

Avoid actuating bomb door while pulling "G' s" as it may cause bomb door mechanism damage or failure.

13. All Armament Switches — OFF/SAFE

ROCKET RELEASE.

1. Master Gun Switch — SIGHT and RADAR or GUNS
   Gunsight light switch to Gunsight ON or Alternate ON.
   Adjust reticle light to desired brilliance.

WARNING

Selection of GUNS position arms the guns.

2. Gunsight Tilting Knob — AS REQUIRED

3. Bomb Arming Switch — SAFE

WARNING

If ordnance is inadvertently released on a rocket pass, the aircraft may not have safe separation from bomb fragments.

4. Rocket Intervalometer — SET
   Set counter on lowest numbered loaded station.

5. Select Armament Switch — AS REQUIRED
   If a single rocket or pod is to be fired, place the select armament switch to ROCKET SINGLE on final approach. If multiple rockets or pods are to be fired set the switch to ROCKETS AUTO on final approach.

WARNING

Ensure that select armament switch is set to ROCKETS SINGLE or ROCKETS AUTO. If inadvertently set to BOMB INT or BOMBS EXT + INT, bombs, flare pods, or rocket pods may be released and will not be fired.

6. Bomb/Rocket Release Button — DEPRESS
   With select armament switch in rockets auto, pods will fire in ascending numerical order at 1/10 second interval as long as the button is depressed.

7. Select Armament Switch — OFF

   Turn select armament switch off after recovery maneuver has been initiated.

NOTE

Retain expended rocket pods if fuel load permits landing at intended base.

FLARE RELEASE, MK-24/SUU-25.

Release MK24 flares from SUU-25A dispensers between 200 and 400 knots IAS in straight and level flight.

1. All External Sta Switches — OFF
2. Rocket Intervalometer — SET

   Set the intervalometer to appropriate rocket station.

3. Select Armament Switch — ROCKET SINGLE

WARNING

Ensure select armament switch is not inadvertently set to bombs since flare pods or bombs will be released.

4. Bomb/Rocket Release Button — DEPRESSED

   Depressing the bomb and rocket release button releases two flares from one tube of the SUU-25A dispenser and advances the rocket intervalometer to the next station. After each release sequence L2, R2, L1 and R1, the intervalometer will have to be reset.

5. Select Armament Switch — OFF

SECTION III

EMERGENCY AIRCREW PROCEDURES

TABLE OF CONTENTS

INTRODUCTION.

This Section contains the expanded aircrew weapons delivery emergency procedures. The abbreviated procedures are contained in the checklist which forms a part of this manual.

EMERGENCY RELEASE PROCEDURES.

BOMBS AND EXTERNAL STORES JETTISON.

1. Tip Tank Jettison Switch — OFF
2. Master Jettison Switch — ACTUATE

CAUTION

If the wing tip tanks are to be retained, the tip tank jettison switch shall be OFF and power must be available to the 28 volt dc distribution bus. Do not turn battery power off after jettisoning stores until the bomb door is closed or the personnel safety switch is placed to SAFE.

BOMBS, EXTERNAL STORES AND TIP TANK JETTISON.

1. Tip Tank Jettison Switch — NORMAL
2. Master Jettison Switch — ACTUATE
   Release and jettison airspeed for external and internal stores is in Section V of T.O. 1B-57B-1.

MALFUNCTION PROCEDURES.

BOMB DOOR EMERGENCY OPERATION.

If the bomb door system fails, proceed as follows to open the door:

1. Emergency Gear T-Handle(s) — IN

CAUTION

The emergency selector valve is spring-loaded to route pressure to the bomb door control valve, but when the emergency landing gear down handle is in the out position, it overrides the spring and the valve will be positioned to route pressure to the landing gear control valve.

2. Bomb Door T-Handle — OUT (ACM)
   Have the aft crew member pull the emergency bomb door open handle all the way out.

3. Ground Shutoff Valve (Star Valve). — CLOSED

4. Hydraulic Handpump — OPERATE

WARNING

- Once the door has been opened by use of the Bomb Door T-Handle, it cannot be closed until after the aircraft is landed and the ground crew resets the valve. Do not attempt to close the door by opening the ground shut-off (star) valve and using the hand pump as hydraulic fluid may be pumped overboard.

- If after approximately 50 strokes of the handpump there is no indication of pressure buildup or bomb door operation, make no further attempt to open the door.

CAUTION

If the bomb door is closed at the time of the hydraulic system failure and it is necessary to open the door before landing to release the bomb load, land with the door open. The emergency portion of the hydraulic reservoir contains only enough fluid for opening the bomb door and extending the landing gear.

RELEASE FAILURE.

1. Switches and circuit breakers — RECHECKED
   Refer to the applicable bomb delivery checklist for proper switch and control position. Check circuit breakers for correct position. In the event ordnance cannot be released by using train or select procedures, then if necessary jettison as stated in Emergency Jettison Procedures.

Runaway Guns-M39-20mm.

1. Master Gun Switch — OFF

2. Inverter Switch — OFF
   Turn No. 1 inverter switch OFF momentarily then return to ON.

Runaway Guns-M3-.50 Caliber.

1. Master Gun Switch — OFF
2. Gun Charger Switch — RETRACT

WARNING

Do not re-position GUN CHARGER switch or remove electrical power from aircraft until the guns are dearmed.

LANDING WITH UNEXPENDED OR HUNG STORES.

Landing with hung or unexpended stores should not be attempted unless engines, flight control systems and hydraulic systems are adequate for accomplishing a normal landing. If an aircraft emergency condition exists, all ordnance should be released or jettisoned prior to entering the traffic pattern. If it is not possible to jettison, and an aircraft emergency condition exists, an operational decision must be made to either land or execute a controlled egress. Egress should be considered when the following conditions exist and munitions cannot be released or jettisoned:

a. Either engine not operating normally.

b. Landing gear malfunction.

c. Wing flap malfunction in conjunction with brake failure.

d. Brake system failure.

e. Uncontrollable bomb door that is cycling or partially open.

f. Blown tire(s).

g. Aircraft fire.

h. Weather conditions requiring instrument approach.

i. When weapon is partly released or armed.

LANDING WITH BATTLE DAMAGED AIRCRAFT.

Refer to Section III of T.O. 1B-57B-1.

FIRE FIGHTING CRITERIA.

FIRE FIGHTING/WITHDRAWAL DISTANCES.

These emergency procedures consist of actions to take if munitions are involved in a fire. Aircrew personnel should be thoroughly familiar with these instructions. It is imperative that the time be recorded, on emergency page of checklist, when the fire envelops a munition. This action is required in order to determine time left to evacuate the area prior to munition function. Table 3-1 gives the withdrawal time in minutes. At the expiration of the time factor, the munition may be expected to function. Lesser distances using protective cover may be used provided the protection afforded will be equal to a submittal barricade (AFM 127-100) with overhead protection and is approved by the responsible Major Air Command. (FFOD-Fire Fighting Operational Distance) Fire fighters and other personnel should avail themselves of all possible cover. Non-essential personnel distances are required to be no more than "inhabited building" distances given in Chapter 5, AFM 127-100. However, the non-essential personnel withdrawal distances given in this chart provide uniform simplified guidance for judicial use in emergencies, where exact inhabited building distances may not be known.

TABLE 3-1.

FIRE FIGHTING/WITHDRAWAL DISTANCES

NOMENCLATURE	FIRE FIGHTING/ WITHDRAWAL TIME (MINUTES)	FIRE FIGHTING/ WITHDRAWAL DISTANCES (FEET)	
		FIRE FIGHTERS	NON-ESSENTIAL PERSONNEL
Cartridge, .50 caliber, all types.	N/A	FFOD	500
Cartridge, 20MM HEI and Incendiary	1	FFOD	500
Cartridge, 20MM API and TP (Ball)	N/A	FFOD	500
Bomb, General Purpose 100-pound, AN-M30A1 250-pound, AN-M57A1 500-pound, MK82 500-pound, MK82 (Snakeye I) 750-pound, M117, M117A1, M117R 250-pound, MK81	5	1200	2000
Bombs, Incendiary Cluster, 750-pound, M-35 and M-36	**WARNING** Water in solid stream or fog should not be used to fight fire. N/A	FFOD	500
Cluster, Fragmentation Bomb 100-pound, M1A2/M1A4	5	1200	2000
Bomb, Fragmentation 220-pound, AN-M88 260-pound, AN-M81	5	1200	2000
Bomb, Fire 250-pound, BLU-10 Series 500-pound, BLU-23/B 500-pound, BLU-32/B 750-pound, BLU-1 Series 750-pound, BLU-27/B	N/A	FFOD	500
Bomb, Practice 25-pound, BDU-33/B, BDU-33A/B	N/A	FFOD	500
Bomb, Leaflet 750-pound, M129	N/A	FFOD	500
Bomb, Smoke M47A4, 100 pound	5	1200	2000
Cluster, Adapter, Missile, MK44	N/A	FFOD	500
Flare, MARK 24 and Mods	N/A	FFOD	500

TABLE 3-1. (CONT)

NOMENCLATURE	FIRE FIGHTING/ WITHDRAWAL TIME (MINUTES)	FIRE FIGHTING/ WITHDRAWAL DISTANCES (FEET)	
		FIRE FIGHTERS	NON-ESSENTIAL PERSONNEL
	WARNING Personnel will remain clear of the area to the fore and aft of the rocket, as personnel can be injured from rockets or rocket blast.		
Rockets, 2.75 inch, all MOD's	2.5	1200	2000
2.75 inch, Practice	N/A	FFOD	2000
CBU-24A/B, CBU-29A/B CBU-49A/B CBU-24B/B, CBU-29B/B CBU-49B/B	1.5	1200	2000
CBU-53/B, CBU-54/B	N/A	FFOD	500

SECTION IV
SUPPLEMENTARY DATA

TABLE OF CONTENTS

INTRODUCTION.

This Section contains the safe separation data, error analysis and fuze arming time data.

SAFE SEPARATION DATA.

The minimum release altitude required for safe escape for general purpose (GP) and fragmentation (FRAG) bomb charts (Tables 6-1, 6-2, and 6-3) may be used to determine the minimum release altitude for fragmentation envelope clearance. For level releases, two sets of minimum release altitude data are provided. One set assumes a straight and level constant speed escape maneuver after release. The second set assumes a 3.5 g pullup to a 20 - 30 degree climb after release with a 2.0 sec g buildup time.

The minimum safe release altitudes for the various munitions were computed using the available fragmentation data collected from static detonations of the items under controlled test conditions. These altitudes are based on the effect of the fragment envelopes from impacting munitions on the delivery aircraft.

The safe altitudes are based on the probability of the delivery aircraft entering the fragment envelope and being struck by a lethal fragment. Whenever this probability is zero, the delivery altitude is considered safe.

In simulating the escape maneuver for dive releases, it was assumed that the recovery g (3.5) was attained linearly in two seconds after release. The 3.5 g pullout acceleration was maintained until a pitch angle of +20 degrees was attained. At this time, the g was "bled-off" to maintain a climb angle between 20 - 30 degrees. Maximum power was assumed when the nose of the aircraft passed through the horizon during the recovery maneuver.

NOTE

It must be kept in mind that there is danger of some fragments traveling faster and further than the theory predicts. Even though the delivery aircraft does not enter the computed fragment envelope, there is some minute chance that it may encounter one of these freak fragments. The probability of this occurring cannot be determined due to the lack of information available on the number, types, and ballistic behavior of such fragments. The probability of being hit is believed to be negligible, however, if the aircraft delivers its ordnance from the indicated minimum safe release altitude or higher.

Table 6-1 lists the minimum release altitudes required for safe escape for dive releases of all GP and fragmentation bombs. Table 6-2 lists the minimum release altitudes required for safe escape for level releases of the GP and fragmentation bombs. Table 6-3 lists the minimum release altitudes required for safe escape for level and dive releases of the M117 Retarded and MK82 (Snakeye I) GP bombs.

USE OF MINIMUM RELEASE ALTITUDE TABLES.

The minimum release altitude for each munition is listed under its column heading for each release condition of dive angle and true airspeed.

WARNING

- If a train release is planned, the last bomb in the train must be released at an altitude that is higher than the minimum value indicated on the charts.
- The importance of releasing at sufficiently high altitudes, and then flying the proper pullout escape maneuver, cannot be over-emphasized. If bombs are released at lower than planned altitudes, or the recovery maneuver is delayed or degraded in any way, there is an excellent chance that the aircraft will be hit by bomb fragments.

MINIMUM RELEASE ALTITUDES 2.75-INCH FFAR.

Based on a 3.5 g pullout attained 2.0 seconds after firing, the aircraft should clear the rocket fragment envelope for all firing conditions listed in the rocket tables.

FUZE SAFE ARMING TIMES.

The fuze arming times, which are required to assure safe escape from premature airbursts (or earlier-than-intended impact bursts), vary widely as a function of release conditions (level or dive, low altitude or high altitude) and release modes (singles, pairs, salvo, or timed ripple). The required safe arming times provided in tables 4-1, 4-2, 4-3 and 4-4 for various GP bombs are listed as a function of release conditions and escape maneuvers. For clarity, an illustration of the delivery and escape maneuver profile for each type of release and escape maneuver is also presented.

DETERMINATION OF FUZE SAFE ARMING TIMES.

VT Fuzed Munitions.

When using proximity fuzes with GP bombs, safety considerations require that the fuzes be kept unarmed until the releasing aircraft has attained an adequate distance from the munition to assure safe escape.

WARNING

Observance of this safety consideration is absolutely mandatory to assure that the delivery aircraft will not be hit by lethal fragments from its own munition in the event of a premature detonation at the expiration of the fuze arming time.

In the determination of the VT fuze safe arming time setting, the value selected should be equal to or greater than the required safe arming time value shown in the table for the desired release condition, release mode, and escape maneuver.

Impact Fuzed Munitions.

Ordinarily, premature airburst detonations of impact fuzed munitions are not anticipated. However, to protect the aircraft and aircrew from any earlier-than-intended burst, fuze safe arming time settings, which will assure safe escape, should be employed with impact type fuzes (as well as VT fuzes) whenever operational considerations will permit this course of action. Use of this procedure would help protect the aircraft and aircrew in the event of an inadvertent low altitude release as well as any premature airburst.

WARNING

If operational considerations and the range of available fuze arming time settings require the selection of settings which will not assure safe escape from an earlier-than-intended burst, the aircrew should be briefed to carefully observe the appropriate minimum release altitudes and recovery maneuvers required for safe escape.

As an additional safety precaution, whenever operational considerations require the use of fuze arming time settings which will not assure safe escape from a premature burst, the aircrew should be briefed to execute a 3.5-g pullup or banked turn escape maneuver immediately after release.

ERROR ANALYSIS.

Analysis of error inducing factors in ordnance delivery tactics will acquaint the aircrew with the various problems involved in accurate and successful delivery of non-nuclear weapons. Even a slight deviation from the optimum release criteria will affect the impact point of the released ordnance, although in some cases one error can be compensated by another error or not infrequently two or more errors will combine to produce a drastic overall error. With practice and proficiency the aircrew can recognize a pending release deviation from the optimum desired and computed for a given sight setting and make a correction to compensate for the deviation.

Compensation can be accomplished by several methods; by releasing early or later, by offsetting the pipper from the target, by maneuvering the aircraft to a new release position, or by making a dry pass and attempting to position the aircraft in a better position on the following pass.

Recognition of improper release conditions, the the effect of ordnance impact released in such conditions, and compensation for deviations from optimum are a necessary function of accurate and successful weapons delivery. This is especially true when conducting the attack against unfamiliar, hostile targets where the constantly changing tactical situation and enemy defensive environment does not always permit generation of optimum release criteria.

Following are graphic illustrations with brief accompanying explanations of some of the release deviations possible and their resultant effect on ordnance impact. Mathematical equations are included to indicate the exact error produced by exact amounts of criteria deviation.

TABLE 4-1.

REQUIRED FUZE SAFE ARMING TIME
LOW ALTITUDE LEVEL RELEASE - LEVEL, CONSTANT SPEED ESCAPE MANEUVER

REL KTAS	SAFE ARMING TIME SEC	VERTICAL DROP TO FUZE ARMING FT	AIRCRAFT TO BOMB SLANT RANGE DISTANCE AT FUZE ARMING FT
		M117, MK82, MK81	
300	9.4	1400	1410
400	7.9	1000	1010
		M57, M30	
300	7.6	900	910
400	6.2	600	620
		M88, M81	
300	7.1	800	810
400	6.2	600	620

NOTE

The values listed are applicable for use with single, pairs, salvo, or timed ripple releases. A straight and level, constant-speed, escape maneuver is assumed after release.

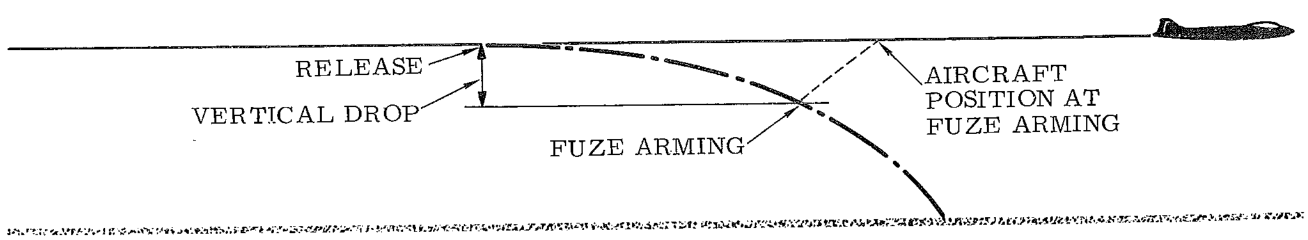


TABLE 4-2

REQUIRED FUZE SAFE ARMING TIME
LOW ALTITUDE LEVEL RELEASE - 3.5 G PULLUP OR
3.5 G - 60° BANKED TURN ESCAPE MANEUVER

REL KTAS	SAFE ARMING TIME SEC	VERTICAL DROP TO FUZE ARMING FT	AIRCRAFT TO BOMB SLANT RANGE DISTANCE AT FUZE ARMING FT
		M117, MK82, MK81	
300	6.1	600	1260
400	5.6	500	1170
		M57, M30	
300	5.0	400	880
400	4.4	300	715
		M88, M81	
300	5.0	400	880
400	4.4	300	715

WARNING

The values listed are applicable for use with singles, pairs, or salvo type releases only and assume that the aircraft attains the 3.5 G escape maneuver acceleration within two seconds after release. If a low altitude level ripple release is to be accomplished where the aircraft is held straight and level throughout the entire ripple release time cycle, the safe arming times listed for a level release - level constant speed escape maneuver should be used and minimum release altitudes selected accordingly.

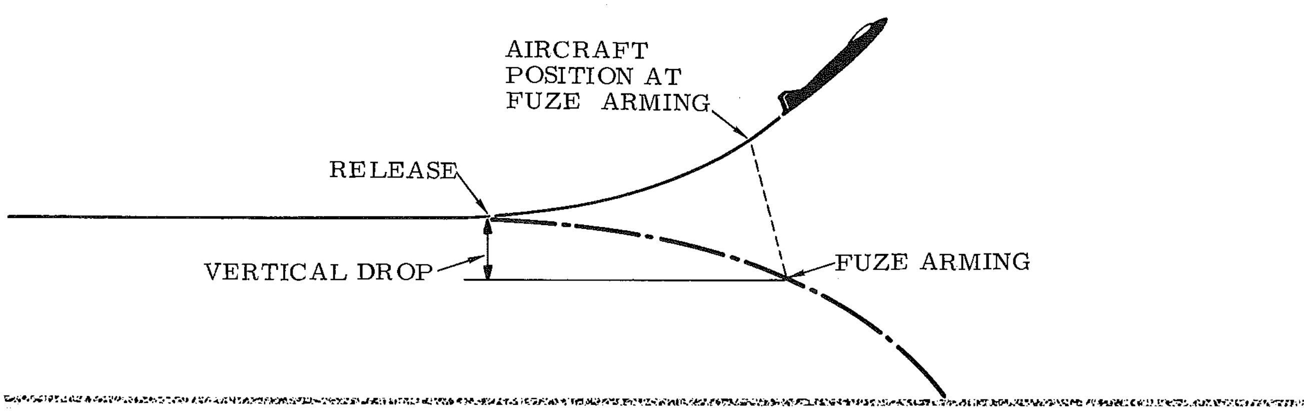


TABLE 4-3

REQUIRED FUZE SAFE ARMING TIME
LOW TO MEDIUM ALTITUDE DIVE RELEASE - 3.5 G
PULLUP TO 20° - 30° CLIMB ESCAPE MANEUVER

RELEASE TAS KTS	RELEASE DIVE ANGLE DEG	SAFE ARMING TIME SEC	VERTICAL DROP TO FUZE ARMING FT	AIRCRAFT TO BOMB SLANT RANGE DISTANCE AT FUZE ARMING FT
			M117, MK-82, MK-81	
300	15	5.5	1200	1250
	30	5.1	1700	1080
	45	5.1	2200	800
400	15	5.1	1300	1095
	30	4.9	2000	965
	45	4.8	2600	895
			M57, M30	
300	15	4.9	1000	960
	30	4.7	1500	865
	45	4.5	1900	780
400	15	4.2	1000	700
	30	4.1	1600	630
	45	4.1	2200	610
			M88, M81	
300	15	4.5	900	805
	30	4.4	1400	755
	45	4.3	1800	690
400	15	3.9	900	575
	30	3.8	1500	550
	45	3.8	2100	530

WARNING

The values listed are applicable for use with singles, pairs or salvo type releases only and assume that the aircraft attains the 3.5 G escape maneuver acceleration within two seconds after release. For timed ripple releases, where the aircraft remains in a fixed dive angle flight condition until the last bomb is released, the safe arming time should be increased by an amount equal to the ripple release time cycle.

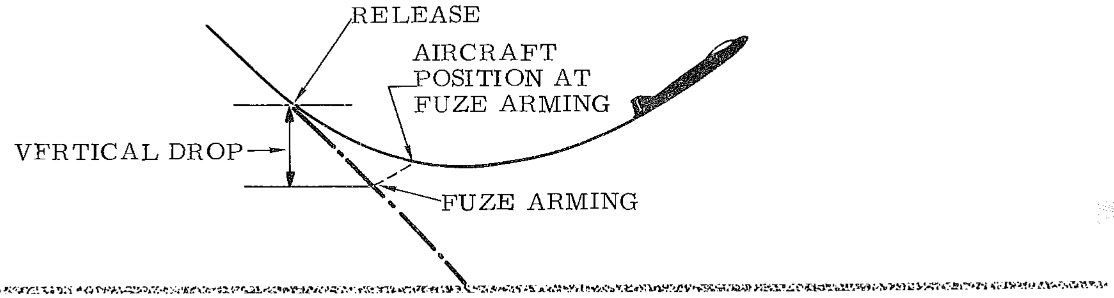


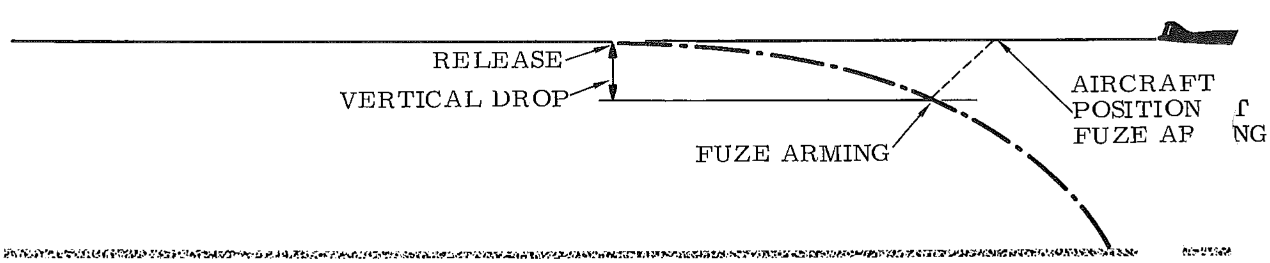
TABLE 4-4

REQUIRED FUZE SAFE ARMING TIME
HIGH ALTITUDE LEVEL RELEASE - LEVEL, CONSTANT SPEED ESCAPE MANEUVER

RELEASE ALTITUDE ABOVE TARGET FT	TAS KTS	SAFE ARMING TIME SEC	VERTICAL DROP TO FUZE ARMING FT	AIRCRAFT TO BOMB SLANT RANGE DISTANCE AT FUZE ARMING FT
		M117, MK-82, MK-81		
10,000 OR LOWER	300	10	1590	1600
	400	8	1020	1030
20,000	300	13	2680	2690
	400	11	1920	1930
30,000	300	15	3570	3580
	400	14	3110	3120
		M57, M30		
10,000 OR LOWER	300	8	1000	1010
	400	7	790	800
20,000	300	11	1910	1920
	400	9	1280	1290
30,000	300	13	2670	2680
	400	11	1910	1920
		M88, M81		
10,000 OR LOWER	300	8	1000	1010
	400	7	790	800
20,000	300	12	2270	2280
	400	10	1580	1590
30,000	300	14	3090	3100
	400	11	1910	1920

NOTE

The lower air density at high altitudes is responsible for the increase in required safe arming time for high altitude releases. A linear interpolation between the safe arming time values listed for 10,000, 20,000, and 30,000 feet may be accomplished to determine the required safe arming time value for intermediate altitudes.



DIVE BOMBING.

In this mode, the bomb is released from a fixed dive angle approach to the target. Release is accomplished manually at a preplanned airspeed and altitude. The aircraft flight path is projected beyond the target, by means of a depressed sight line, to compensate for the curvature of the bomb trajectory. See Figure 4-1.

This chart is drawn to scale for a BDU-33/B 45 degree dive, 340 KTAS, 3000 foot AGL release, 10 degree C at release altitude. The bomb range for this release condition (obtained from bombing table) is 2324 feet. Therefore, for this release condition, the bomb must be released at a horizontal distance of 2324 feet from the target at the planned 3000 foot AGL and 45 degree dive angle. If the 45 degree dive flight path is projected from the release point into the ground, it can be seen that sight depression, sufficient to project the flight path approximately 676 feet beyond the target, is required to compensate for the trajectory curvature. Figure 4-7 illustrates the other items which must be considered in computing the depression setting which will provide the required depression from flight path. The formula used to compute setting is as follows:

$$\phi = 17.78 \left[\tan^{-1} \frac{Y_P}{R_P \pm W_R t} - |\theta| \right] + \alpha - \beta$$

where

ϕ = sight depression in mils.

$Y_P = Y_R$ - (X parallax factor) sin θ + (Y parallax factor) cos θ

$R_P = R$ - (X parallax factor) cos θ - (Y parallax factor) sin $\theta + R_C$

Y_R = release altitude (AGL) in feet.

R = bomb range in feet under no-wind conditions.

X parallax factor = 23 feet.

Y parallax factor = 3 feet

R_C = range correction factor.

W_R = release rangewind component in ft/sec. Headwind is minus; tailwind is plus.

t = bomb time of flight in seconds.

θ= release angle in degrees. This is the angle angle between the horizontal and the aircraft flight path.

α = fuselage reference line angle of attack in mils.

DIVE BOMBING

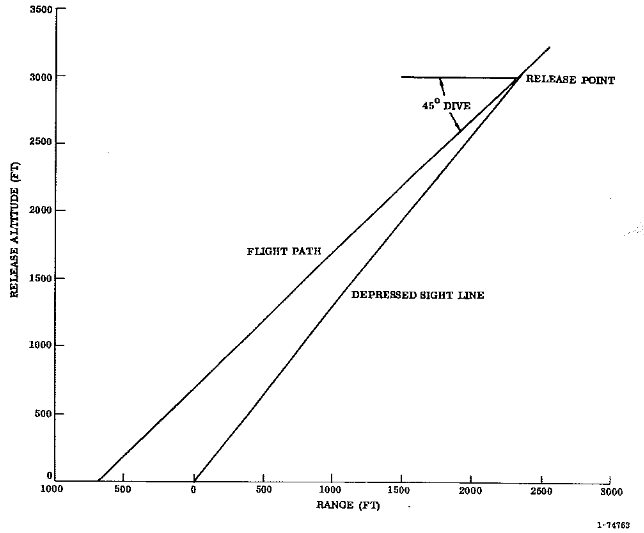


Figure 4-1. Dive Bombing

β = zero sight line orientation with respect to the aircraft fuselage reference line in mils.

The quantity

$$17.78 \left[\tan^{-1} \frac{Y_P}{R_P \pm W_R t} - |\theta| \right]$$

in the sight depression angle formula represents the depression angle from flight path which is listed in the bombing tables. It is a function of release altitude, bomb range, and dive angle. Bomb range, in turn, is a function of release altitude, dive angle, true airspeed, ejection velocity, and effective drag. Since many variables are involved and the depression setting is based on preplanned conditions, any deviation from preplanned conditions is bound to result in impact range error. The following paragraphs indicate the amount of impact error to be expected for certain deviations from planned release TAS, altitude, or dive angle. The following standard or planned conditions are assumed:

a.	Release TAS:	340 knots
b.	Release Altitude:	3000 feet AGL
c.	Release Angle:	-40 degrees
d.	Aircraft Gross Weight:	40,000 lbs
e.	Temperature at Release Altitude:	5° C (41° F)
f.	Wind:	Calm
g.	Munition	M117

For these conditions, the sight depression from flight path is 128 mils and the aircraft angle of attack at release is -18.4 mils. Therefore, the release depression setting would be 109.6 mils (sum of depression from flight path and angle of attack). With a fixed depression setting assumed, the following equation determines an offset aimpoint required for a hit if the actual release condition is different from the planned release conditions.

$$A = R_P - Y_P \cot\left[\theta + \frac{\phi - \alpha_A + \alpha_P}{17.78}\right]$$

where

A = offset aimpoint in feet

$Y_P = Y_R$ - (X parallax sin $|\theta|$ + (Y parallax factor) cos $|\theta|$

$R_P = R$ - (X parallax factor) cos $|\theta|$ - (Y parallax factor) sin $|\theta|$ + R_C

X parallax factor = 23 feet

Y parallax factor = 3 feet

R = bomb range in feet

Y_R = release altitude (AGL) in feet

θ = release angle in degrees

ϕ = planned depression angle from flight path in mils

α_A = actual angle of attack in mils

α_P = planned angle of attack in mils

A is an aimpoint offset. If the bomb is released with the depressed sight on the target, it can be used to represent impact error. The Y_P cot [ ] part of the formula provides the horizontal distance from release to target for the actual release condition. A positive A (offset) indicates a positive (long) error. The offset is zero if all conditions are met.

Effect of Release TAS Error.

TAS = 320 knots (20 knots slower than planned), 40° dive, 3000 feet AGL, α_A = -15.6 mils, and R = 2726 feet.

$$A = 2706 - 2988 \cot\left[40 + \frac{128 + 15.6 - 18.4}{17.78}\right]$$

A = -76 feet

TAS = 360 knots (20 knots faster than planned), 40° dive, 3000 feet AGL, α_A = -20.7 mils, and R = 2844 feet.

$$A = 2824 - 2988 \cot\left[40 + \frac{128 + 20.7 - 18.4}{17.78}\right]$$

A = 70 feet

Effect of Release Altitude Error.

Altitude = 2800 feet (200 feet lower than planned), 40° dive, 340 KTAS, α_A = -18.4 mils, and R = 2635 feet.

$$A = 2615 - 2788 \cot\left[40 + \frac{128 + 18.4 - 18.4}{17.78}\right]$$

A = 33 feet

Altitude = 3200 feet (200 feet higher than planned), 40° dive, 340 KTAS, α_A = -18.4 mils, and R = 2938 feet.

$$A = 2918 - 3188 \cot\left[40 + \frac{128 + 18.4 - 18.4}{17.78}\right]$$

A = -34 feet

Effect of Dive Angle Error.

Dive angle = 35° (5° less than planned), 340 KTAS, 3000 feet AGL, α_A = -16.8 mils, and R = 3197 feet.

$$A = 3176 - 2989 \cot\left[35 + \frac{128 + 16.8 - 18.4}{17.78}\right]$$

A = -131 feet

Dive angle = 45° (5° steeper than planned), 340 KTAS, 3000 feet AGL, α_A = -19.8 mils, and R = 2418 feet.

$$A = 2400 - 2986 \cot\left[45 + \frac{218 + 19.8 - 18.4}{17.78}\right]$$

A = 90 feet

LOW LEVEL BOMBING.

In this mode, the bomb is released from a low altitude level approach at a planned airspeed and altitude above ground. If the depressed sight line is used for estimating the release point, the procedure used for the dive bombing error analysis may be used to estimate low level bombing errors resulting from deviation from the planned conditions. The following standard or planned conditions are assumed:

a. Release TAS:	320 knots
b. Release Altitude:	50 feet
c. Release Angle:	0°
d. Aircraft Gross Weight:	40,000 lbs

e.	Temperature at Release Altitude:	15° C (41° F)
f.	Wind:	Calm
g.	Munition:	Unfinned BLU-1C/B

For these conditions, the slight depression angle from the flight path is 63 mils, and the angle-of-attack is -10.0 mils

Effect of Release TAS Error.

TAS = 300 knots (20 knots slower than planned), 0° release angle, 50 feet AGL, α_A = - 5.9 mils, R = 829 feet.

$$A = 806 - 53 \cot \left[0^\circ + \frac{63 + 5.9 - 10.0}{17.78}\right]$$

A = - 110 feet

TAS = 340 knots (20 knots faster than planned), 0° release angle, 50 feet AGL, α_A = -13.2 mils, R = 930 feet.

$$A = 907 - 53 \cot \left[0^\circ + \frac{63 + 13.2 - 10.0}{17.78}\right]$$

A = 92 feet

Effect of Release Altitude Error.

Release altitude = 40 feet (10 feet lower than planned), 0° release angle, 320 KTAS, α_A = - 10.0 mils, R = 793 feet.

$$A = 770 - 43 \cot \left[0^\circ + \frac{63 + 10.0 - 10.0}{17.78}\right]$$

A = 75 feet

Release altitude = 60 feet (10 feet higher than planned), 0° release angle, 320 KTAS, α_A = -10.0 mils, R = 957 feet.

$$A = 934 - 63 \cot \left[0^\circ + \frac{63 + 10.0 - 10.0}{17.78}\right]$$

A = -84 feet

Effect of Release Angle Error.

Release angle = -1° instead of planned 0°, 50 feet AGL, 320 KTAS, α_A = -10.0 mils, R = 762 feet.

$$A = 739 - 53 \cot \left[1^\circ + \frac{63 + 10.0 - 10.0}{17.78}\right]$$

A = 72 feet

Release angle = + 1° instead of planned 0°, 50 feet AGL, 320 KTAS, α_A = -10.0 mils, R = 1011 feet.

$$A = 988 - 53 \cot \left[-1^\circ + \frac{63 + 10.0 - 10.0}{17.78}\right]$$

A = -207 feet

ROCKET LAUNCHING 2.75-INCH FFAR.

As in dive bombing, the depressed pipper is used to compensate for the curvature of the rocket trajectory from the launch point to impact. These projectiles can be delivered more accurately than a bomb under most circumstances because the high velocity attained after launch provides a much straighter trajectory with less time of flight. The following launch conditions were used as the standard for an error analysis study:

a.	Airspeed	360 KTAS
b.	Altitude	2500 feet
c.	Angle	30° dive

Errors caused by deviation of ± 20 knots from the 360 knots standard, ± 200 feet from the 2500 feet altitude standard, and ± 5° from the 30° dive standard were computed. The effects of these deviations from planned launch conditions on the 2.75-inch rocket impact are very small. The ± 20 knots airspeed deviations cause impact range errors of approximately ± 30 feet. The ± 200 feet altitude deviations cause impact range errors of approximately ± 5 feet. The ±5° dive angle deviations cause impact errors of approximately ± 20 feet. These errors are much less than the normal rocket dispersion from the standard trajectory.

EFFECT OF RELEASE ALTITUDE ERROR AND RESULTNG VARIATION OF SLANT RANGE AT RELEASE ON ORDNANCE IMPACT.

Ordnance released at a higher altitude than planned, resulting in a greater slant range from the target, results in the ordnance impacting short of the target. See Figure 4-2. Consequently, ordnance released at a lower altitude, resulting in a shorter slant range from the target, will overshoot the target. The fallacy of pressing into the target becomes immediately apparent as the released ordnance will overshoot the target while further exposing the aircraft to the bomb blast and fragmentation envelope.

EFFECT OF DIVE ANGLE ON ORDNANCE IMPACT POINT.

Releasing ordnance at a steeper than optimum dive angle results in the ordnance overshooting the target due to the lesser sight depression requirement as the release dive angle increases. See Figure 4-3. A reduced dive angle from optimum results in the ordnance impacting short due to the requirement for a greater sight depression angle at shallower dive angles.

EFFECT OF RELEASE ALTITUDE ERROR AND RESULTING VARIATION OF SLANT RANGE AT RELEASE ON ORDNANCE IMPACT

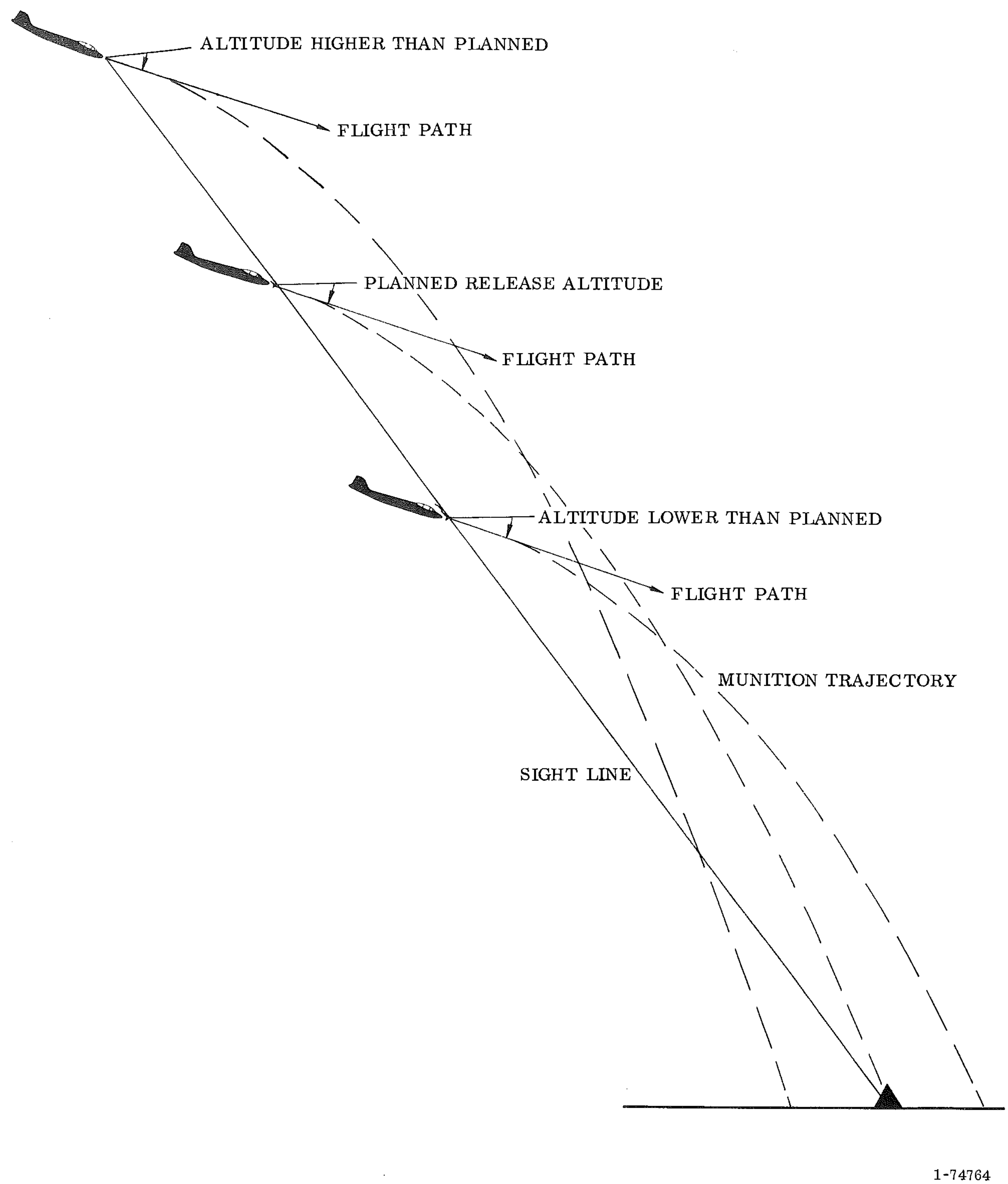


Figure 4-2

EFFECT OF DIVE ANGLE ON ORDNANCE IMPACT

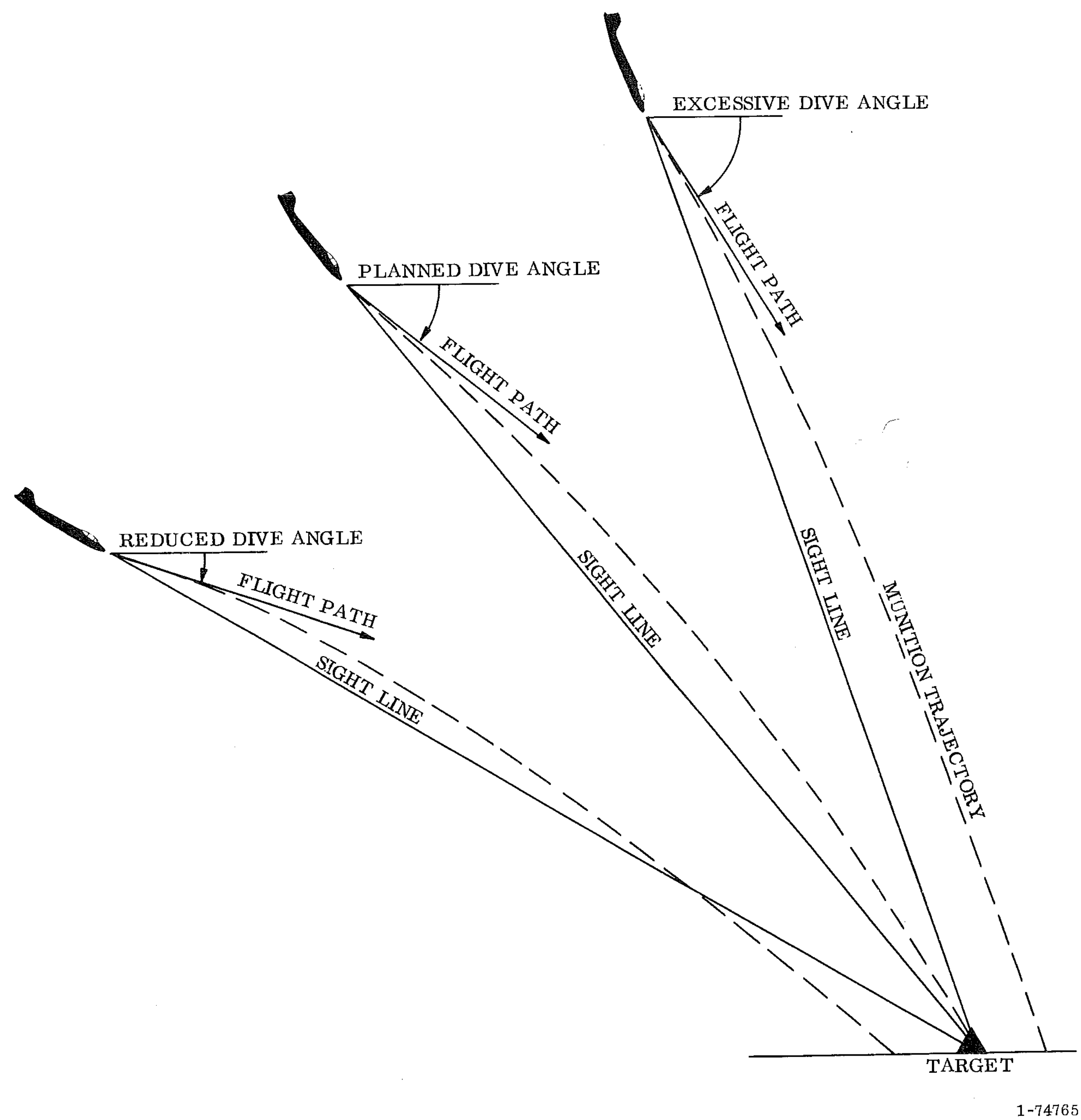


Figure 4-3

EFFECT OF DIVE ANGLE AND SLANT RANGE ON ORDNANCE IMPACT POINT.

When using the altimeter to determine correct release altitude commensurate with the optimum release slant range, variations in dive angle induces a double error in the ordnance impact point. See Figure 4-4. Releasing on a given altimeter indication when the dive angle is steeper than optimum also reduces the release slant range. Either condition requires less sight depression and the ordnance overshoots the target.

Consequently, releasing on a given altimeter indication in a shallower dive angle than optimum creates a requirement for greater sight depression than selected to compensate for the decreased dive angle and increased range and the ordnance will impact short of the intended target. When computing indicated altimeter indications to determine release it is important to have the altimeter set to the target altimeter setting and to include altimeter lag in the computations.

EFFECT OF DIVE ANGLE AND SLANT ANGLE ON ORDNANCE IMPACT

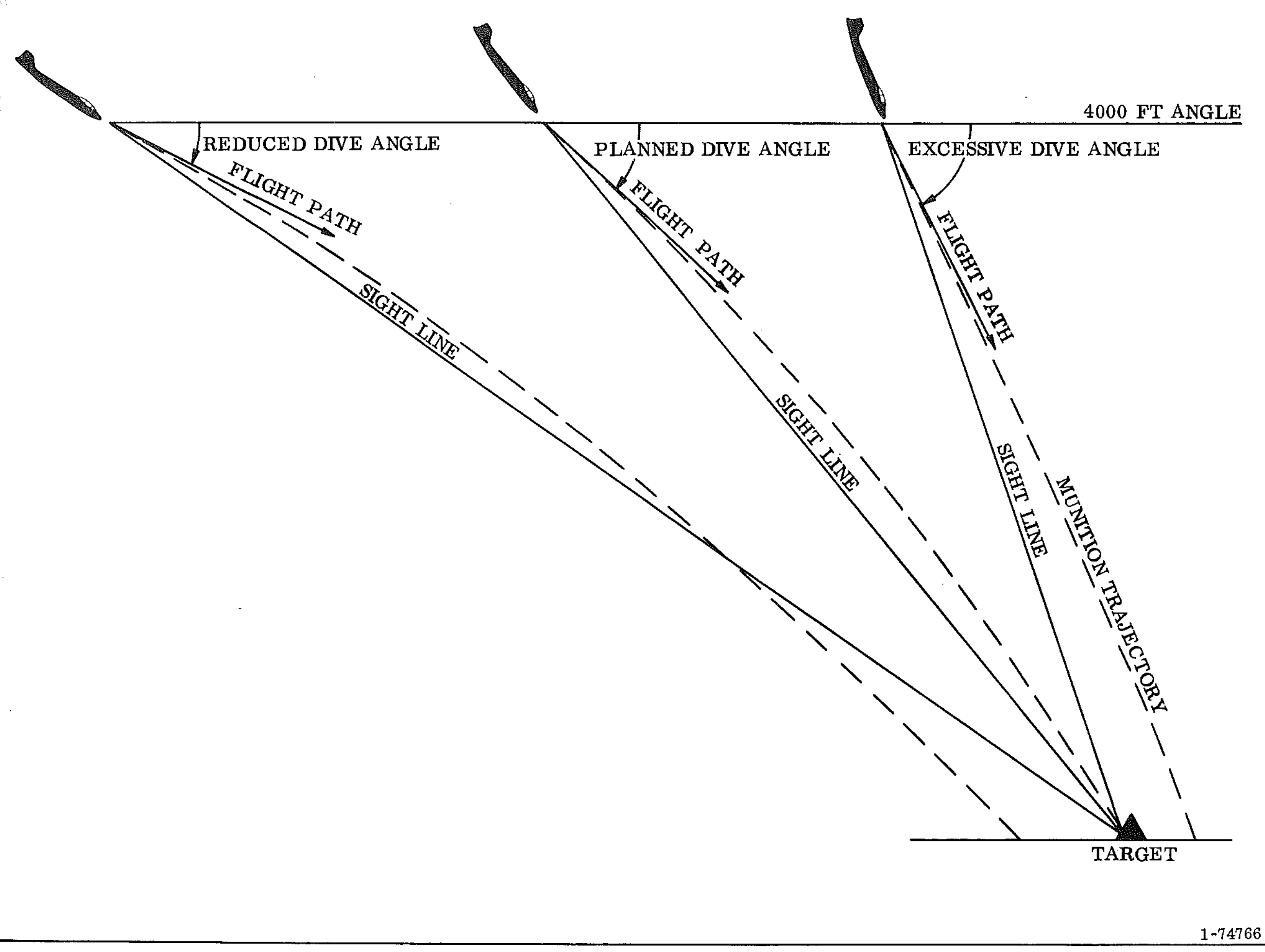


Figure 4-4

EFFECT OF AIRSPEED ON ORDNANCE IMPACT.

The only velocity imparted to a bomb released from an aircraft is the velocity imparted by the speed of the aircraft at the time of release. See Figure 4-5. Bombs released at a lower airspeed than required by the computed sight setting results in the bomb impacting short of the target and consequently bombs released at a higher than computed airspeed will overshoot the target. Changes in aircraft airspeed changes the angle of attack of the aircraft and will alter the sight depression relative to the flight path of the aircraft. The changed angle of attack will in turn induce an overshoot or undershoot error in impact of the ordnance.

This same change in angle of attack of the aircraft will alter the angle of attack of the rocket launcher and muzzles of the guns relative to the flight path of the aircraft. This in turn alters the amount of trajectory shift of the rocket and guns while at the same time imparting a different aircraft release velocity to the projectiles. Rockets are greatly effected by changes in release airspeed from optimum and guns to a lesser degree. An increase in airspeed from the optimum selected for a given release condition and precomputed sight setting will cause an overshoot for rocket and gun projectives. An undershoot will occur when the airspeed is less than optimum.

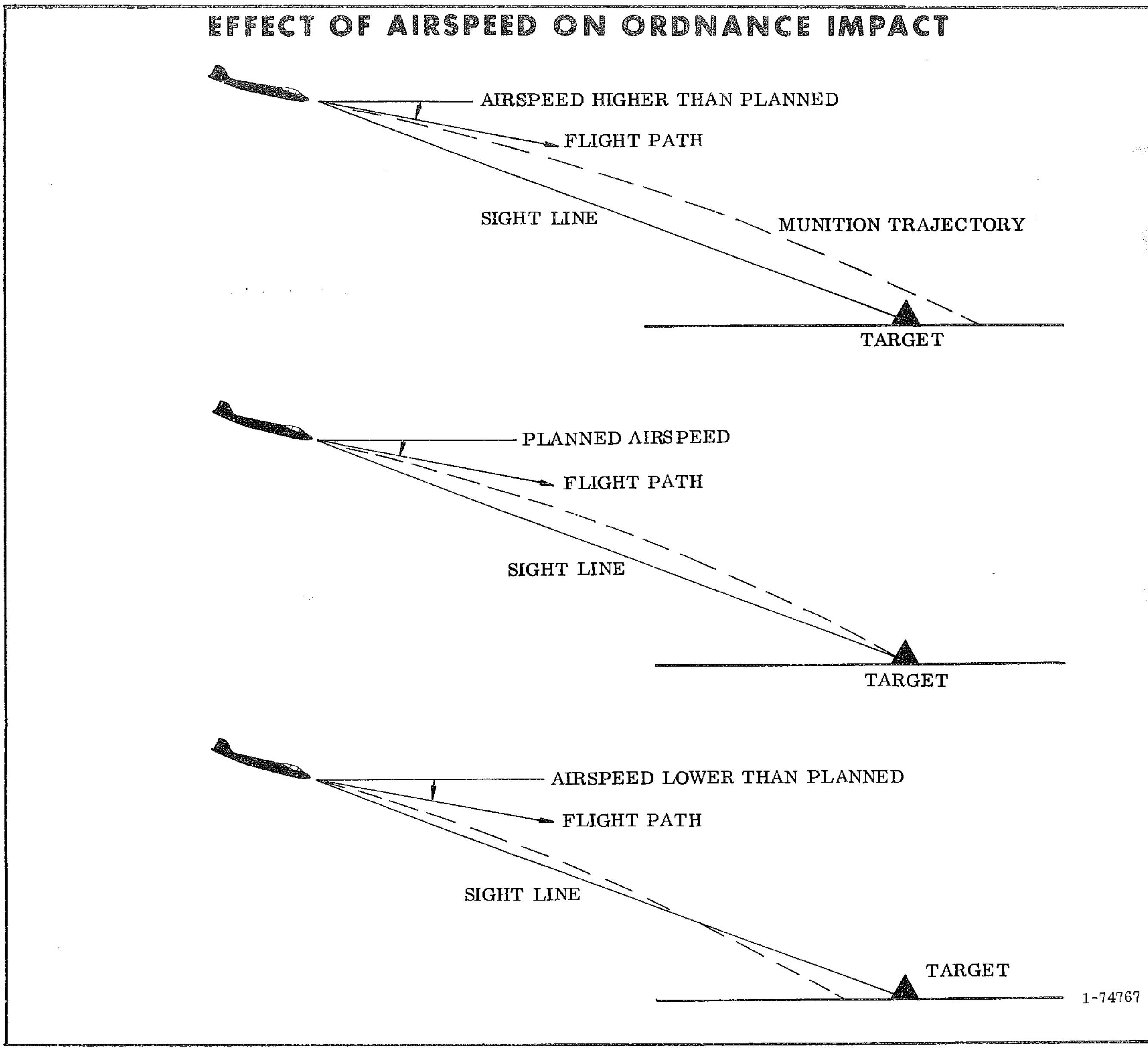


Figure 4-5

EFFECT OF SKID ON ORDNANCE IMPACT.

Ordnance released while the aircraft is flying in a skid causes the impact to occur right or left of the target as a result of the cross vector forces acting on the ordnance at the time of release. See Figure 4-6. Right rudder application, in an attempt to hold the sight picture in the target, will cause the ordnance to impact left of the target and conversely left rudder application will cause the ordnance to impact to the right. Bombs are the most effected by skid as bombs will follow the flight of the aircraft and the total error increases in proportion to the release slant range. Rockets and guns have their own velocity at release and the resultant forces cause less drift error. The bullet path is the result of the aircraft velocity and muzzle velocity. As the latter is so high when compared with aircraft speed the bullet veers very little from the sight line. The rocket velocity being less falls between the bomb and bullet projectile.

EFFECT OF SKID ON ORDNANCE IMPACT

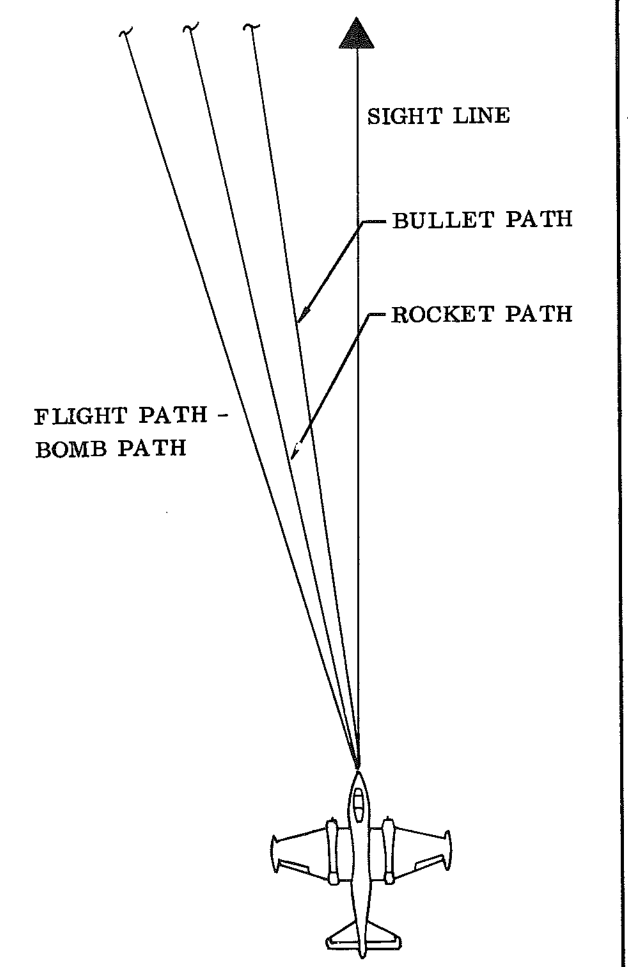


Figure 4-6

EFFECT OF "G" LOADING ON ORDNANCE IMPACT.

Dive bombing ballistic tables are based on a release G force equal to the cosine of the dive angle (.866 G at 30°, for example). Ordnance released when the aircraft deviates from the planned G condition will result in an impact error. See Figure 4-7. An increase in G-loading on an aircraft results in an increase in angle of attack which, in effect decreases sight depression relative to the flight path. The result will be an undershoot. Conversely, a negative G-loading will decrease the aircraft angle of attack, thus producing an overshoot. Gun and rocket accuracy is further aggravated by the different than computed trajectory shift caused by the change in the muzzle and launcher angle of attack.

EFFECT OF ALTITUDE ON LEVEL BOMBING.

Bombs released from the aircraft flying at an altitude above the optimum release altitude computed for release result in the sight picture occurring early and the bomb impacting short of the target. See Figure 4-8. Consequently, bombs released below the optimum release altitude results in a late sight picture and the bomb impacts past the target.

EFFECT OF RELEASING ORDNANCE IN A BANK ON ORDNANCE IMPACT.

Ordnance released from the aircraft is immediately effected by gravity and depending on the type of ordnance released and the sight depression selected the ordnance will impact right or left of the target if released while the aircraft is in a bank. See Figure 4-9. This will create the greatest error when releasing bombs, as the bomb has the least amount of forward velocity to counteract the force of gravity and requires a greater amount of sight depression which will in turn place the aircraft further right or left of the target at release. Guns are least affected by firing while in a bank. Rocket projectiles have a velocity of their own and are less affected than bombs but more so than guns.

DEPRESSED SIGHT LINE PENDULUM EFFECT.

Tracking the target with the pipper while the aircraft is in a bank results in the pipper moving away from the target when the aircraft wings are leveled. See Figure 4-10. The movement becomes more pronounced as the sight line is depressed. Consequently initiated aircraft alignment with the target should be accomplished by reference to the nose of the aircraft until the wings are leveled and transition can be made to the sight line for tracking reference.

EFFECT OF 'G' LOADING ON ORDNANCE IMPACT

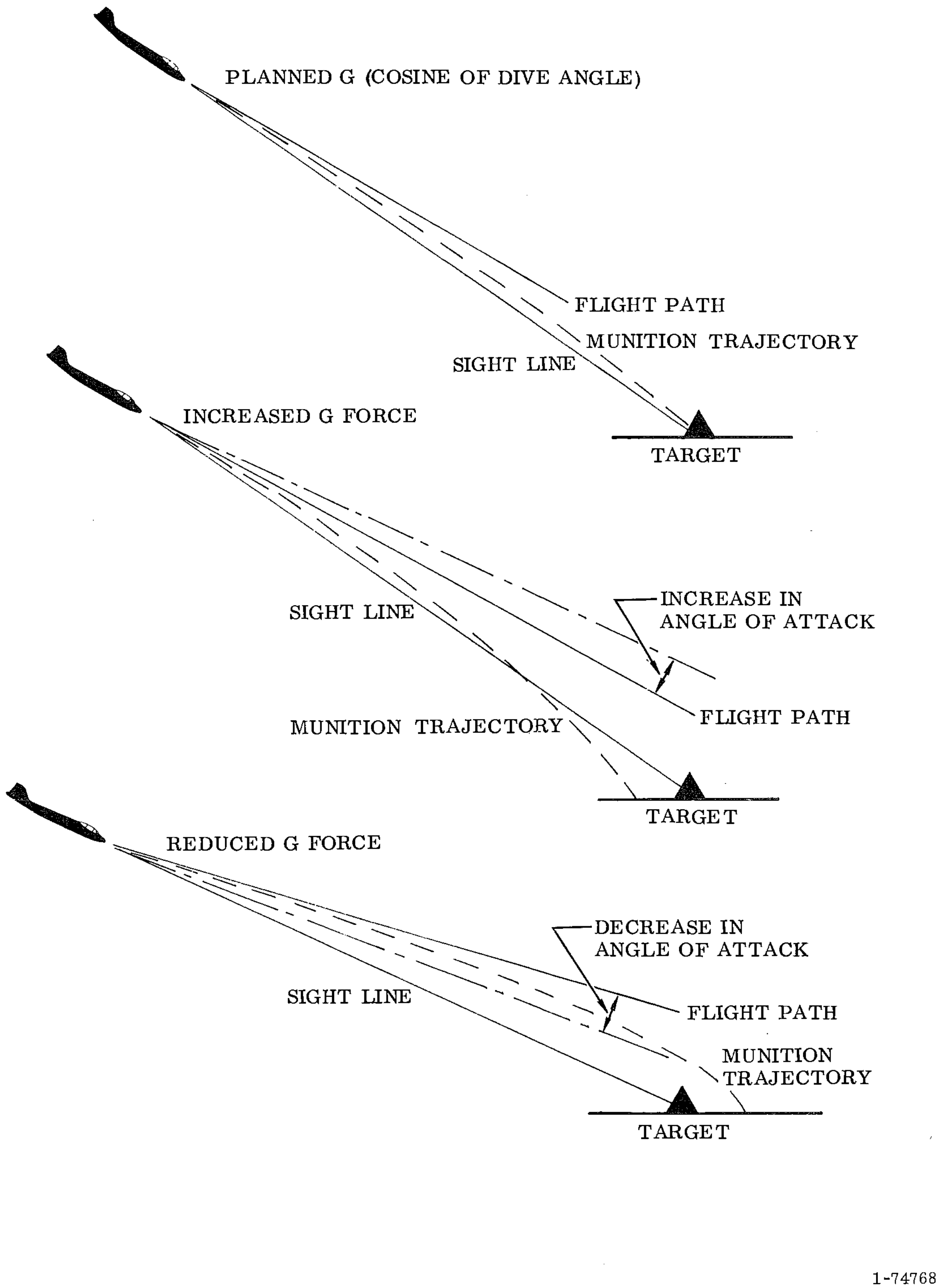


Figure 4-7

EFFECT OF ALTITUDE ON LEVEL BOMB IMPACT

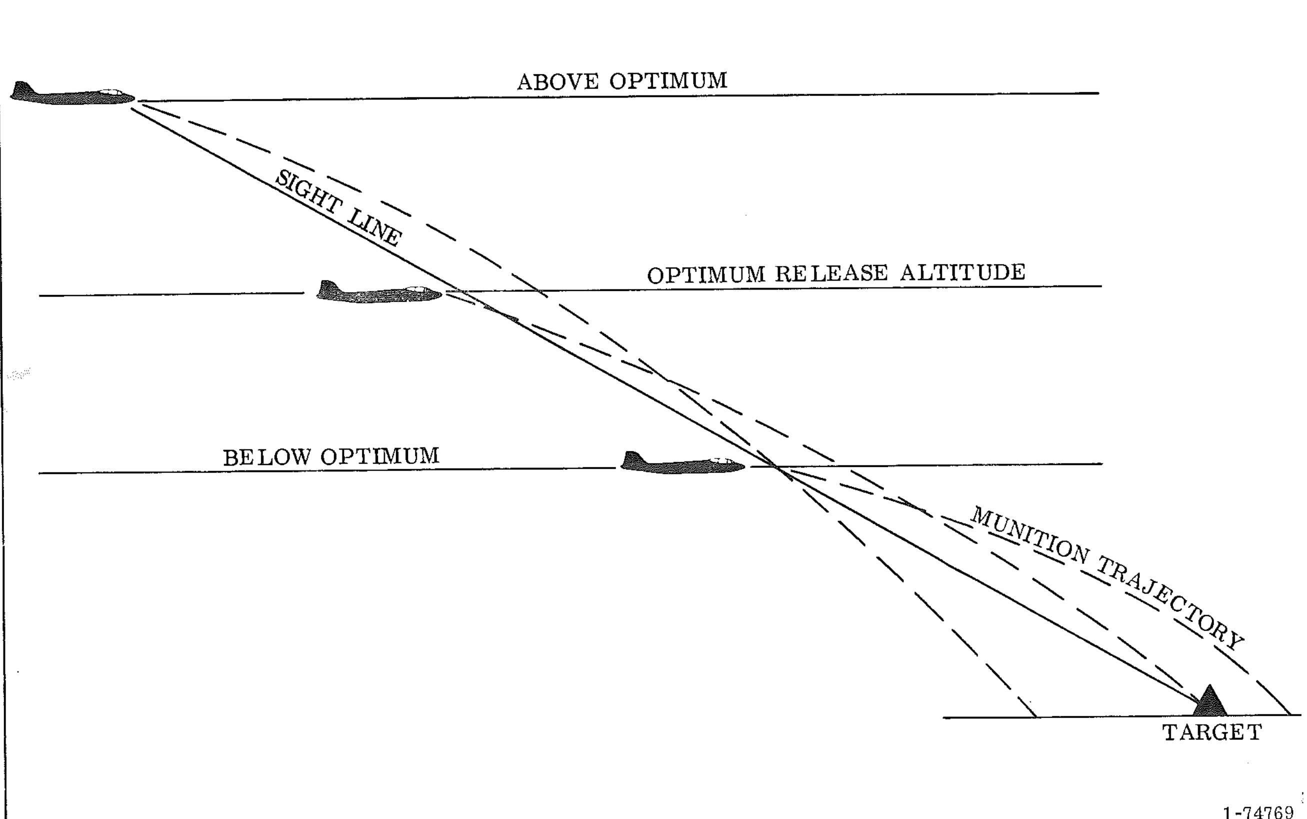


Figure 4-8

OFFSETTING FOR EXTERNAL STORE SINGLE RELEASE.

Due to the distance, the external stations are offset from the aircraft center line and sight line. See Figure 4-11. Some correction must be made right or left of the target to compensate for this distance when making single releases from external stations. This is true for bombs and also for rockets as the rockets are designed to fire straight ahead of the aircraft and do not converge towards the aircraft center line.

Distances from the aircraft center line to the four external stations are listed below.

Outboard rocket station (STA) 1 and 2 - 28 feet

Inboard rocket station (STA) 3 and 4 - 25 feet

Outboard bomb/rocket station (STA) L_2, R_2, 5 and 6 - 22 feet

Inboard bomb/rocket station (STA) L_1, R_1, 7 and 8 - 19 feet

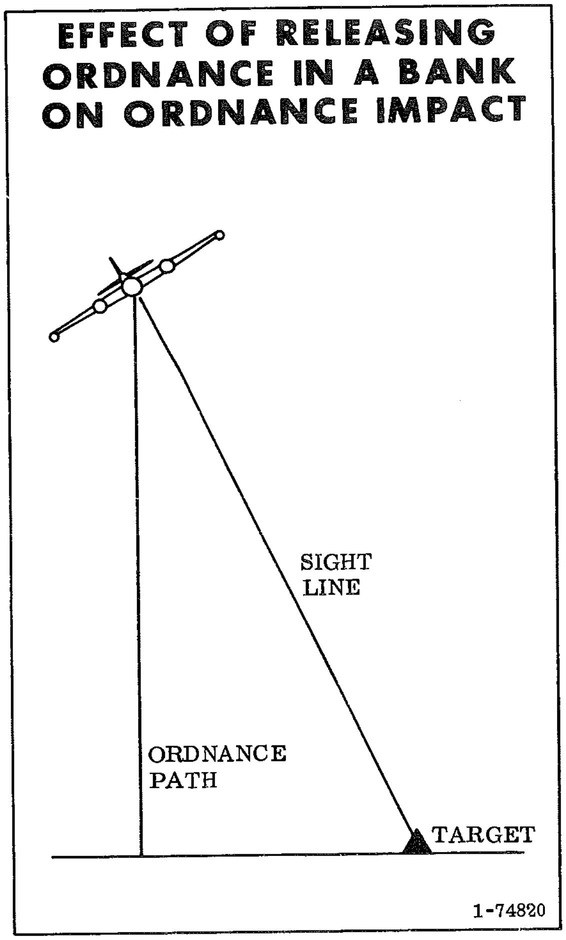


Figure 4-9

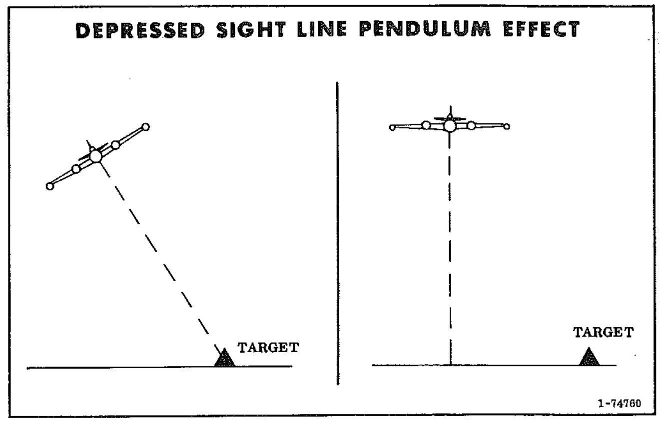


Figure 4-10

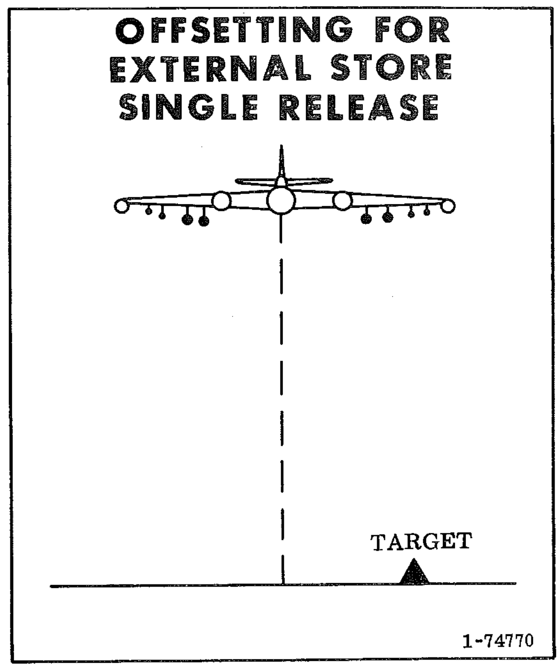


Figure 4-11

SECTION V

PLANNING PROCEDURES AND SAMPLE PROBLEMS

TABLE OF CONTENTS

INTRODUCTION.

The purpose of this section is to provide the aircrew with the data required to plan a weapon delivery mission with nonnuclear bombs, rockets, practice ordnance and guns and to illustrate the planning procedures.

All ballistic table computations are based on the ICAO Standard Day Atmosphere. Ambient temperature and pressure variations from the standard day will not significantly affect the nonnuclear item trajectory computations because the weapon time of flight is generally short.

REFERENCE LINES.

The various reference lines used in the computations covered in this manual are illustrated in figure 5-1.

REFERENCE LINES

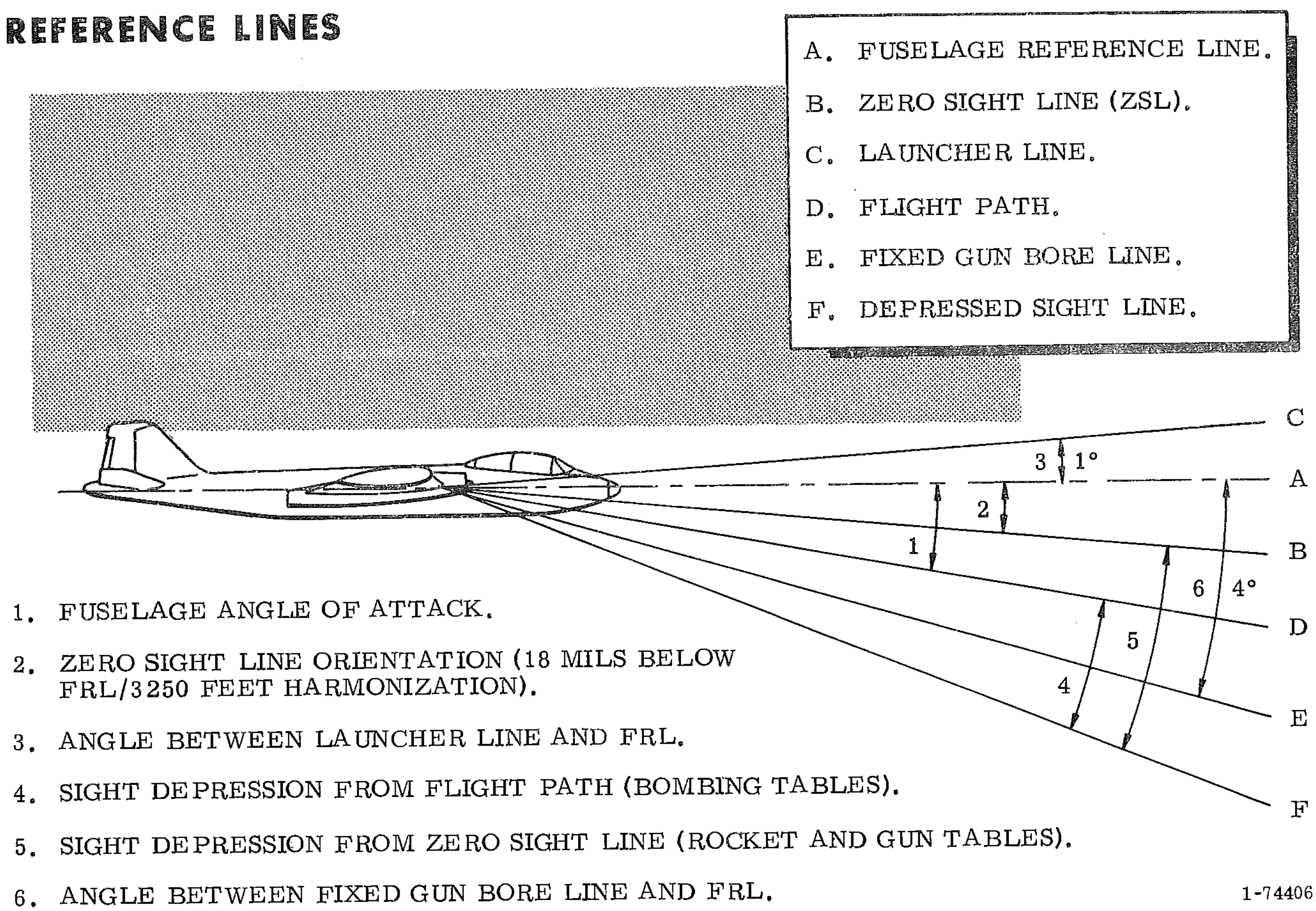


Figure 5-1

PRESSURE ALTITUDE.

Pressure altitude is the altitude read on the aircraft altimeter when a setting of 29.92 inches of Hg is used. The term pressure altitude is used because an altimeter is merely a specialized barometer which is calibrated in accordance with the standard day atmosphere pressure lapse rate. The altimeter setting permits correction to sea level conditions. No simple way has been devised to correct for variation in the pressure lapse rate from sea level to altitude. The only way to accomplish this correction is to determine from observations the actual pressure altitude for the desired flight level above MSL and fly this value using an altimeter setting of 29.92.

SIGHT SETTING COMPUTATION.

The rocket, 20mm, and .50 caliber firing tables provide the depressed reticle setting as a function of the zero sight line angle of attack. Range tables are provided to illustrate the aircraft slant range and horizontal range to the aimpoint for the various values of aircraft angle of attack. Rangewind correction tables are provided to show a mil correction and the wind effect in feet for various values of rangewind at firing altitudes. The wind effect in foot value may be used as an offset aimpoint to compensate for the effect of various values of crosswind at firing altitudes. The mil correction is added for headwinds and subtracted for tailwinds. Compensation for launcher line orientation, trajectory shift and trajectory drop is included in the basic no-wind depressed reticle settings. These settings are based on a 3250 foot harmonization.

The bombing tables provide the sight depression angle from the aircraft flight path and rangewind correction factors. Use the angle of attack chart to find the aircraft zero sight line angle of attack in mils. The depressed reticle setting equals sight depression from flight path plus rangewind correction factor plus zero sight line angle of attack.

NOTE

The zero sight line angle of attack equals FRL angle of attack minus 18 mils.

INTERPOLATION OF BALLISTIC TABLES.

If it is deemed necessary to interpolate between values in the ballistic tables, a straight linear interpolation is adequate.

DESCRIPTION OF CHARTS AND TABLES.

GENERAL PURPOSE BOMBS AND FRAGMENTATIONS.

The general purpose and fragmentation bomb release conditions are contained in the level dive and ripple bombing tables (T.O. 1B-57B-34-1-2). Special charts are also provided in Section VI for recomputation of sight depression angles (from flight path) for other impact points commencing at any desired distance short of the target.

Level Bombing Tables.

The conditions for level bombing are based on a 0 degree dive angle. The level bombing tables include the following parameters.

a. Release velocity (TAS): 300-knots to 400-knots true airspeed in 20-knot increments.

b. Release altitudes: 500 feet to 4000 feet.

c. Ejection velocity: All bombs - 0 ft/sec.

The following data may be obtained from the tables:

a. Bomb range from release to impact, in feet.

b. Bomb time of flight, in seconds.

c. Slant range from release to impact, in feet.

d. Trajectory impact angle, in degrees. (This data item is provided for aid in terminal effect studies.)

e. Sight depression angle from flight path, in mils.

f. Headwind correction factor, in mils per knot.

g. Tailwind correction factor, in mils per knot.

h. Crosswind correction factor, in feet per knot.

Dive Bombing Tables.

The bomb release conditions provide at least a 100-foot ground clearance during dive recovery. The ground clearance computations are based on a pullout acceleration of 3.5g attained 2.0 seconds after release.

The dive bombing tables include the following conditions:

a. Release velocity (TAS): 300-knots to 400-knots true airspeed in 20-knot increments.

b. Dive angles: 20 to 45 degrees in 5 degree increments.

c. Release altitude above target: 1000 feet to 7000 feet in 500-foot increments.

d. Ejection velocities: All bombs - 0 ft/sec.

The following data may be obtained from the tables:

a. Bomb range from release to impact, in feet.

b. Bomb time of flight, in seconds.

c. Slant range from release to impact, in feet.

d. Trajectory impact angle, in degrees. (This data item is provided for aid in terminal effect studies.)

e. Slight depression angle from flight path, in mils.

f. Headwind correction factor, in mils per knot.

g. Tailwind correction factor, in mils per knot.

h. Crosswind correction factor, in feet per knot.

Ripple Bombing Tables.

Ripple bombing tables are provided as supplementary data and are not used in the sample problem. These tables can be used for specific cases, where applicable, in lieu of the method shown in the sample problem pertaining to ripple bombing. For release conditions of 350 KTAS, 15 and 30 degree dive angles, various release altitudes, and grouped under B-3A intervalometer settings of 100 mph and various intervals, the following data is provided:

a. Range release to center of ripple, in feet.

b. Time of fall of first bomb, in seconds.

c. Release altitude of last bomb, in feet.

d. Ripple length, in feet.

e. Sight depression angle, in mils.

f. Head and tailwind correction factors, in mills/knot.

g. Crosswind correction factors, in feet/knot.

This data is provided for the following munitions:

a. M30A1 GP Bomb (box or conical fin); 7, 14 and 21 bomb ripple releases.

b. M57A1 GP Bomb (box or conical fin); 4, 8 and 12 bomb ripple releases.

c. M117 GP Bomb with M131 fin; 4 bomb ripple release.

d. M1A2/M1A4 Frag Cluster Bomb; 4, 8 and 12 bomb ripple releases.

e. M81 Frag Bomb (box or conical fin); 7, 14 and 21 bomb ripple releases.

f. M88 Frag Bomb (box or conical fin); 7, 14 and 21 bomb ripple releases.

g. MK81 GP Bomb (low drag).

h. MK82 GP Bomb (low drag).

FIRE BOMBS.

The fire bomb release conditions are contained in the level bombing and dive bombing tables (T.O. 1B-57B-34-1-2). Special charts are also provided in Section VI for recomputation of right depression angles (from flight path) for other impact points commencing at any desired distance short of the target.

Level Bombing Tables.

The conditions for level bombing are based on a 0 degree dive angle. The level bombing tables include the following parameters:

a. Release velocity (TAS): 300-knots to 400-knots true airspeed in 20-knot increments.

b. Release altitudes: 50 feet to 2000 feet in 25, 50 and 500-foot increments.

c. Ejection velocity: All bombs - 0 ft/sec.

The following data may be obtained from the tables:

a. Bomb range from release to impact, in feet.

b. Bomb time of flight, in seconds.

c. Slant range from release to impact, in feet.

d. Trajectory impact angle, in degrees. (This data item is provided for aid in terminal effects studies.)

e. Sight depression angle from flight path, in mils.

f. Headwind correction factor, in mils per knot.

g. Tailwind correction factor, in mils per knot.

h. Crosswind correction factor, in feet per knot.

Dive Bombing Tables.

The dive release conditions, based on a 3.5g pullout, provide at least a 100-foot ground clearance during recovery. The ground clearance computations are based on a pullout acceleration of 3.5g attained 2.0 seconds after release.

The dive bombing tables include the following conditions.

a. Release velocity (TAS): 300-knots to 400-knots true airspeed in 20-knot increments.

b. Dive angle: 15, 30, 35 and 40 degrees.

c. Release altitude above target: 500 feet to 4500 feet in 500-foot increments.

d. Ejection velocities: All bombs - 0 ft/sec.

The following data may be obtained from the tables:

a. Bomb range from release to impact, in feet.

b. Bomb time of flight, in seconds.

c. Slant range from release to impact, in feet.

d. Trajectory impact angle, in degrees. (This data item is provided for aid in terminal effects studies.)

e. Sight depression angle from flight path, in mils.

f. Headwind correction factor, in mils per knot.

g. Tailwind correction factor, in mils per knot.

h. Crosswind correction factor, in feet per knot.

MISCELLANEOUS MUNITIONS.

M35 and M36 Incendiary Cluster.

Dive bombing tables are provided in T.O. 1B-57B-34-1-2 for the M35 and M36 incendiary cluster. These tables include the following information:

a. Release velocity (TAS): 300-knots to 400-knots true airspeed in 20-knot increments.

b. Dive angle: 0, 15, 25, 30, 35, 40 and 45 degrees.

c. Release altitude above target: 1300 to 5000 feet.

d. Bomb range from release to impact, in feet.

e. Bomb time of flight, in seconds.

f. Slant range from release to impact, in feet.

g. Trajectory impact angle, in degrees.

h. Sight depression angle from flight path, in mils.

i. Wind correction factors.

M129E1 Leaflet Bomb.

A level bombing table is provided in T.O. 1B-57E-34-1-2 for the M129E1 leaflet bomb. The table includes the following information:

a. Release velocity (TAS): 300-knots to 400-knots true airspeed in 20-knot increments.

b. Release altitude above fuze function: 1000 to 10,000 feet in 1000-foot increments.

c. Bomb range to fuze function, in feet.

d. Bomb time of fall to fuze function, in seconds.

BDU-33/B and BDU-33A/B Practice Bomb.

Level bombing and dive bombing tables are provided in T.O. 1B-57B-34-1-2 for the BDU-33/B and BDU-33A/B practice bomb. The level bombing tables include the following information:

a. Dive angle - 0 degrees.

b. Release velocity (TAS): 300-knots to 400-knots true airspeed in 20-knot increments.

c. Release altitude above target: 50 to 4000 feet.

d. Bomb range from release to impact, in feet.

e. Bomb time of flight, in seconds.

f. Slant range from release to impact, in feet.

g. Trajectory impact angle, in degrees.

h. Sight depression angle from flight path, in mils.

i. Wind correction factors.

The dive bombing tables contain the following information:

a. Dive angle: 15 to 40 degrees in 5-degree increments.

b. Release velocity (TAS): 300-knots to 400-knots true airspeed in 20-knot increments.

c. Release altitude above target: 500 to 7000 feet.

d. Bomb range from release to impact, in feet.

e. Bomb time of flight, in seconds.

f. Slant range from release to impact, in feet.

g. Trajectory impact angle, in degrees.

h. Sight depression angle from flight path, in mils.

i. Wind correction factors.

M47A4 SMOKE BOMB.

Level bombing and dive bombing tables are supplied for the M47A4 (T.O. 1B-57B-34-1-2). The level bombing tables contain the following information.

a. Dive angle - 0 degrees.

b. Release velocity (TAS): 300-knots to 400-knots true airspeed in 20-knot increments.

c. Release altitude above target: 500 to 400 feet in 500-foot increments.

d. Bomb range from release to impact, in feet.

e. Bomb time of flight, in seconds.

f. Slant range from release to impact, in feet.

g. Trajectory impact angle, in degrees.

h. Sight depression angle from flight path, in mils.

i. Wind correction factors.

The dive bombing tables contain the following information:

a. Dive angle: 20 to 45 degrees in 5-degree increments.

b. Release velocity (TAS): 300 to 400 knots in 20-knot increments.

c. Release altitude above target: 1000 to 7000 feet in 500-foot increments.

d. Bomb range from release to impact, in feet.

e. Bomb time of flight, in seconds.

f. Slant range from release to impact, in feet.

g. Trajectory impact angle, in degrees.

h. Sight depression angle from flight path, in mils.

i. Wind correction factors.

MK44 Cluster.

Dive bombing tables are provided in T.O. 1B-57B-34-1-2 for the MK44 cluster (shape 2B lazy dog missiles). These tables contain the following information:

a. Function time: 7.0 seconds.

b. Functioning altitude: 500 feet.

c. Dive angle: 0, 15, 25, 30, 35, 40 and 45 degrees.

d. Release velocity (TAS): 300 to 400 knots in 20-knot increments.

e. Release altitude above target: 1300 to 5000 feet.

f. Bomb range from release to impact, in feet.

g. Slant range from release to impact, in feet.

h. Sight depression angle from flight path, in mils.

i. Wind correction factors.

ROCKET FIRING TABLES.

Rocket firing tables are provided for the 2.75-inch FFAR rocket. These data are applicable for all launchers oriented one degree up from the Fuselage Reference Line (FRL). Depressed sight settings, wind correction, slant range and horizontal range data are provided for each firing condition. Based on a 3.5 g pullout attained in 2.0 sec after firing, the aircraft should clear the rocket fragment envelope during recovery for all firing conditions listed in these tables.

The rocket firing tables include the following parameters:

a. Release velocity: 300 knots to 400 knots true airspeed, in 25-knot increments.

b. Release altitudes: 1000 feet to 5000 feet, varying with dive angle and airspeed.

c. Release dive angle: 15° to 45° in 15° increments.

d. Zero sight line angle of attack: -45 mils to -10 mils in 5 mil increments.

The following data may be obtained from the tables:

a. The depressed sight setting (function of ZSL angle of attack) in mils.

b. Slant range and horizontal range at release (function of ZSL angle of attack) in mils.

c. Depressed sight setting correction for rangewind effect (function of wind velocity and time of flight) in mils.

d. Wind effect (function of wind velocity and time of flight) in feet for crosswind offset.

M39 GUN (20mm) AND M3 MACHINE GUN (.50 CAL) FIRING TABLES (GROUND ATTACK).

Depressed sight settings, wind correction, slant range and horizontal range data are provided for ground attack using the M39 cannon or M3 gun. The conditions listed provide at least a 50-foot ground clearance during recovery, based on a 3.5 g pullout attained in 2.0 sec. The tables are identical in format to the rocket firing tables.

DIVE RECOVERY CHARTS.

The dive recovery charts (figures 6-2, 6-3 and 6-4) may be used to determine the altitude lost during pullout. The data on these charts were taken from recovery flight path computations based on the B-57 thrust, drag and angle of attack information. In these computations the acceleration was built up linearly from the cosine of the initial dive angle to the planned 3.0, 3.5 and 4.0 g pullout acceleration. A 2.0 sec g build-up time was used commencing immediately after release or firing. No throttle advance was assumed until the nose of the aircraft passed through the horizon. Enter the chart with release velocity (KTAS). Project to the right to release dive angle and down to altitude lost.

NOTE

Release altitude must always be greater than the sum of altitude lost during pull-out and minimum recovery altitude above ground. These charts contain no reaction time or safety factors other than the 3.0, 3.5 or 4.0 g attained in 2.0 seconds.

ZERO SIGHT LINE (ZSL) ANGLE OF ATTACK CHART.

This chart (figure 6-16) is used to determine the ZSL angle of attack at release and is required in the computation of the depressed sight setting. The unit of measurement used is 1° = 17.7778 mils.

Enter the chart with release KIAS. Project up to aircraft gross weight, across to dive angle, and down to zero sight line (ZSL) angle of attack.

SIGHT DEPRESSION ANGLE CHARTS.

These charts (figures 6-6 through 6-15) provide the sight depression angle from release to aimpoint. Separate charts are provided for release dive angles of 0°, 5°, 10°, 15°, 20°, 25°, 30°, 35°, 40° and 45°. The charts for release dive angles of 0°, 5°, 10° and 15° may be used in the determination of sight depression angles for fire bomb impacts commencing at any desired distance short of the target. Charts for release dive angles of 15°, 20°, 25°, 30°, 40° and 45° may be used in the determination of sight depression from flight path for GP bomb impact patterns using the train release mode. Enter proper dive angle chart with desired distance from release to aimpoint (bomb range plus aiming allowance). Project up to release altitude and across to sight depression angle from flight path.

AIRSPEED CONVERSION CHART.

The airspeed conversion chart (figure 6-16) may be used to convert indicated airspeed (KIAS) to true Mach number to true airspeed (KTAS) and/or vice versa. Release pressure altitude and free-air temperature (°C) are required for the use of this chart.

KIAS to KTAS Conversion. Enter the chart with KIAS. Project up to release pressure altitude, across through Mach number to release temperature, and down to KTAS. Reverse this procedure for KTAS to KIAS conversion.

ALTIMETER CORRECTION CHART.

The altimeter correction chart (figure 6-17) may be used to correct the altimeter reading for position or installation error. The error is a function of release pressure altitude and indicated airspeed.

Enter the chart with indicated airspeed (KIAS). Project up to release pressure altitude and across to the altitude error correction.

ALTIMETER LAG CHART.

Altimeter lag must be considered in the determination of the release indicated altitude for dive maneuvers. Enter the altimeter lag chart (figure 6-5) with release true airspeed (KTAS). Project across to dive angle and down to altimeter lag.

NOTE

This correction is positive.

Release Indicated Altitude.

Release indicated altitude is the sum of the following items:

a. Target altitude above MSL.

b. Release altitude above target.

c. Altimeter lag.

d. Altimeter position error correction.

BOMB RELEASE TIME INTERVAL.

For train releases it is necessary to determine the B-3A release groundspeed (MPH) and interval between bombs (ft) settings that will produce the desired time interval between bombs. Figure 6-18 may be used to determine the groundspeedd and interval values to be selected to yield the desired time between bombs. Enter the chart with the desired time interval between bombs, project right to groundspeed and down to interval between bombs.

NOTE

True groundspeed (MPH) and interval (ft) settings can be used to control impact spacing for level train releases. This does not hold true for train releases during dive approaches. Impact pattern length for dive releases of various numbers of bombs released at various time intervals may be computed as described in Impact Pattern for Train Release. The approximate spacing between bombs can then be computed by dividing the impact pattern length in feet by the number of bombs minus one. Using this computational procedure, the release time interval can be varied until the value which will yield the desired impact spacing is determined.

RELATIVE WIND VECTOR CHART.

The relative wind vector chart (figure 6-19) may be used to resolve release altitude wind into rangewind and crosswind components. Relative wind direction must be determined before entering the relative wind vector chart. Obtain relative wind direction by subtracting approach course to target from the wind direction. For example, assume the following:

Given: a. Forecast wind: 350°/30 knots.

b. Approach course: 040° True.

Find: Relative wind direction: 350° - 040° = 310°

NOTE

If the aircraft course to target is greater than the wind direction, add 360 degrees to the wind direction, then subtract the approach course to obtain the relative wind direction.

Enter the relative wind vector chart with 310°. Project toward the center of the circle to the 30 knot wind circle, then over to the horizontal and vertical axes. Read the rangewind and crosswind components, respectively.

Offset Aimpoint.

To obtain release crosswind correction or offset aimpoint multiply the crosswind factor (ft/kt) by the release crosswind component (kt).

NOTE

The crosswind correction factors listed in the bombing tables assume that the aircraft is drifting with the wind with no crab angle involved.

If a crab angle is used to maintain a ground track during a level approach, subtract an amount equal to bomb range in feet divided by approach true airspeed in knots from the crosswind ft/kt listed in the bombing tables. For low drag items, released at low altitudes, use of a crab angle to maintain a ground track through the target will eliminate the need for an offset aimpoint.

DIVE ANGLE vs DISTANCE CHART.

The dive angle versus distance chart (figure 6-20) provides a means of approximating the distance to a target for a given dive angle and altitude. This chart is provided as supplementary data and is not used in the sample problems.

MILS TO DEGREES CONVERSION CHART.

When the depressed sight setting in mils exceeds the sight mil scale, it will be necessary to convert the sight setting in mils to degrees. A mils to degrees conversion chart (figure 6-21) is provided for this computation. Enter the chart with mils, project right to the reflector, and down to the degree scale.

MINIMUM RELEASE ALTITUDES.

In practically all cases, the fuzes will be armed well before the aircraft clear the bomb lethal fragment envelope during recovery. Consequently, every effort must be made to ensure that releases are accomplished at altitudes sufficiently high to provide bomb lethal fragment clearance for impact bursts. Minimum release altitudes are shown on the plots in the Supplementary Data Section. The time or vertical drop, required for the direct arming fuzes to arm, may be approximated by looking at the slant range from release to impact listed in the bombing tables. (For dive releases, slant range closely approximates trajectory arc length.) If the M188 VT fuze is to be used, a release condition which has a slant range from release to impact in excess of 3600 feet must be selected to allow time for the M188 VT fuze to arm. This is a minimum value. It is recommended that an optimum value of 4600 feet be used. Salvo releases, where the fast arming impact fuzes are used, are not recommended. For the M904 nose fuze or M905 tail fuze, the minumum time of fail for the fuze to arm is the arming delay setting plus 20%. The release altitude or vertical drop, required to provide the minimum time of fall, may be obtained by interpolation in the bombing tables.

WARNING

- Salvo releases, where the fast arming tail fuzes are used, are not recommended because the bombs are very close to the aircraft when the fuze arms. In this case a bomb collision and possible premature detonation could result in the loss of an aircraft.
- The importance of releasing at sufficiently high altitudes, and then flying the proper pullout escape maneuver, cannot be over-emphasized when considering safe escape. If bombs are released at lower than planned minimum altitudes, or the recovery maneuver is degraded, there is an excellent chance that the aircraft will be hit by bomb fragments.
- For some of the steeper dive angle conditions, ground clearance during recovery, rather than bomb lethal fragments, will be the limiting factor in the determination of minimum release altitudes. The dive recovery charts, presented in Section VI, may be used to estimate altitude loss during pullout.

Release bombs at an altitude which will allow sufficient slant range (air travel) for fuze to arm.

IMPACT PATTERN FOR TRAIN RELEASE.

The length of the impact pattern for a train release may be determined from the following formula:

$$P.L. = 1.6878\ T\ V_R \cos\theta\ (N-1) - \Delta R$$

where

P.L. = Pattern length in ft.

T = Time interval between bombs in sec.

V_R = Release TAS in kt.

θ = Release dive angle in deg.

N = Number of bombs in ripple.

ΔR = Difference in ft between range of first and last bombs released during the ripple.

NOTE

ΔR is zero for level releases at constant KTAS. For dive releases, interpolation in the tables will be required to determine ΔR. The release altitude for the last bomb in the ripple will be $1.6878\ T\ V_R \sin\ \theta\ (N-1)$ ft lower than the first bomb release altitude.

For example, assume a four bomb M117 train from the bomb bay is to be released from a 360 KTAS, 35° dive, 3000-foot AGL condition. Since the last bomb in the train will be 105 feet lower than the first bomb, the release altitude of the last bomb will be 2895 feet. Select the proper bombing table for the planned 35° dive, 3000-ft AGL, 360 KTAS release condition and obtain the bomb range of the first bomb. Using the same table interpolate for the bomb range at 2895-foot AGL, the release altitude of the last bomb. The difference in feet between these two ranges will provide the ΔR in the pattern length computation.

DIVE AND LOW LEVEL BOMBING SAMPLE PROBLEM.

MISSION CONDITIONS.

The following sample problem uses 35° dive bomb train release conditions for the M117 GP bomb using the M904 nose fuze and the M190 tail fuze and will follow the order outlined in the mission planning form (figure 6-1). A release indicated airspeed of 350 kts, a release altitude of 3000 feet above target, and a target height of 200 feet MSL are assumed.

Item 4d of the mission planning form is the total weight of the stores carried.

Compute the fuel remaining over the target (item 6). Add this value to the sum of airplane operating weight (item 5) and external weight (item 4d) to obtain gross weight over the target.

Obtain the following data from the weather forecaster:

a. Altimeter setting at target (item 9):	29.92 in. Hg
b. Release pressure altitude (item 18):	2700 ft
c. Release altitude temperature (item 19):	15° C

RELEASE CONDITIONS.

The following charts are used to determine items 16, 20, 21, 22, 23, 24 and 25, and to verify that the planned initial release altitude of 3000 feet above target is sufficiently high to provide ground clearance during recovery and fragment envelope clearance.

a. Release Time Interval Chart, figure 6-18.

b. KIAS - KTAS Chart, figure 6-16.

c. Dive Recovery Chart, figure 6-3.

d. Altimeter Lag Chart, figure 6-5.

e. Altimeter Correction Chart, figure 6-17.

f. Angle of Attack Chart, figure 6-16.

g. B-57/M117 Safe Separation Data, table 4-1.

MISSION PLANNING FORM

MISSION CONDITIONS

1. Delivery Mode . . . . DIVE BOMBING, TRAIN RELEASE
2. Munitions and unit weight . . . . M117 , ______ pounds
3. Type of Fuzing . . . . (IMPACT) (DELAY) (VT)

	Nose	Tail
a. Type:	M904	M190
b. Action:	DELAY	DELAY
c. Functioning Delay:	0.01 SEC	0.01 SEC
d. Arming Delay:	4.0	4100

4. External Weight Index:

	No.	Items	Total Weight	
a. Outboard:				pounds
b. Inboard:				pounds
c. Bomb Bay:	4	M117	3200	pounds
d. Totals:	4		3200	pounds

5. Airplane Operating Weight (28, 500 lb) . . . . 28,500 pounds
6. Fuel Remaining over Target . . . . 10,000 pounds
7. Airplane Gross Weight over Target . . . . 41,700 pounds
   (Add items 4d, 5, and 6)
8. Target Altitude above MSL . . . . 200 feet
9. Altimeter Setting at Target . . . . 29.92 in. Hg
10. Approach Course to Target . . . . 040 ° True

RELEASE CONDITIONS

11. Release Indicated Airspeed . . . . 350 knots
12. Release Dive Angle . . . . 35 deg
13. Type of Release . . . . . . (Single or Train) . . . . . . TRAIN
14. Number of Bombs in Train 4
15. Time Interval between Bombs . . . . 100 millisec
16. Bomb Release Interval Control Settings . . . . . . 200 MPH/ 29 ft
17. a. Release Altitude above Target (AGL) . . . . 3000 feet
    b. Release Altitude (AGL) for last bomb (if train release) . . . . . . 2895 feet
    NOTE: Must be sufficiently high to provide adequate time for fuze arming, ground clearance during recovery, and fragment envelope clearance.
18. Release Pressure Altitude . . . . 3200 feet
19. Release Altitude Temperature . . . . 15 ° C
20. Release True Airspeed . . . . 360 knots
    (from KIAS - KTAS Chart)
21. Altitude Lost During Pullout . . . . 1240 feet
    (from Dive Recovery Chart)
22. Altimeter Lag . . . . 152 feet
    (from Altimeter Lag Chart)
23. Altimeter Correction . . . . 195 feet
    (from Altimeter Correction Chart)
24. Release Indicated Altitude . . . . 3547 feet
    (add items 8, 17a, 22, and 23)
25. Angle of Attack (Zero Sight Line) . . . . -18 mils

WIND VALUES

26. Forecast Wind . . . . 350 °True 30 knots
27. Relative Wind . . . . 310 °True 30 knots
28. Rangewind Component (head) (~~tail~~) . . . . 19 knots
29. Crosswind Component (left) (~~right~~) . . . . 23 knots

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Figure 5-2. Sample Mission Planning Form (Bombs) (Sheet 1 of 2)

DIVE AND LEVEL BOMBING CONDITIONS (Single Release, (Train Release))

30.	a.	Bomb Time of Flight (first bomb)	6.69	seconds
	b.	Bomb Time of Flight (last bomb if train release)	6.50	seconds
31.	a.	Bomb Range (first bomb)	3270	feet
	b.	Bomb Range (last bomb if train release)	3180	feet
32.		Impact Pattern Length for Train Release	60	feet
33.		Range Correction for Initial Impact(s)	30	feet
	a.	Predetermined distance short of target for single fire bomb releases	—	feet
	b.	One-half impact pattern length for train release	30	feet
34.		Range from Release to Target (Item 31a and Item 33a or b)	3300	feet
35.		Sight Depression from Flight Path. (From tables or chart)	130	mils
36.		Headwind Correction Factor	1.75	mils/ft
37.		Tailwind Correction Factor	-1.68	mils/ft
38.		Crosswind Correction Factor	11.1	ft/kt
39.		Rangewind Correction to Sight Depression Angle (Item 36 or item 37 times item 28)	33	mils
40.		Crosswind Correction (Item 38 times item 29)	255	feet
41.		Depressed Reticle Setting 145 mils or (Item 35 plus item 39 plus item 25)	8.1	deg
42.		Pylon Position Correction (left) (right). Wing Station: Inboard / Outboard; Offset: 19 ft / 22 ft	—	feet
43.		Offset Aimpoint (left) (right). (Item 40 plus or minus item 42)	255	feet

ROCKET FIRING OR STRAFING CONDITIONS

44.	Angle of Attack (Zero Sight Line) (Item 25)		mils
45.	Projectile Time of Flight		seconds
46.	Release Slant Range		feet
47.	Release Horizontal Range		feet
48.	Sight Depression from ZSL (No Wind)		mils
49.	Rangewind Correction (+) (head) (-) (tail)		mils
50.	Depressed Reticle Setting ______ mils or (Item 48 plus item 49)		deg
51.	Crosswind Correction		feet

1-74901

Figure 5-2. Sample Mission Planning Form (Bombs) (Sheet 2 of 2)

MISSION PLANNING FORM

MISSION CONDITIONS

1. Delivery Mode . . . . ROCKET FIRING
2. Munitions and unit weight. . . . . LAU-3/A, 429 pounds
3. Type of Fuzing. . . . . (IMPACT) (DELAY) (VT)

	Nose	Tail
a. Type:	MK 176	NA
b. Action:	IMPACT	NA
c. Functioning Delay:	INTEGRAL	NA
d. Arming Delay:	INTEGRAL	NA

4. External Weight Index:

	No.	Items	Total Weight	
a. Outboard:	2	LAU-3/A	1124	pounds
b. Inboard:	2	"	1124	pounds
c. Bomb Bay:				pounds
d. Totals:	4		2248	pounds

5. Airplane Operating Weight (28, 500 lb) . . . . 28500 pounds
6. Fuel Remaining over Target. . . . . 9250 pounds
7. Airplane Gross Weight over Target. . . . . 39998 pounds
   (Add items 4d, 5, and 6)
8. Target Altitude above MSL . . . . 200 feet
9. Altimeter Setting at Target . . . . 29.92 in. Hg
10. Approach Course to Target . . . . 040 ° True

RELEASE CONDITIONS

11. Release Indicated Airspeed . . . . 350 knots
12. Release Dive Angle. . . . . 30 deg
13. Type of Release. . . . . (Single or Train) . . . . . . SINGLE
14. Number of Bombs in Train . . . . –
15. Time Interval between Bombs. . . . . – millisec
16. Bomb Release Interval Control Settings . . . . ____ MPH/ – ft
17. a. Release Altitude above Target (AGL) . . . . 2500 feet
    b. Release Altitude (AGL) for last bomb (if train release) . . . – feet
    NOTE: Must be sufficiently high to provide adequate time for fuze arming, ground clearance during recovery, and fragment envelope clearance.
18. Release Pressure Altitude . . . . 2700 feet
19. Release Altitude Temperature . . . . 15 ° C
20. Release True Airspeed . . . . 360 knots
    (from KIAS - KTAS Chart)
21. Altitude Lost During Pullout. . . . . 950 feet
    (from Dive Recovery Chart)
22. Altimeter Lag . . . . 134 feet
    (from Altimeter Lag Chart)
23. Altimeter Correction . . . . 195 feet
    (from Altimeter Correction Chart)
24. Release Indicated Altitude . . . . 3029 feet
    (add items 8, 17a, 22, and 23)
25. Angle of Attack (Zero Sight Line) . . . . -18 mils

WIND VALUES

26. Forecast Wind. . . . . 350 °True 30 knots
27. Relative Wind . . . . 310 °True 30 knots
28. Rangewind Component (head) (tail). . . . . 19 knots
29. Crosswind Component (left) (right) . . . . 23 knots

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Figure 5-3. Sample Mission Planning Form (Rockets or Strafing) (Sheet 1 of 2)

DIVE AND LEVEL BOMBING CONDITIONS (Single Release, Train Release)

30.	a.	Bomb Time of Flight (first bomb)	______	seconds
	b.	Bomb Time of Flight (last bomb if train release)	______	seconds
31.	a.	Bomb Range (first bomb)	______	feet
	b.	Bomb Range (last bomb if train release)	______	feet
32.		Impact Pattern Length for Train Release	______	feet
33.		Range Correction for Initial Impact(s)	______	feet
	a.	Predetermined distance short of target for single fire bomb releases	______	feet
	b.	One-half impact pattern length for train release	______	feet
34.		Range from Release to Target (Item 31a and Item 33a or b)	______	feet
35.		Sight Depression from Flight Path (From tables or chart)	______	mils
36.		Headwind Correction Factor	______	mils/ft
37.		Tailwind Correction Factor	______	mils/ft
38.		Crosswind Correction Factor	______	ft/kt
39.		Rangewind Correction to Sight Depression Angle (Item 36 or item 37 times item 28)	______	mils
40.		Crosswind Correction (Item 38 times item 29)	______	feet
41.		Depressed Reticle Setting ______ mils or (Item 35 plus item 39 plus item 25)	______	deg
42.		Pylon Position Correction (left) (right). Wing Station: Inboard, Outboard; Offset: 19 ft, 22 ft	______	feet
43.		Offset Aimpoint (left) (right) (Item 40 plus or minus item 42)	______	feet

ROCKET FIRING OR STRAFING CONDITIONS

44.	Angle of Attack (Zero Sight Line) (Item 25)	-18	mils
45.	Projectile Time of Flight	2.38	seconds
46.	Release Slant Range	4833	feet
47.	Release Horizontal Range	4137	feet
48.	Sight Depression from ZSL (No Wind)	4	mils
49.	Rangewind Correction (+) (head) (-) (tail)	+8	mils
50.	Depressed Reticle Setting 12 mils or (Item 48 plus item 49)	0.7	deg
51.	Crosswind Correction	93	feet

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Figure 5-3. Sample Mission Planning Form (Rockets or Strafing)(Sheet 2 of 2)

NOTE

For specified release pressure altitude and temperature conditions, the release true airspeed (KTAS) is 360 knots. According to the data presented in table 4-1 for a 35° dive 360 KTAS release, a 3000 feet above target initial release altitude is greater than the minimum altitude required for fragment envelope clearance during recovery. The release altitude of 2895 feet, for the last bomb in the train, is greater than the minimum altitude shown on table 4-1 for fragment envelope clearance during recovery.

The release KIAS (item 11), 360 kts, dive angle (item 12), 35°, type of release (item 13), train, 1 number of bombs in train (item 14), 4, time interval between bombs (item 15), 100 milliseconds, initial release altitude above target (item 17a) 3000 feet; release altitude of last bomb in train (item 17b), 2895 feet, release pressure altitude (item 18), 3200 feet, and release altitude temperature (item 19), 15° C, are recorded in the planning form. Use the release time interval chart (figure 6-18) to determine groundspeed (item 16), 200 MPH, and interval between bombs (item 16), 29 feet. Use $1.6878\ T\ V_R \sin \theta\ (N-1)$ feet (where T = Time between release in seconds, V_R = Release TAS in knots, θ = Release dive angle in degrees and N = Number of bombs in train) subtracted from the released altitude above target (item 17a) to determine the release altitude for the last bomb (item 17b). Use figure 6-16 to determine release KTAS. Use the 3.5 g in 2.0 second dive recovery chart (figure 6-3) to determine the altitude lost during pullout (item 21), 1240 feet. Use the altimeter lag chart (figure 6-5) to determine altimeter lag (item 22) 152 feet. Use the altimeter correction chart (figure 6-17) to determine altimeter correction (item 23), 195 feet.

RELEASE INDICATED ALTITUDE.

Release indicated altitude (item 24) is the sum of the following items:

a. Item 8, Target Altitude above MSL	200 ft
b. Item 17a, Release Altitude above Target	3000 ft
c. Item 22, Altimeter Lag	152 ft
d. Item 23, Altimeter Correction	195 ft
Release Indicated Altitude	3547 ft

ZERO SIGHT LINE ANGLE OF ATTACK.

Use the angle of attack chart (figure 6-16) to find the zero sight line angle of attack (item 25), -18 mils.

NOTE

The chart provides zero sight line angle of attack, not fuselage (FRL) angle of attack. To obtain angle of attack add 18 mils to the value read from the zero sight line angle of attack.

WIND VALUES.

Use the Relative Wind Vector chart (figure 6-19) to determine the release altitude rangewind and crosswind components.

DIVE AND LEVEL BOMBING CONDITIONS.

Select the proper bombing table from T.O. 1B-57B-1-2 for release of first and last bomb, for the planned 35° dive, 3000-feet AGL, 360 KTAS release condition. Record bomb time of flight of first bomb (item 30a), 6.69 seconds, bomb range of first bomb (item 31a), 3270 feet, headwind correction factor (item 36), 1.75 mils/knots, tailwind correction factor (item 37), - 1.68 mils/knots, and crosswind correction factor (item 38), 11.1 foot/knots. Using the same table and a release altitude of 2895 feet for the last bomb interpolate for bomb time of flight of last bomb (item 30b), 6.50 seconds, and bomb range of last bomb (item 31b), 3180 feet.

Impact Pattern Length. Use the pattern length formula where $P.L. = 1.6878\ T\ V_R \cos \theta\ (N-1) - \Delta R$.

$$P.L. = 1.6878\ (0.1)\ (360\ \text{KTAS}) \cos 35° \ (4-1) - 90\ \text{ft} = 60\ \text{ft}$$

Sight Depression. Select the proper sight depression angle chart, enter the chart with range from release to target (item 34), 3300 feet, project up to release altitude above target (item 17a), 3000 feet, and across to the sight depression from flight path (item 35), 130 mils.

Rangewind Correction. Multiply the headwind correction factor (item 36) by the rangewind component (19 knot headwind) (item 29) to obtain the rangewind correction to sight depression angle (item 39).

$$1.75 \times 19 = 33 \text{ mils}$$

Depressed Reticle Setting. Add sight depression angle from flight path (item 35), rangewind correction factor (item 39), and zero sight line angle

DIVE BOMBING TABLES

BOMB, GP, 750-LB, M117 W/FIN, M131 (CONICAL)

DIVE ANGLE	TAS	ALT ABOVE TGT	BOMB RANGE	TIME OF FLIGHT	SLANT RANGE FROM REL	IMPACT ANGLE	SIGHT DEP FROM FLIGHT PATH	WIND CORRECTION FACTORS		
								HEAD	TAIL	CROSS
DEG	KTS	FT	FT	SEC	FT	DEG	MILS	MILS/KNOT		FT/KT
35	300	2500	2629	6.43	3628	50	154	2.16	-2.07	10.9
35	320	2500	2699	6.19	3679	49	141	2.02	-1.94	10.4
35	340	2500	2762	5.96	3725	48	129	1.90	-1.82	10.1
35	360	2500	2819	5.75	3768	47	118	1.79	-1.72	9.7
35	380	2500	2871	5.55	3807	46	109	1.69	-1.63	9.4
35	400	2500	2918	5.36	3842	45	101	1.60	-1.54	9.0
35	300	3000	3031	7.43	4265	52	174	2.17	-2.08	12.5
35	320	3000	3118	7.17	4327	51	160	2.03	-1.95	12.1
35	340	3000	3197	6.92	4384	50	147	1.91	-1.83	11.7
35	360	3000	3270	6.69	4438	49	135	1.80	-1.73	11.3
35	380	3000	3336	6.46	4487	48	125	1.70	-1.64	10.9
35	400	3000	3397	6.25	4532	47	116	1.61	-1.55	10.6
35	300	3500	3409	8.38	4886	54	193	2.17	-2.08	14.1
35	320	3500	3513	8.10	4959	52	177	2.03	-1.95	13.7
35	340	3500	3609	7.83	5027	51	164	1.91	-1.84	13.2
35	360	3500	3697	7.58	5091	50	151	1.80	-1.74	12.8
35	380	3500	3779	7.34	5151	49	140	1.70	-1.65	12.4
35	400	3500	3853	7.11	5205	48	130	1.62	-1.56	12.0

1-74879

Figure 5-4

of attack (item 25). Use the mils to degrees chart (figure F6-16) to convert the depressed reticle setting from mils to degrees.

130 + 33 - 18 = 145 mils or 8.1 deg

Offset Aimpoint. Multiply the crosswind correction factor (item 38), by the release crosswind component (item 29) to obtain the crosswind correction (item 40).

11.1 x 23 = 255 ft

NOTE

The crosswind correction will be the offset aimpoint (item 43). The corrections for the pylon positions (lateral offset from sight) are considered negligible. Refer to Offset Aimpoint paragraph.

GUN AND ROCKET FIRING SAMPLE PROBLEM.

Computational procedures for rocket or strafing ground attacks are very similar to the procedures used in the planning of a bombing mission. All strafing attack conditions listed in the tables should provide at least a 50-foot ground clearance based on a 3.5 g pullout. The tabulated 2.75 inch rocket firing conditions should provide fragment envelope clearance during a 3.5 g pullout. Due to the similarity of bombing, rocket, and gun computational procedures, a completed mission planning form (figure 5-3) for a LAU-3/A 2.75 inch FFAR mission is provided to illustrate the rocket and gun planning procedures.

SECTION VI

PLANNING CHARTS AND TABLES

TABLE OF CONTENTS

INTRODUCTION

This section contains charts and tables used in conventional weapons delivery mission planning.

The level, dive and ripple bombing tables are provided in T.O. 1B-57B-34-1-2 and are applicable for both box and conical fin bombs.

MISSION PLANNING FORM

MISSION CONDITIONS

1. Delivery Mode . . . . ____________________
2. Munitions and unit weight. . . . . ____________________, __________ pounds
3. Type of Fuzing. . . . . ______ (IMPACT) ______ (DELAY) ______ (VT)

	Nose	Tail
a. Type:	________	________
b. Action:	________	________
c. Functioning Delay:	________	________
d. Arming Delay:	________	________

4. External Weight Index:

	No.	Items	Total Weight	
a. Outboard:	________	________	________	pounds
b. Inboard:	________	________	________	pounds
c. Bomb Bay:	________	________	________	pounds
d. Totals:	________	________	________	pounds

5. Airplane Operating Weight (28, 500 lb) . . . . __________ pounds
6. Fuel Remaining over Target. . . . . __________ pounds
7. Airplane Gross Weight over Target . . . . __________ pounds
   (Add items 4d, 5, and 6)
8. Target Altitude above MSL . . . . __________ feet
9. Altimeter Setting at Target . . . . __________ in. Hg
10. Approach Course to Target . . . . __________ ° True

RELEASE CONDITIONS

11. Release Indicated Airspeed . . . . __________ knots
12. Release Dive Angle. . . . . __________ deg
13. Type of Release . . . . (Single or Train) . . . . __________
14. Number of Bombs in Train . . . . __________
15. Time Interval between Bombs. . . . . __________ millisec
16. Bomb Release Interval Control Settings . . . . ______ MPH/ __________ ft
17. a. Release Altitude above Target (AGL) . . . . __________ feet
    b. Release Altitude (AGL) for last bomb (if train release) . . . . __________ feet
    NOTE: Must be sufficiently high to provide adequate time for fuze arming, ground clearance during recovery, and fragment envelope clearance.
18. Release Pressure Altitude . . . . __________ feet
19. Release Altitude Temperature . . . . __________ ° C
20. Release True Airspeed . . . . __________ knots
    (from KIAS - KTAS Chart)
21. Altitude Lost During Pullout. . . . . __________ feet
    (from Dive Recovery Chart)
22. Altimeter Lag . . . . __________ feet
    (from Altimeter Lag Chart)
23. Altimeter Correction . . . .(minus) __________ feet
    (from Altimeter Correction Chart)
24. Release Indicated Altitude . . . . __________ feet
    (add items 8, 17a, 22, and 23)
25. Angle of Attack (Zero Sight Line) . . . . __________ mils

WIND VALUES

26. Forecast Wind. . . . . ______ °True __________ knots
27. Relative Wind . . . . ______ °True __________ knots
28. Rangewind Component (head) (tail). . . . . __________ knots
29. Crosswind Component (left) (right) . . . . __________ knots

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Figure 6-1 (Sheet 1 of 2)

DIVE AND LEVEL BOMBING CONDITIONS (Single Release, Train Release)

30. a. Bomb Time of Flight (first bomb) . . . . ________ seconds
    b. Bomb Time of Flight (last bomb if train release) . . . . ________ seconds
31. a. Bomb Range (first bomb) . . . . ________ feet
    b. Bomb Range (last bomb if train release) . . . . ________ feet
32. Impact Pattern Length for Train Release . . . . ________ feet
33. Range Correction for Initial Impact(s) . . . . ________ feet
    a. Predetermined distance short of target for single ANTI-PAM bomb releases . . . . ________ feet
    b. One-half impact pattern length for train release . . . . ________ feet
34. Range from Release to Target (Item 31a and Item 33a or b) . . . . ________ feet
35. Sight Depression from Flight Path . . . . ________ mils
    (From tables or chart)
36. Headwind Correction Factor . . . . ________ mils/ft
37. Tailwind Correction Factor . . . . ________ mils/ft
38. Crosswind Correction Factor . . . . ________ ft/kt
39. Rangewind Correction to Sight Depression Angle . . . . ________ mils
    (Item 36 or item 37 times item 28)
40. Crosswind Correction . . . . ________ feet
    (Item 38 times item 29)
41. Depressed Reticle Setting . . . . ______ mils or ________ deg
    (Item 35 plus item 39 plus item 25)
42. Pylon Position Correction (left) (right) . . . . ________ feet

Wing Station	Inboard	Outboard
Offset	19 ft	22 ft

43. Offset Aimpoint (left) (right) . . . . ________ feet
    (Item 40 plus or minus item 42)

ROCKET FIRING OR STRAFING CONDITIONS

44. Angle of Attack (Zero Sight Line) . . . . ________ mils
    (Item 25)
45. Projectile Time of Flight . . . . ________ seconds
46. Release Slant Range . . . . ________ feet
47. Release Horizontal Range . . . . ________ feet
48. Sight Depression from ZSL (No Wind) . . . . ________ mils
49. Rangewind Correction (+) (head) (-) (tail) . . . . ________ mils
50. Depressed Reticle Setting . . . . ______ mils or ________ deg
    (Item 48 plus item 49)
51. Crosswind Correction . . . . ________ feet

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Figure 6-1 (Sheet 2 of 2)

DIVE RECOVERY CHART

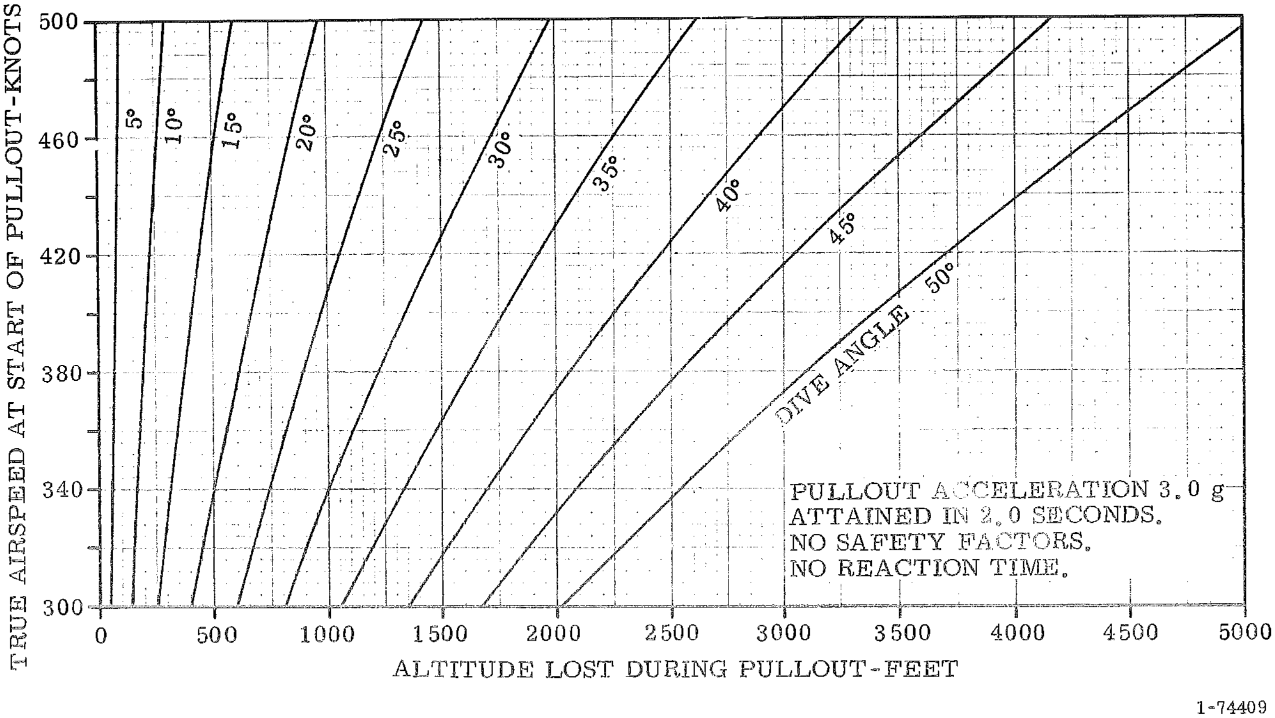

Figure 6-2

DIVE RECOVERY CHART

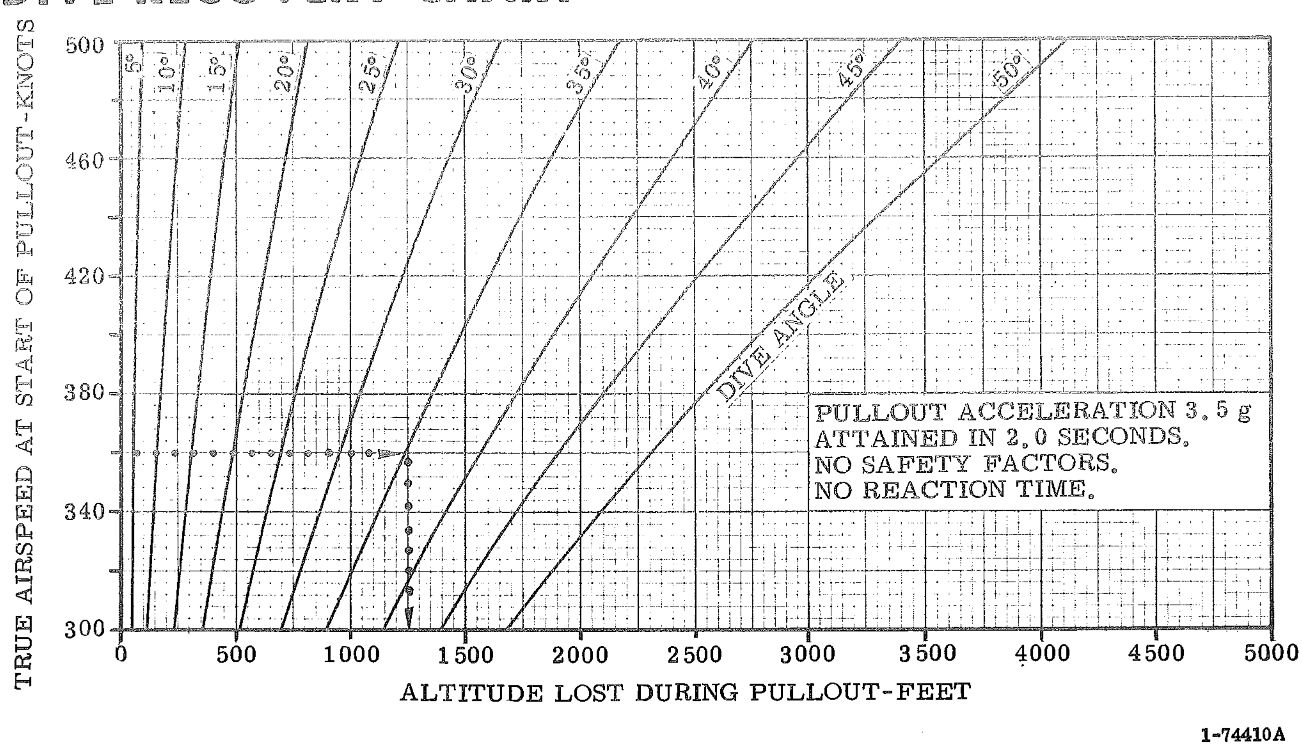

Figure 6-3

DIVE RECOVERY CHART

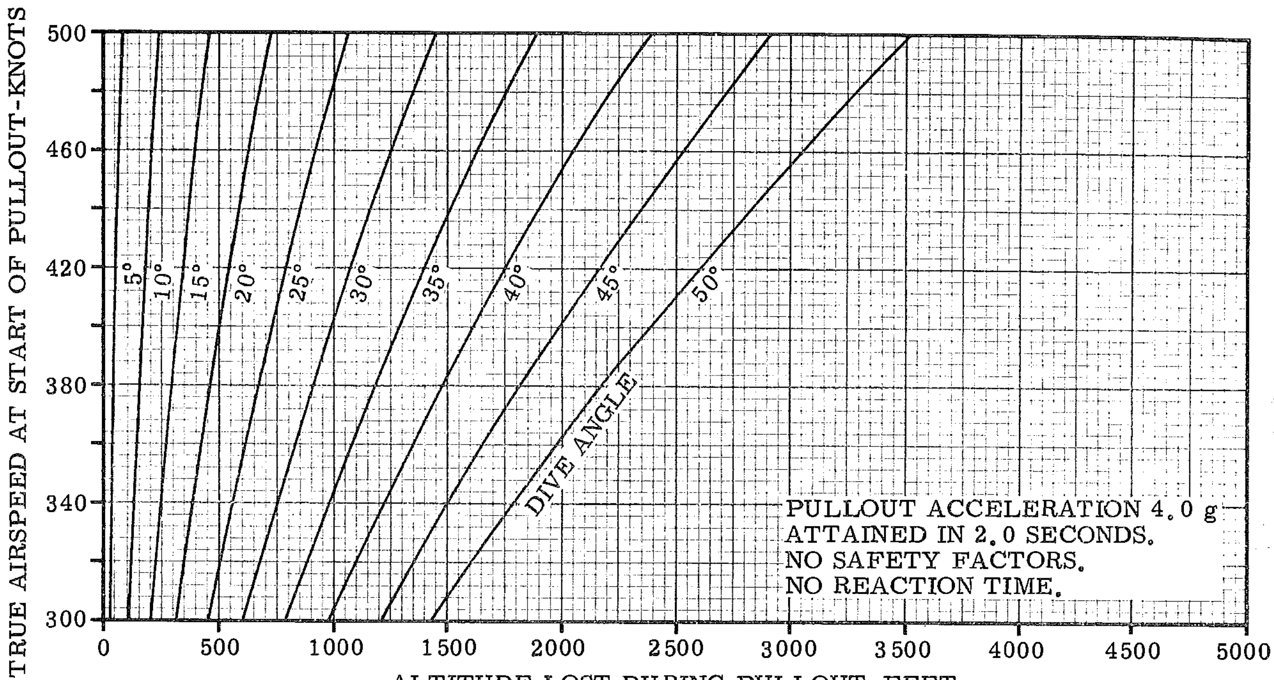

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Figure 6-4

ALTIMETER LAG CHART

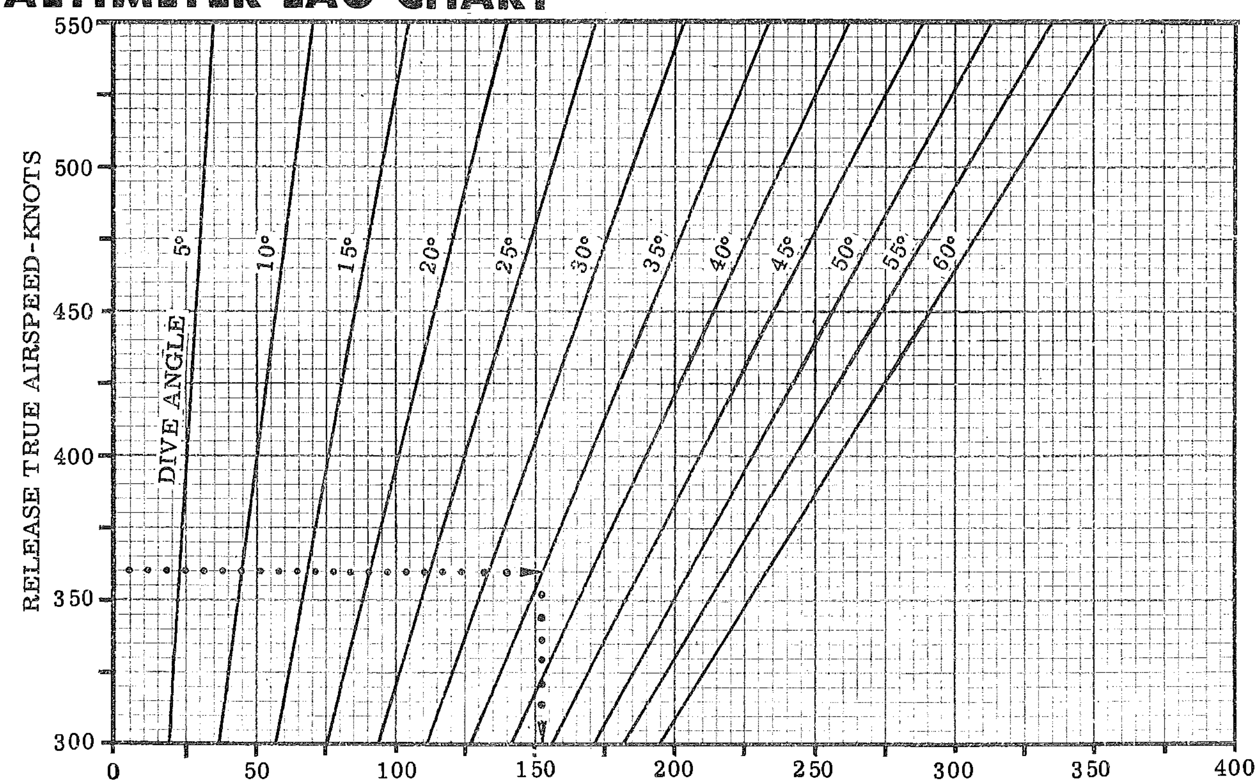

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Figure 6-5

SIGHT DEPRESSION ANGLE CHART LEVEL RELEASE CONDITIONS

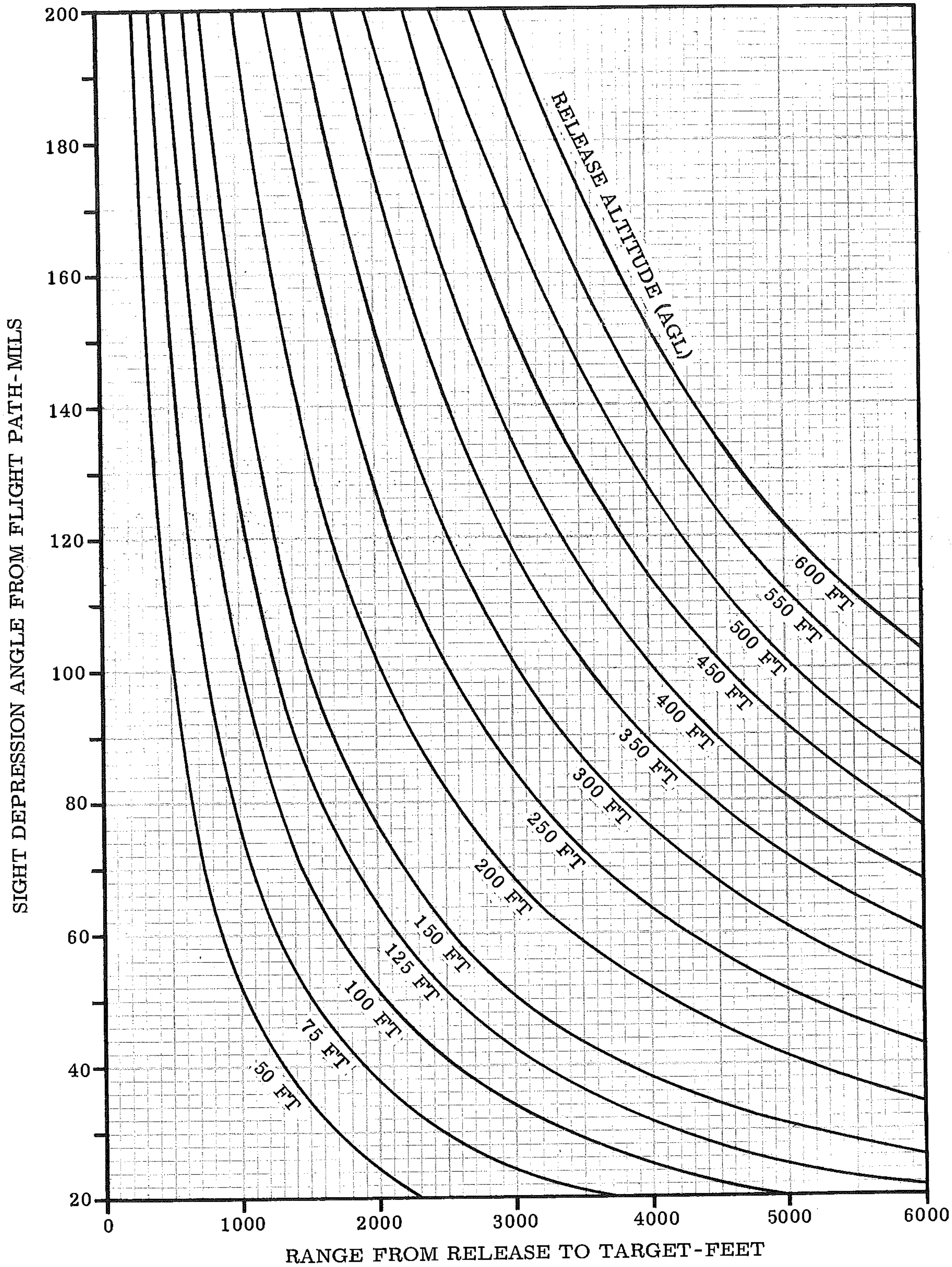

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Figure 6-6

SIGHT DEPRESSION ANGLE CHART 5° DIVE RELEASE CONDITIONS

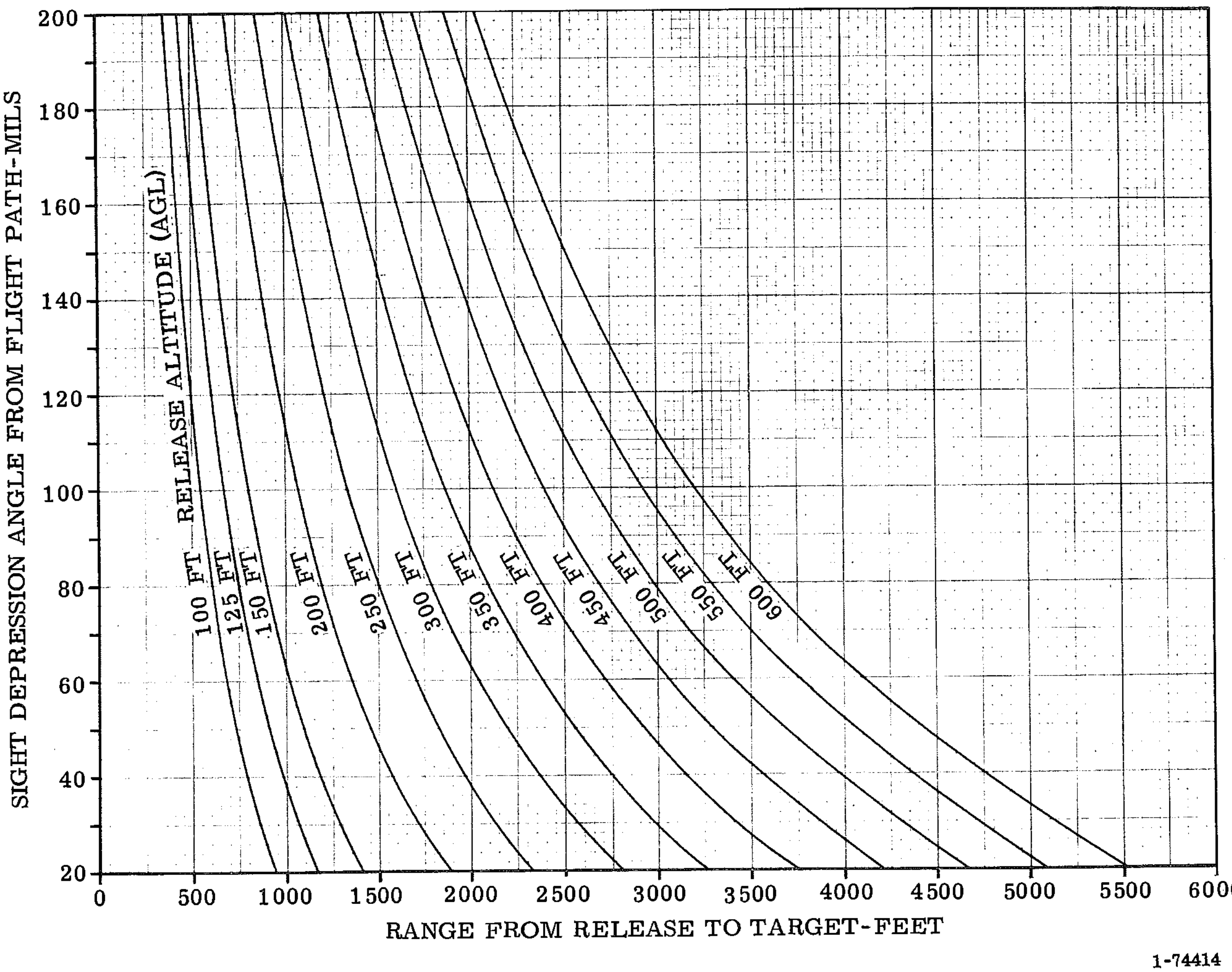

Figure 6-7

SIGHT DEPRESSION ANGLE CHART 10° DIVE RELEASE CONDITIONS

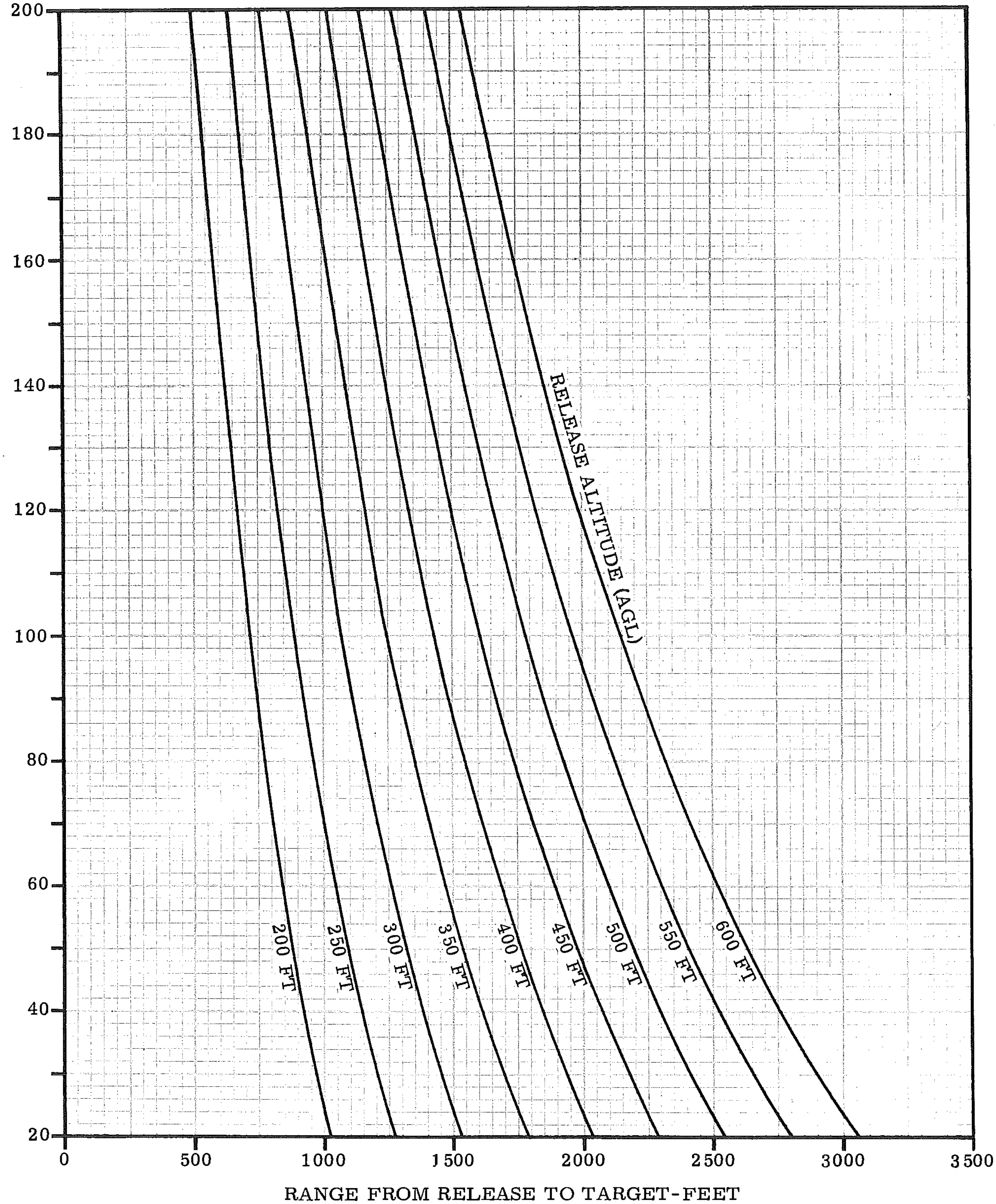

Figure 6-8

SIGHT DEPRESSION ANGLE CHART 15° DIVE RELEASE CONDITIONS

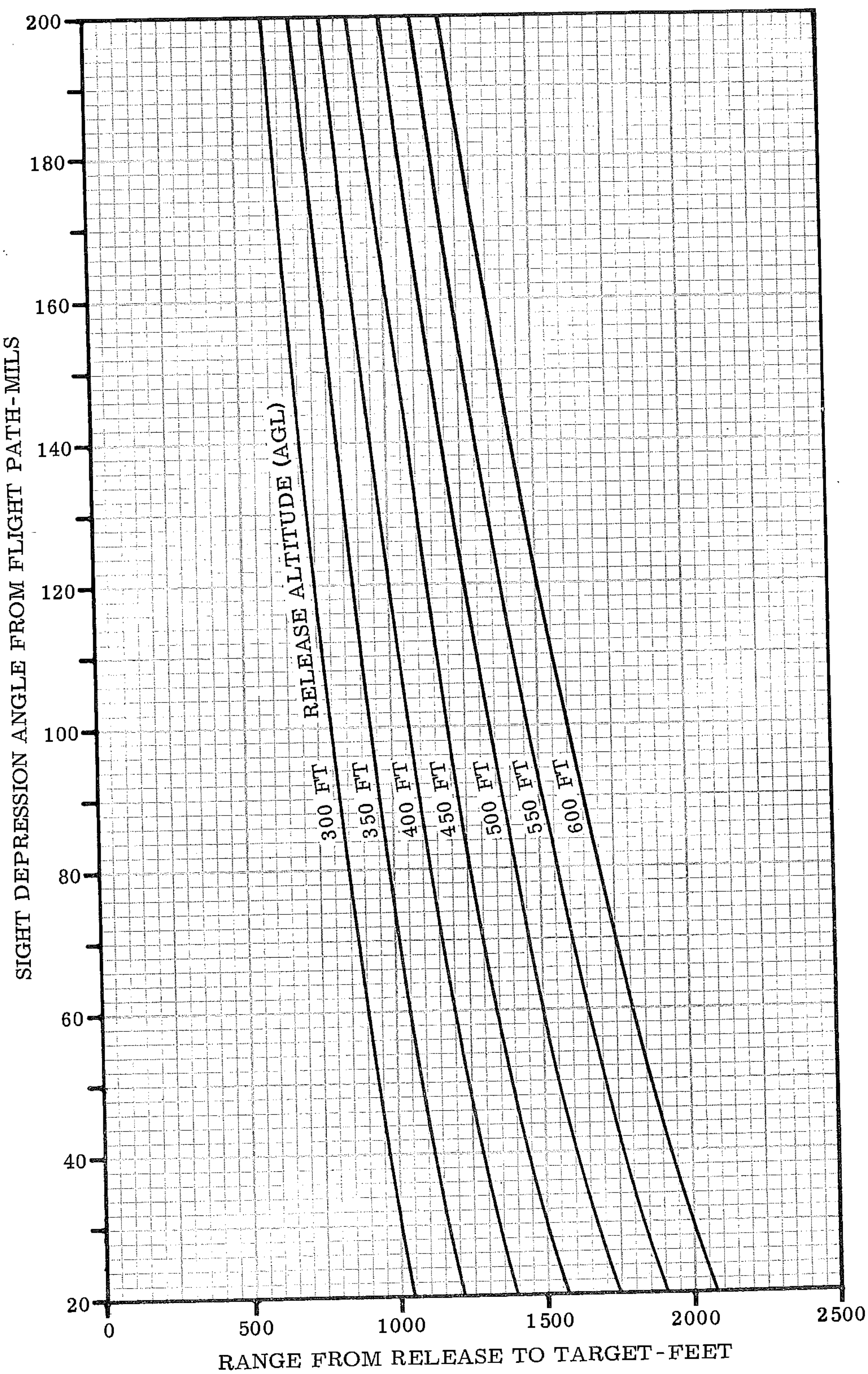

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Figure 6-9

SIGHT DEPRESSION ANGLE CHART 20° DIVE RELEASE CONDITIONS

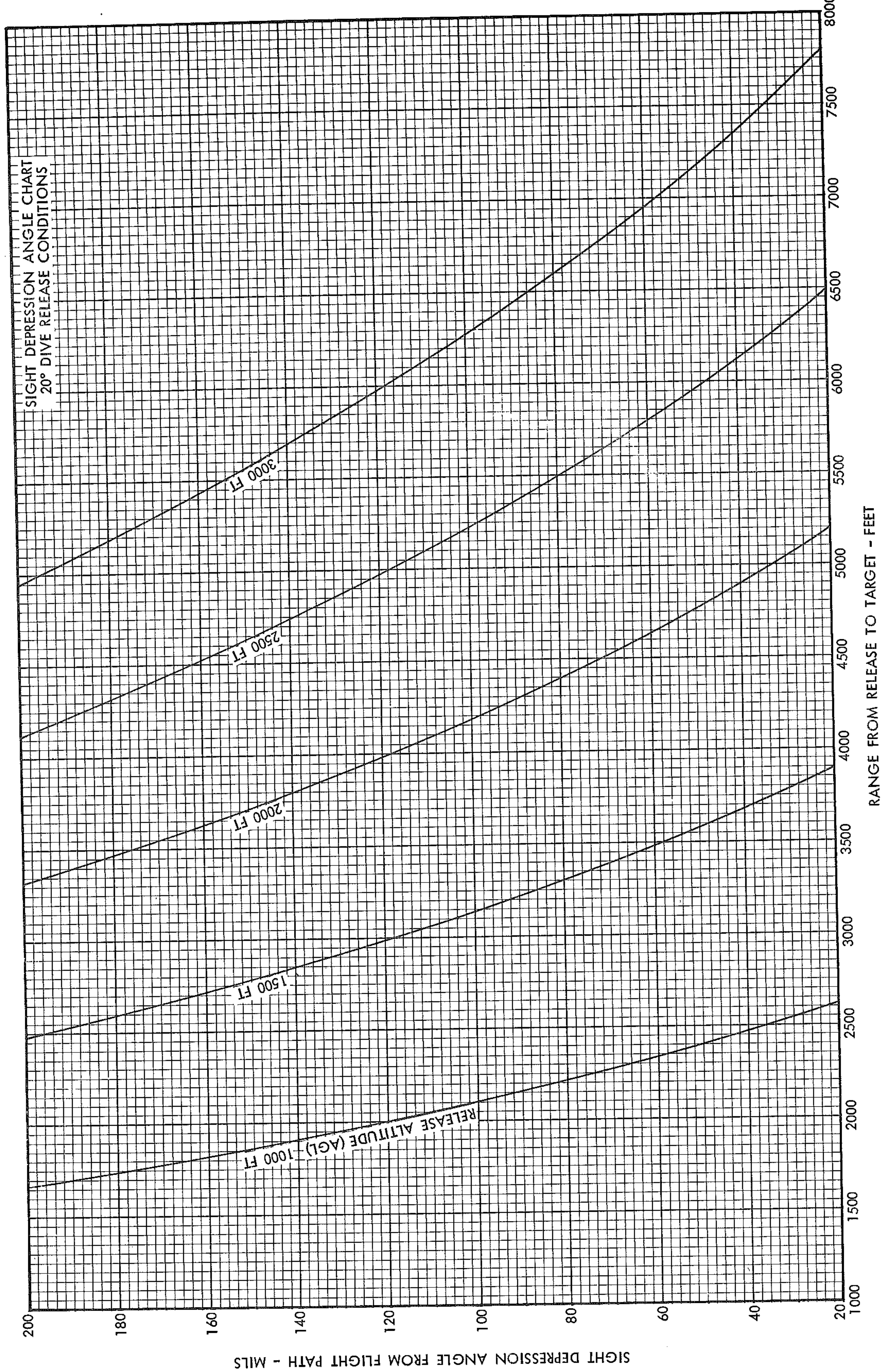

Figure 6-10.

SIGHT DEPRESSION ANGLE CHART 25° DIVE RELEASE CONDITIONS

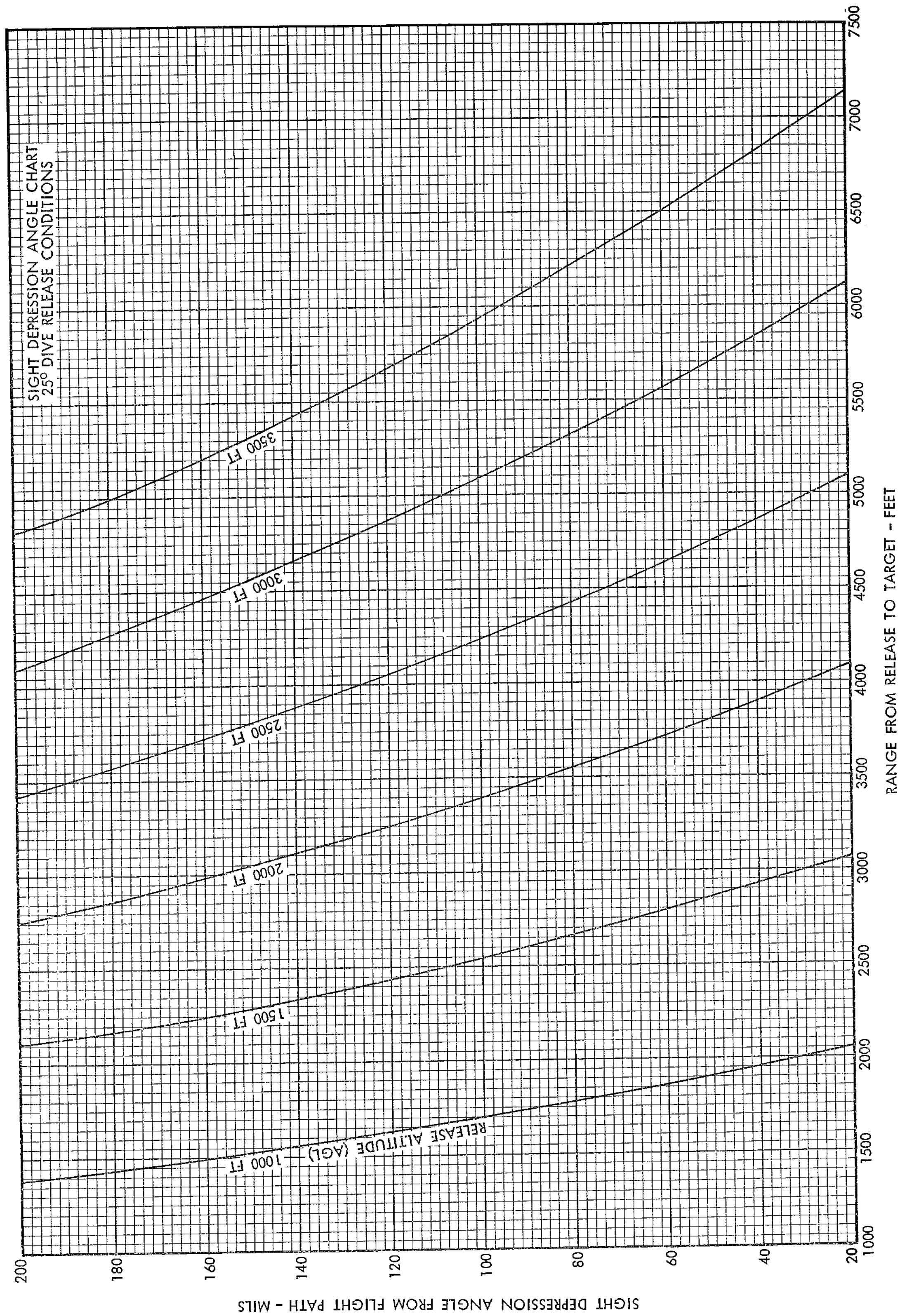

Figure 6-11.

SIGHT DEPRESSION ANGLE CHART 30° DIVE RELEASE CONDITIONS

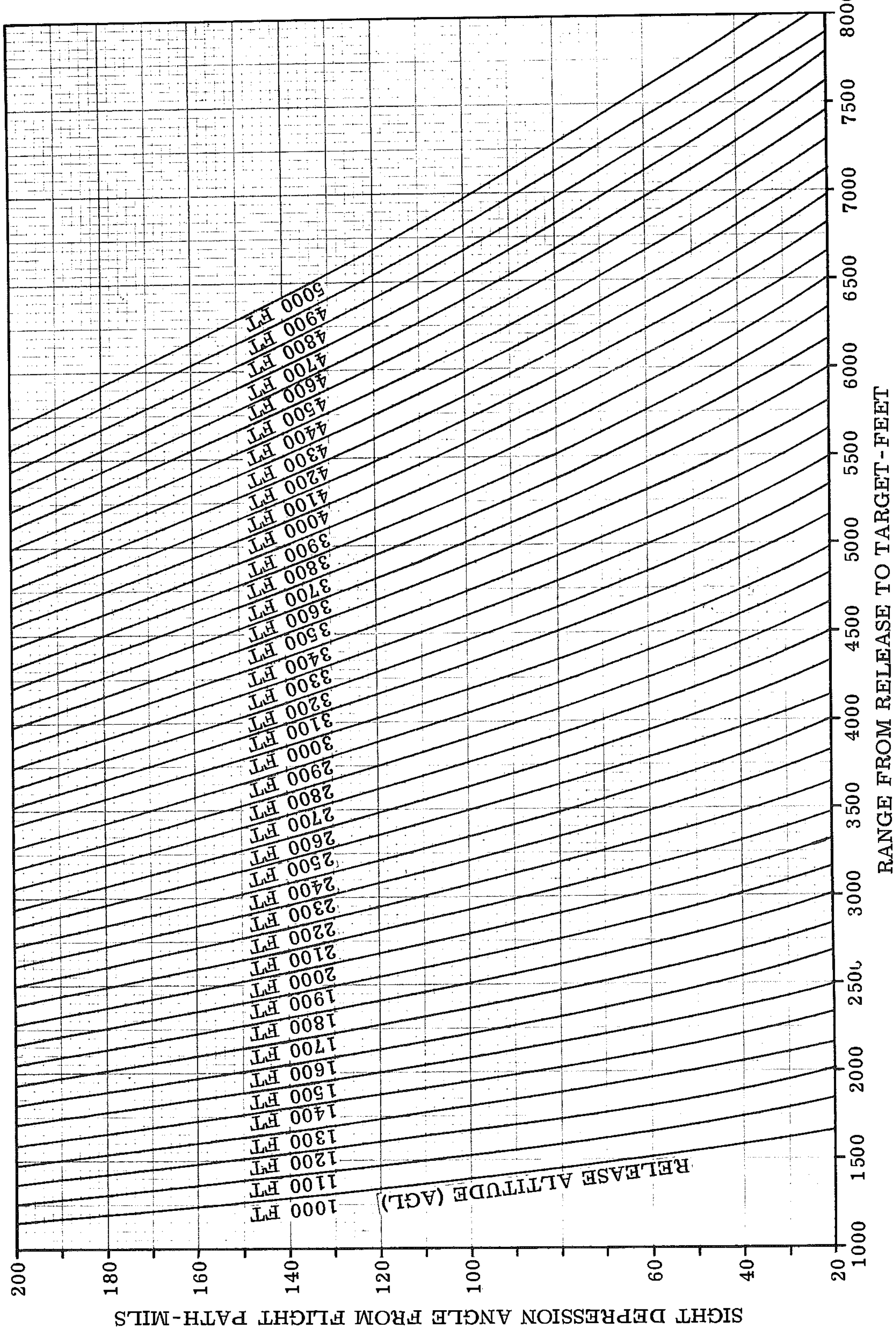

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Figure 6-12

SIGHT DEPRESSION ANGLE CHART 35° DIVE RELEASE CONDITIONS

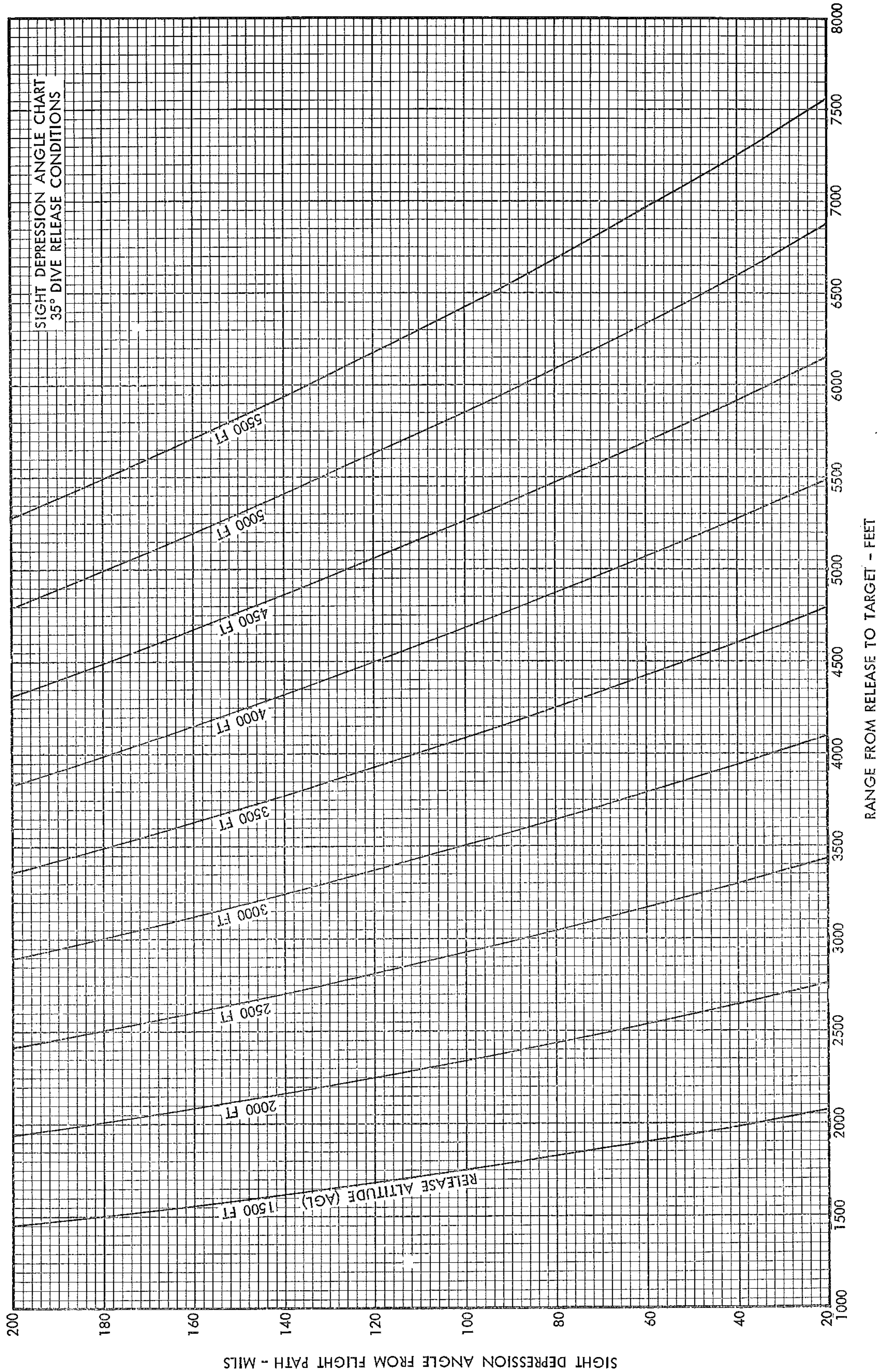


Figure 6-13.

SIGHT DEPRESSION ANGLE CHART 40° DIVE RELEASE CONDITIONS

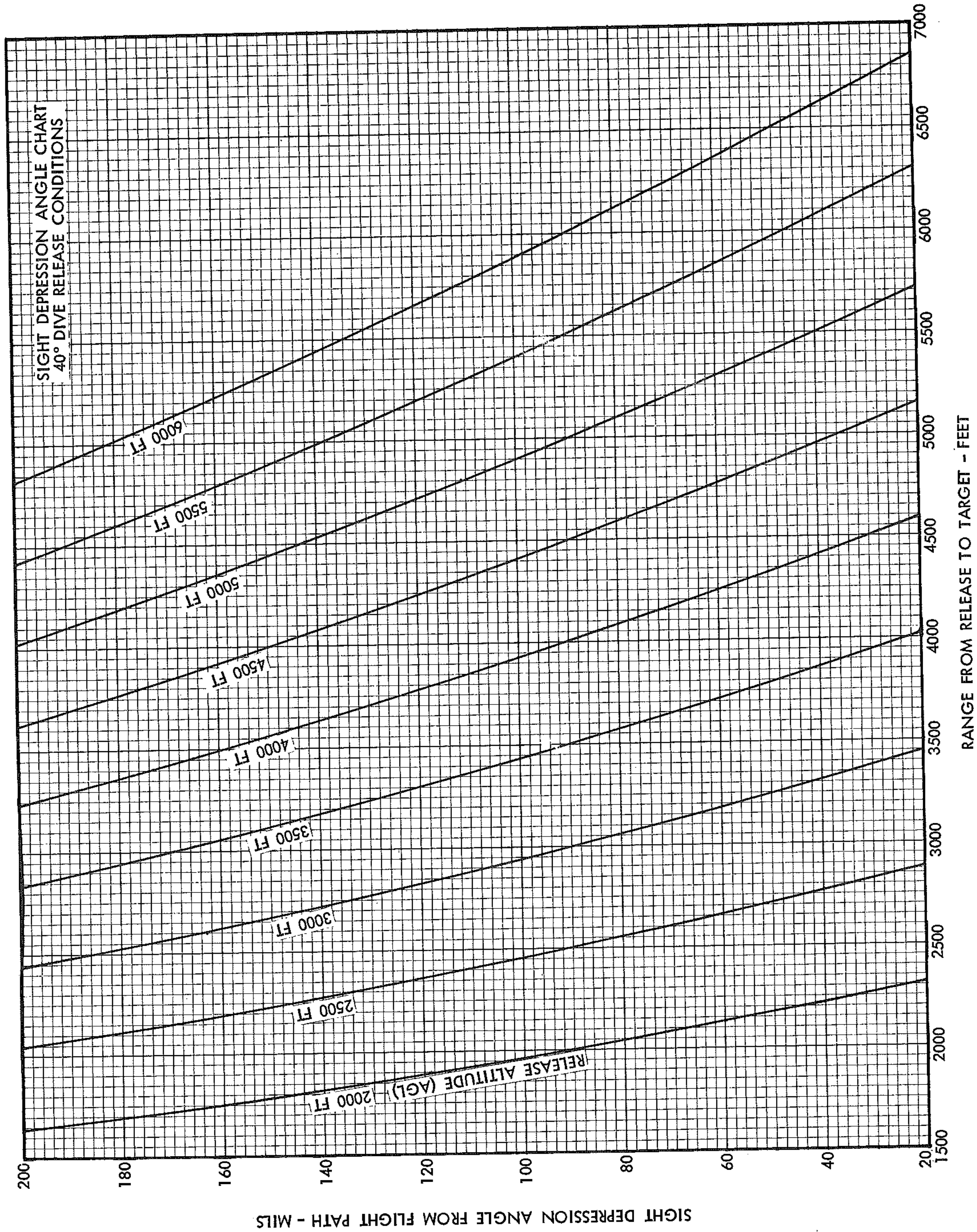


Figure 6-14.

SIGHT DEPRESSION ANGLE CHART 45° DIVE RELEASE CONDITIONS

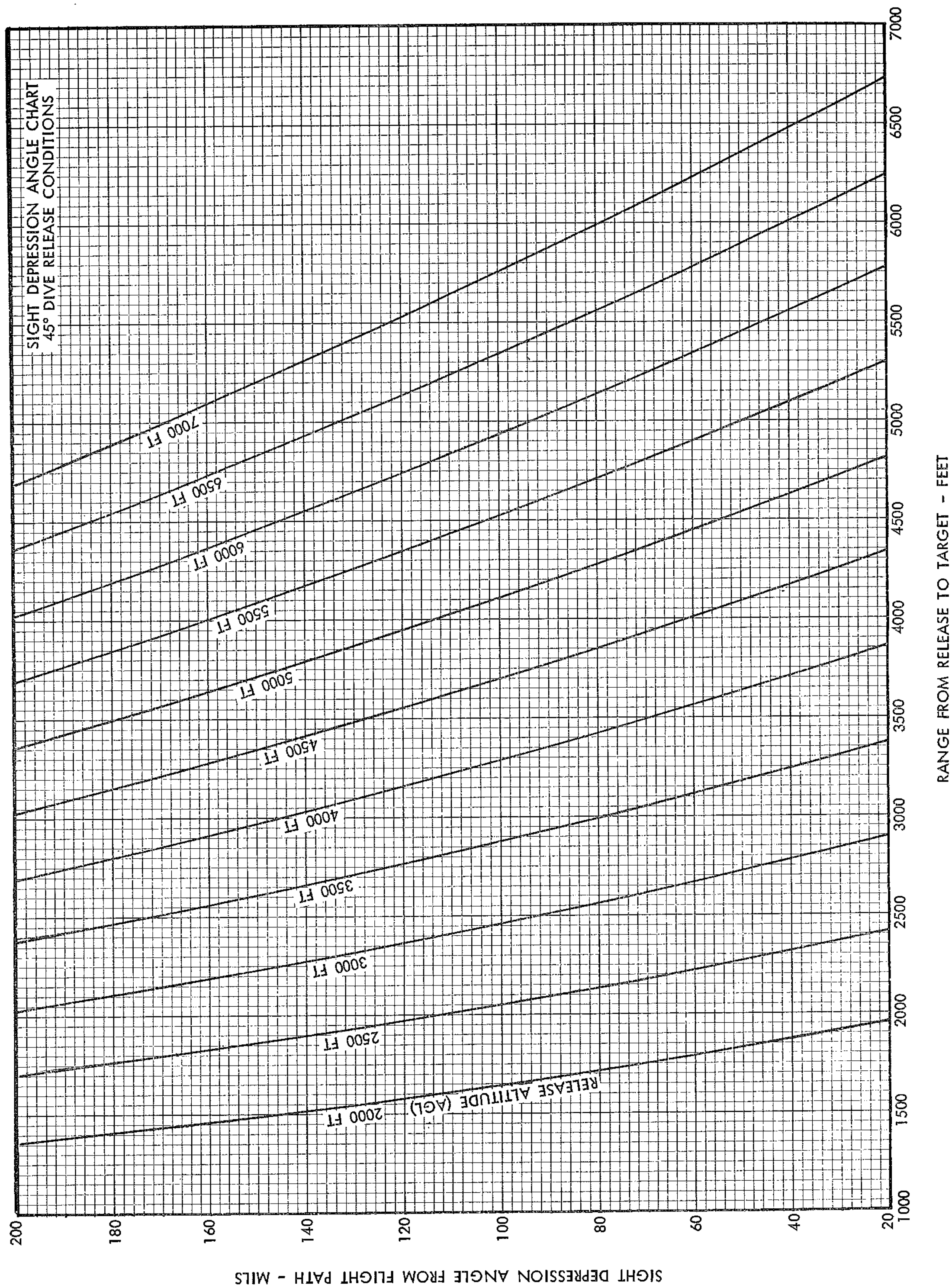


Figure 6-15.

CONVERSION - ZERO SIGHT LINE ANGLE OF ATTACK - KIAS - TRUE MACH. NO.- KTAS CHART

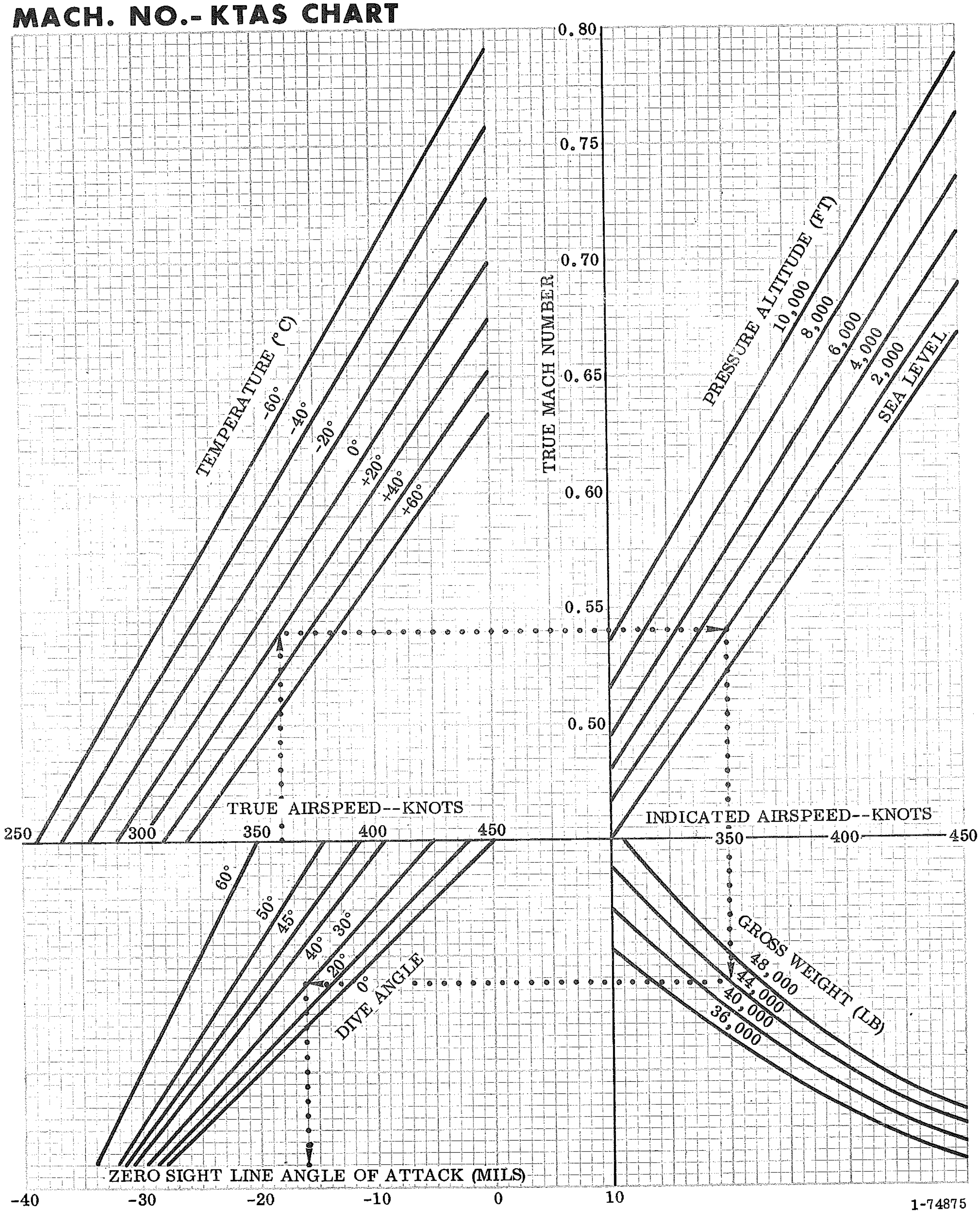


Figure 6-16

ALTIMETER CORRECTION CHART

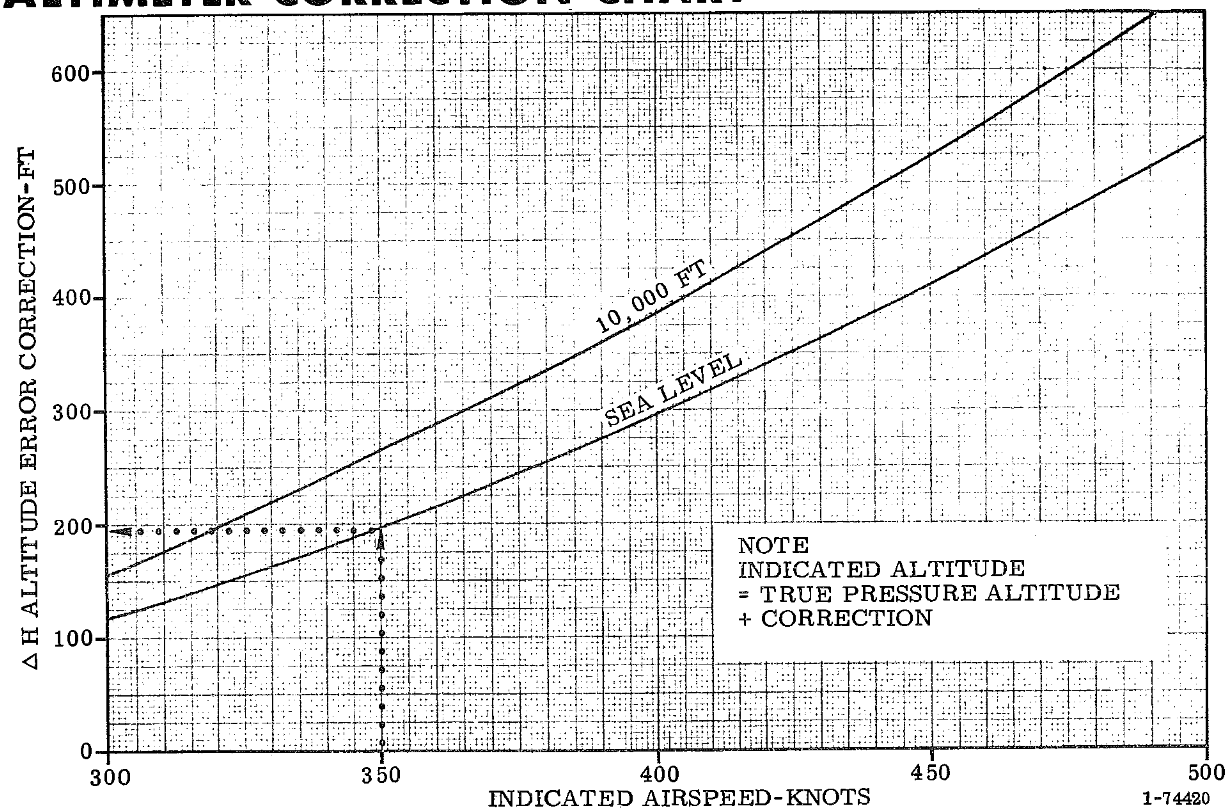


Figure 6-17

RELEASE TIME INTERVAL CHART FOR VARIOUS GROUNDSPEED-SPACING SETTINGS

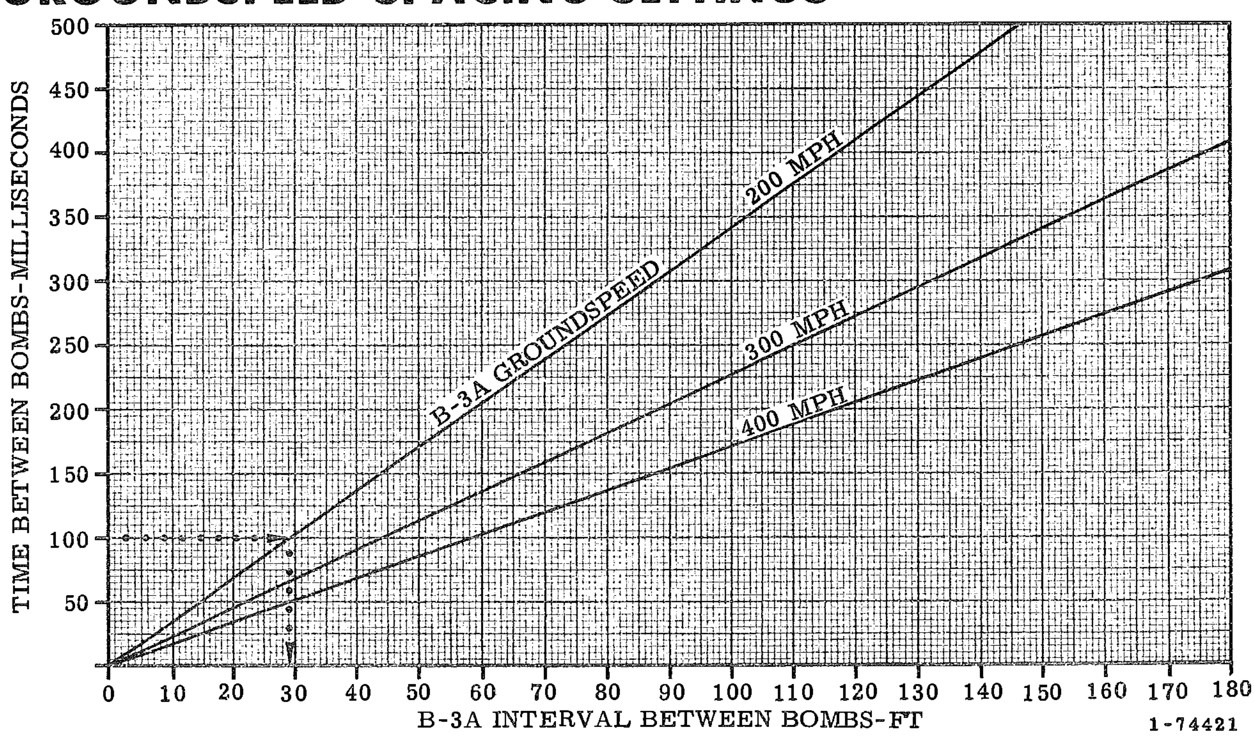
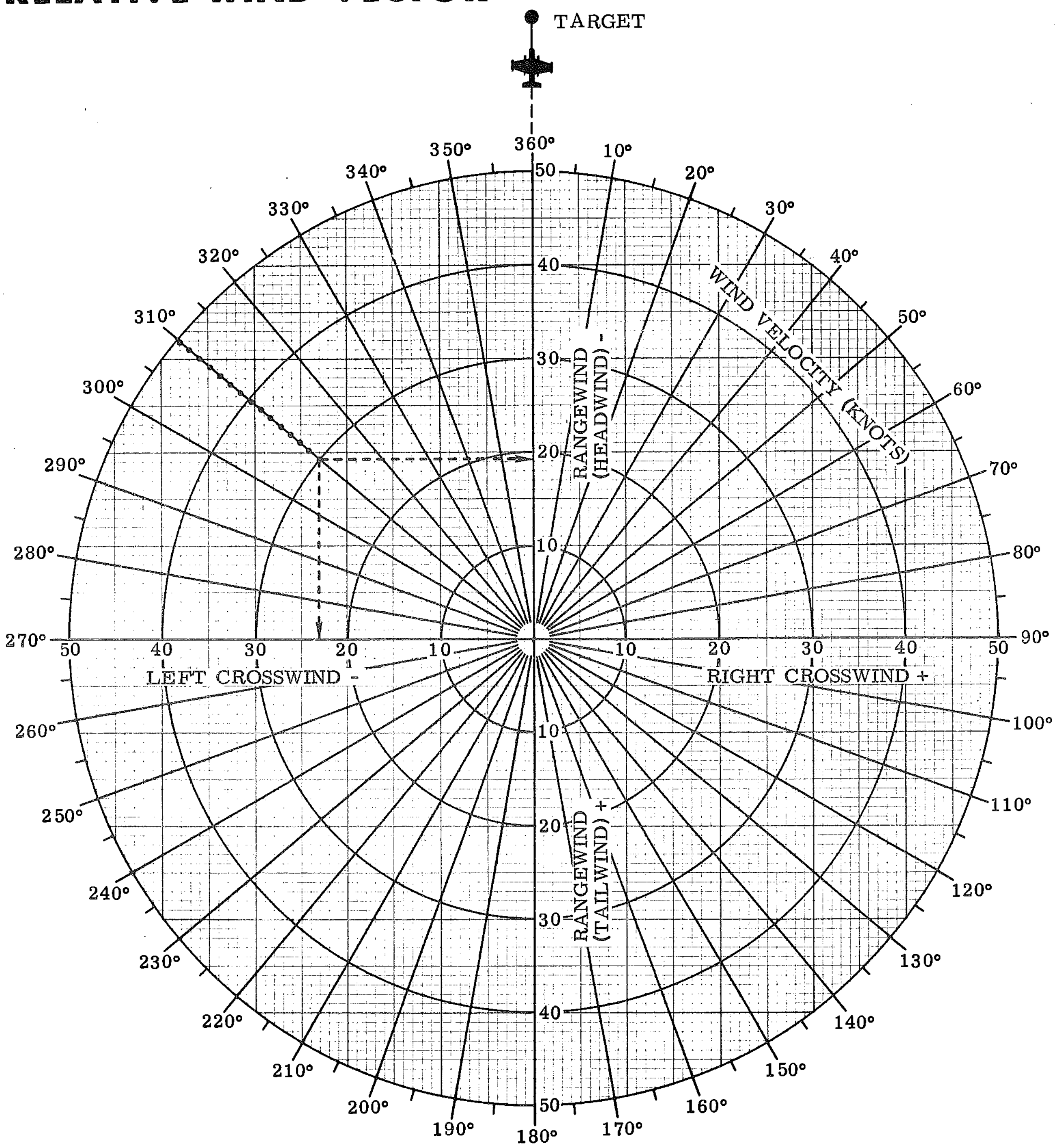


Figure 6-18

RELATIVE WIND VECTOR



1-74422

Figure 6-19

DIVE ANGLE VS DISTANCE

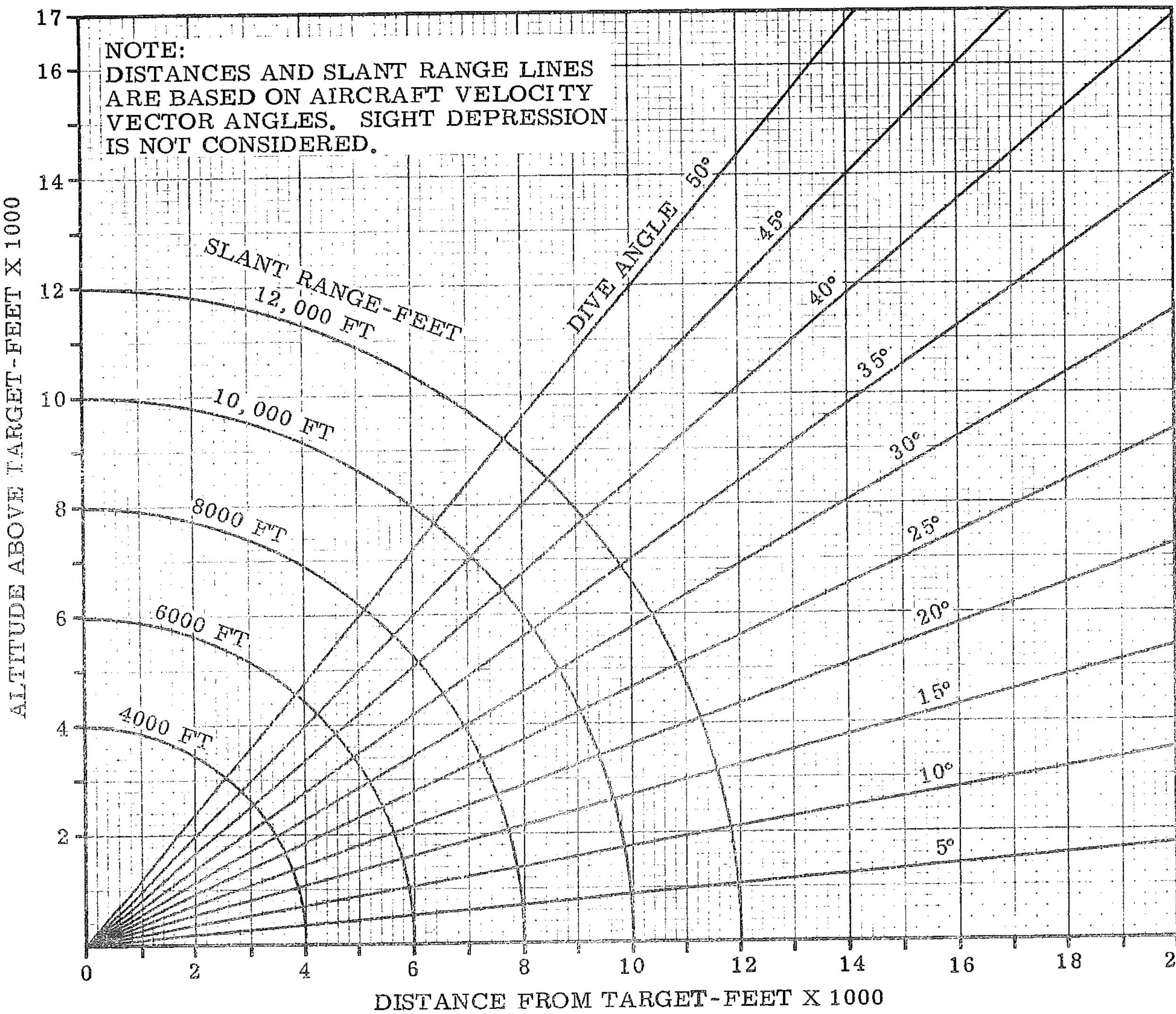


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Figure 6-20

MILS TO DEGREES CONVERSION CHART

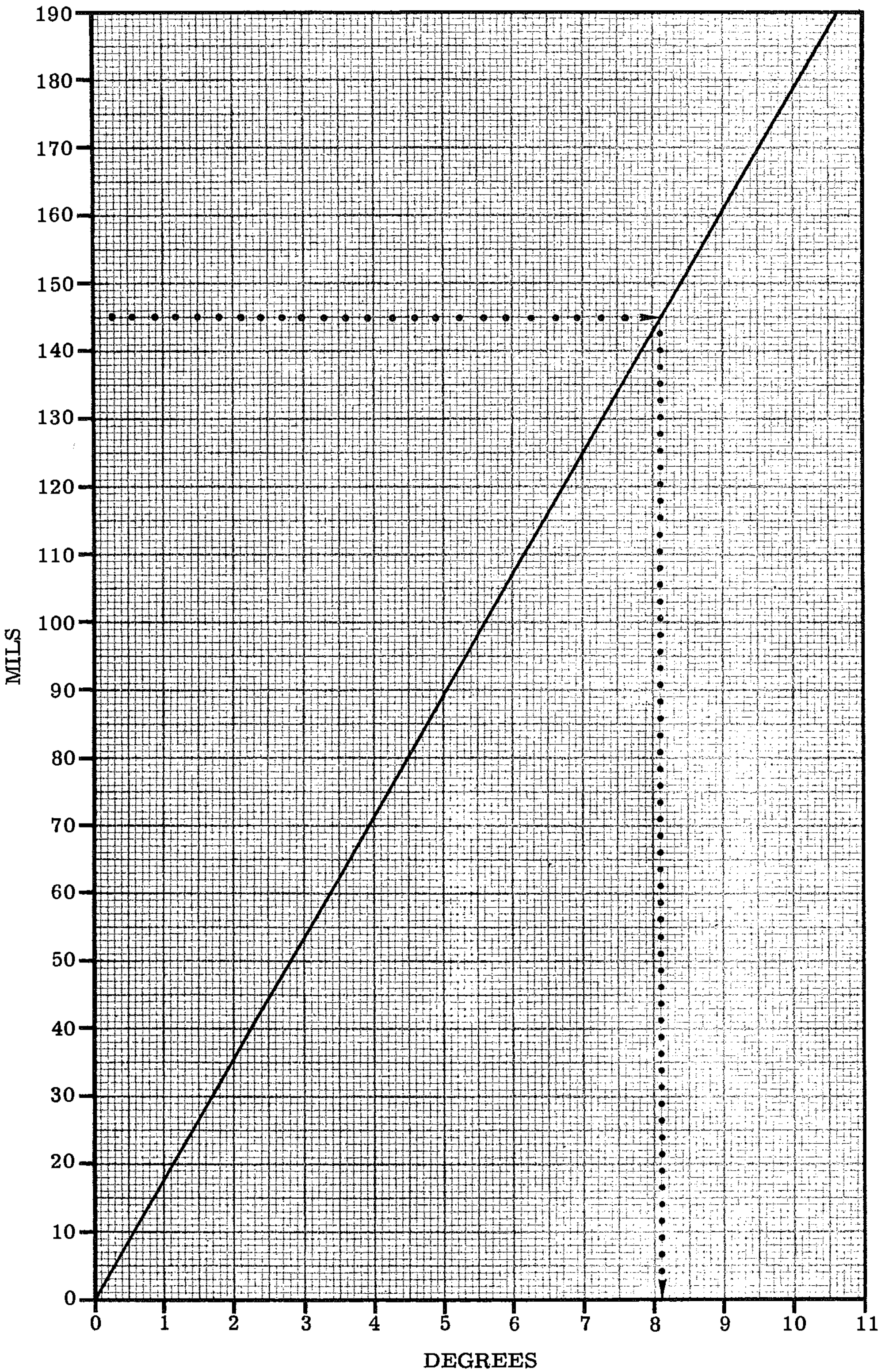

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Figure 6-21

TABLE 6-1

MINIMUM RELEASE ALTITUDE*
REQUIRED FOR SAFE ESCAPE
FOR
GENERAL PURPOSE AND FRAGMENTATION BOMBS

RELEASE TAS KTS	RELEASE DIVE ANGLE DEG	ALT LOST DURING PULLUP FT	MINIMUM RELEASE ALTITUDE FOR FRAGMENTATION ENVELOPE CLEARANCE: M117 BOMB FT	MK82 BOMB FT	MK81 BOMB FT	M57 BOMB FT	M30 BOMB FT	M88 BOMB FT	M81 BOMB FT	M1A2 BOMB FT
300	5	50	800	700	700	600	500	500	600	300
300	10	130	1000	800	800	800	700	700	700	500
300	15	240	1200	1000	1000	1000	800	800	900	600
300	20	370	1400	1200	1100	1100	1000	1100	1200	700
300	25	520	1500	1400	1300	1300	1100	1300	1400	800
300	30	710	1700	1600	1500	1500	1300	1300	1400	1200
300	35	920	1900	1700	1700	1600	1400	1600	1700	1200
300	40	1150	2100	1900	1800	1800	1500	1700	1800	1200
300	45	1410	2200	2000	2000	1900	1600	1700	1800	1500
320	5	50	800	700	700	600	500	500	500	300
320	10	140	1000	900	800	800	700	700	700	500
320	15	260	1200	1000	1000	1000	800	800	900	600
320	20	410	1400	1200	1200	1200	1000	1100	1200	700
320	25	580	1600	1400	1400	1300	1100	1300	1400	800
320	30	790	1800	1600	1600	1500	1300	1300	1400	1200
320	35	1020	2000	1800	1800	1600	1400	1600	1700	1200
320	40	1280	2200	2000	1900	1800	1500	1800	1900	1300
320	45	1570	2400	2100	2000	1900	1600	1800	1800	1600
340	5	60	800	700	600	600	500	500	500	300
340	10	150	1000	900	800	800	600	700	700	500
340	15	280	1200	1100	1000	1000	800	900	900	600
340	20	450	1400	1300	1300	1200	1000	1100	1200	700
340	25	640	1600	1500	1400	1300	1100	1300	1400	900
340	30	870	1900	1700	1600	1500	1300	1400	1400	1200
340	35	1130	2100	1900	1800	1700	1400	1700	1700	1200
340	40	1420	2200	2100	2000	1900	1500	1800	1900	1500
340	45	1750	2400	2200	2100	2000	1800	1800	1800	1800
360	5	60	800	700	600	600	500	500	500	300
360	10	170	1000	900	800	800	600	700	700	500
360	15	310	1200	1100	1100	1000	800	900	900	600
360	20	490	1500	1300	1300	1200	1000	1100	1200	700
360	25	700	1700	1500	1400	1400	1100	1400	1400	900
360	30	960	1900	1700	1600	1600	1300	1400	1400	1200
360	35	1240	2100	1900	1800	1700	1400	1700	1800	1300
360	40	1570	2300	2100	2000	1900	1600	1900	2000	1600
360	45	1930	2500	2300	2200	2000	2000	2000	2000	2000
380	5	70	800	700	600	600	400	500	500	300
380	10	180	1000	900	800	800	600	700	700	500
380	15	340	1200	1100	1100	1000	800	900	900	600
380	20	530	1500	1400	1300	1200	1000	1200	1200	700
380	25	770	1700	1600	1500	1400	1100	1400	1500	900
380	30	1050	2000	1800	1700	1600	1300	1500	1400	1200
380	35	1360	2200	2000	1900	1800	1400	1800	1900	1400
380	40	1720	2400	2200	2000	1900	1800	1900	2000	1800
380	45	2120	2600	2300	2200	2200	2200	2200	2200	2200
400	5	70	700	700	600	500	400	500	500	300
400	10	200	1000	900	800	800	600	700	700	400
400	15	370	1300	1100	1100	1000	800	900	900	600
400	20	580	1500	1400	1400	1200	1000	1200	1300	700
400	25	840	1700	1600	1600	1400	1100	1400	1500	900
400	30	1140	2000	1800	1700	1600	1300	1500	1500	1200
400	35	1490	2200	2000	2000	1800	1500	1800	1900	1500
400	40	1880	2400	2300	2200	1900	1900	2000	2100	1900
400	45	2320	2600	2400	2400	2400	2400	2400	2400	2400

* THESE MINIMUM RELEASE ALTITUDES ARE BASED ON A 3.5 G RECOVERY AND ASSUME THAT THE 3.5 G IS ATTAINED WITHIN 2.0 SEC AFTER RELEASE. THE G IS MAINTAINED UNTIL A 20° - 30° CLIMB OUT ANGLE IS ATTAINED.

TABLE 6-2

MINIMUM RELEASE ALTITUDES REQUIRED FOR SAFE ESCAPE (LEVEL RELEASE) FOR GENERAL PURPOSE AND FRAGMENTATION BOMBS

STRAIGHT AND LEVEL CONSTANT POWER ESCAPE MANEUVER

MINIMUM REL ALT FOR FRAGMENTATION ENVELOPE CLEARANCE

REL TAS KTS	M117 BOMB FT	MK82 BOMB FT	MK81 BOMB FT	M57 BOMB FT	M30 BOMB FT	M88 BOMB FT	M81 BOMB FT	M1A2 BOMB FT
180	1700			1300	900			500
200	1600			1300	900			500
220	1500			1200	900			500
240	1500			1200	800			400
260	1400			1100	800			400
280	1400			1000	700			400
300	1400	1200	1100	900	600	800	800	300
320	1300	1200	1000	900	600	800	800	300
340	1300	1100	1000	800	600	700	700	300
360	1200	1100	900	700	600	700	700	300
380	1100	1000	900	700	500	700	700	200
400	1000	1000	900	600	500	600	600	200
3.5 G MAX POWER PULLUP*								
300	600	500	500	400	300	400	400	200
320	600	500	400	400	300	300	400	200
340	600	500	400	400	300	300	300	200
360	500	500	400	400	200	300	300	200
380	500	400	400	300	200	300	300	200
400	500	400	400	300	200	300	300	200

*THESE MINIMUM RELEASE ALTITUDES ASSUME THAT A 3.5 G MAX POWER PULLUP IS ATTAINED 2.0 SECONDS AFTER RELEASE. THE G IS MAINTAINED UNTIL A 20°-30° CLIMB OUT ANGLE IS ATTAINED.

TABLE 6-3

MINIMUM RELEASE ALTITUDE
REQUIRED FOR
SAFE ESCAPE AND GROUND CLEARANCE DURING RECOVERY
FOR
M117 (RETARDED) AND MK 82 (SNAKEYE I) BOMBS

STRAIGHT AND LEVEL CONSTANT POWER ESCAPE MANEUVER

REL TAS KTS	M117 (RETARDED) BOMB FT	MK 82 (SNAKEYE I) BOMB FT
300	225	225
320	175	150
340	125	150
360	125	150
380	125	150
400	125	125

3.5 G MAX POWER PULLUP*

	5 DEG DIVE		15 DEG DIVE	
REL TAS KTS	M117 (RETARDED) BOMB FT	MK 82 (SNAKEYE I) BOMB FT	M117 (RETARDED) BOMB FT	MK 82 (SNAKEYE I) BOMB FT
300	400	400	600	600
320	300	400	500	600
340	300	300	500	500
360	300	300	500	500
380	300	300	500	500
400	300	300	500	500

	25 DEG DIVE		35 DEG DIVE	
REL TAS KTS	M117 (RETARDED) BOMB FT	MK 82 (SNAKEYE I) BOMB FT	M117 (RETARDED) BOMB FT	MK 82 (SNAKEYE I) BOMB FT
300	900	900	1000	1000
320	800	800	1100	1100
340	800	800	1200	1200
360	800	800	1300	1300
380	800	800	1400	1400
400	900	900	1500	1500

* THESE MINIMUM RELEASE ALTITUDES ARE BASED ON A 3.5 G RECOVERY AND ASSUME THAT THE 3.5 G IS ATTAINED WITHIN 2.0 SEC AFTER RELEASE.

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