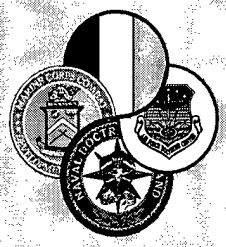


J-FIRE

MULTISERVICE PROCEDURES FOR THE JOINT APPLICATION OF FIREPOWER

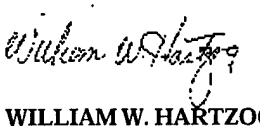
FM 90-20
MCRP 3-16.8B
NWP 3-09.2
AFTTP(I) 3-2.6

NOVEMBER 1997

AIR LAND SEA APPLICATION CENTER

FOREWORD

This publication has been prepared under our direction for use by our respective commands and other commands as appropriate.



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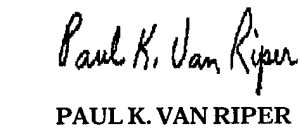

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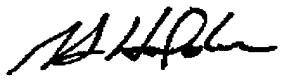

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PREFACE

1. Scope

J-Fire applies to the tactical operating forces of the Army, Marine Corps, Navy, and Air Force. It is a United States (US) unilateral-only document, but it includes North Atlantic Treaty Organization (NATO) formats where appropriate. Information in *J-Fire* has been extracted from existing applicable service directives. It is intended primarily for use by members of battalion-level combat units. Navy and Marine information has been coordinated with Naval Doctrine Command (NDC) and the Marine Corps Combat Development Command (MCCDC), respectively.

2. Purpose

J-Fire provides a pocket-sized, quick reference guide for requesting fire support. *J-Fire* contains calls for fire, a format for joint air strike requests, a format for briefing aircrews who provide close air support, structures of communication nets, and data on weapons.

3. Implementation Plan

Participating service command offices of primary responsibility (OPRs) will review this publication, validate the information, and reference and incorporate it in service manuals, regulations, and curricula as follows:

Army. The Army will incorporate the procedures in this publication in US Army training and doctrinal publications as directed by the commander, US Army Training and Doctrine Command (TRADOC). Distribution is in accordance with DA Form 12-11E.

Marine Corps: PCN 14400003300

Marine Corps. The Marine Corps will incorporate the procedures in this publication in US Marine Corps training and doctrinal publications as directed by the commanding general, US Marine Corps Combat Development Command (MCCDC). Distribution is in accordance with MCPDS.

Navy. The Navy will incorporate these procedures in US Navy training and doctrinal publications as directed by the commander, Naval Doctrine Command (NDC). Distribution is in accordance with MILSTRIP Desk Guide and NAVSOP Pub 409.

Air Force. Air Force units will validate and incorporate appropriate procedures in accordance with applicable governing directives. Distribution is in accordance with AFI 37-160.

4. User Information

a. The TRADOC-MCCDC-NDC-AFDC Air Land Sea Application (ALSA) Center developed this publication with the joint participation of the approving service commands. ALSA will review and update this publication as necessary.

b. We encourage recommended changes for improving this publication. Key your comments to the specific page and paragraph and provide a rationale for each recommendation. Send comments and recommendation directly to—

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c. This publication reflects current joint and service doctrine, command and control organizations, facilities, personnel, responsibilities, and procedures. Changes in service protocol, appropriately reflected in joint and service publications, will likewise be incorporated in revisions to this document.

*FM 90-20
*MCRP 3-16.8B
*NWP 3-09.2
*AFTTP(I) 3-2.6

FM 90-20	US Army Training and Doctrine Command Fort Monroe, Virginia
MCRP 3-16.8B	Marine Corps Combat Development Command Quantico, Virginia
NWP 3-09.2	Naval Doctrine Command Norfolk, Virginia
AFTTP(I) 3-2.6	Headquarters Air Force Doctrine Center Maxwell Air Force Base, Alabama

6 NOVEMBER 1997

J-FIRE
Multiservice Procedures for the Joint Application of Firepower

TABLE OF CONTENTS

*** This publication supersedes FM 90-20, FMFRP 2-72, ACCP 50-28, USAFEP 50-9, PACAFP 50-28, and CINCLANTFLTINST 3330.5, 11 Feb 94.**

TABLES

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U.S. Special Operations Command, JSOFI, SOFI-D, Ft Bragg, NC

ARTILLERY/MORTAR FIRE

A call for fire is a concise message prepared by the observer. It contains all information needed by the fire direction center (FDC) to determine the method of target attack. It is a request for fire, not an order. There are six elements of the call for fire sent to the FDC in three transmissions: The observer identification, warning order, target location, target description, method of engagement, and method of fire and control. There is a break after each transmission and the FDC reads back data. Be ready for a challenge and response after the last readback.

1st Transmission **(Mandatory Call)**

1. Observer identification (ID). (Call Signs)

2. Warning order (adjust fire; fire for effect; immediate suppression; immediate smoke; suppress; mark; adjust fire, polar; adjust fire, shift _____ (insert the known point or target).

2nd Transmission **(Mandatory Call)**

3. Target location (can be given in three ways: grid, polar plot, and shift from a known point).

3rd Transmission **(Mandatory Call)**

4. Target description (brief but accurate statement describing the target).

5. Method of engagement (danger close, high angle, ammo type requested, mark).

6. Method of fire and control (at my command, request time of flight, request splash, request time on target (TOT), direction).

TARGET LOCATION METHODS

There are three methods to define the target location: grid coordinates, polar plot, and shift from a known point. The most common method is grid coordinates. The call for fire formats on following pages are all set up for the grid coordinates method. If the other methods are desired, substitute these formats into the second transmission (target location box).

Polar Plot:

"Direction _____**"** in mils/degrees
(Observer to target (tgt) line)

(Note: Must specify degrees to FDC only if direction is given in degrees.)

"Distance _____**"** in meters

"Up/Down _____**"** in meters

(Note: Difference in target altitude with respect to observer altitude.)

Shift From A Known Point:

"Direction _____**"** in mils/degrees
(Observer to tgt line)

(Note: Must specify degrees to FDC only if direction is given in degrees)

"Left/Right (Lateral Shift)_____**"** in meters

"Add/Drop (Range Shift)_____**"** in meters

"Up/Down (Vertical Shift) _____**"** in meters

(Note: Difference in target altitude with respect to known point altitude.)

MESSAGE TO OBSERVER

After the FDC processes the call for fire, it will send the following:

a. Call sign of the unit firing the mission **(Mandatory Call)**. This is given as the last letter of the call sign of the unit firing the mission. If two letters are given, then the first letter is the unit that will fire for effect, and the second is the unit firing the adjusting rounds.

b. Changes to the call for fire (if any are made).

c. Number of Rounds **(Mandatory Call)**. Number of rounds, per tube that will fire for effect.

d. Target Number **(Mandatory Call)**. For tracking subsequent missions or to record as a target for future use.

e. Time of Flight. Time in seconds from shot to impact. Announced when time of flight is requested by observer or when firing high angle, aerial observer, moving target, Copperhead, or coordinated illumination missions.

ARTILLERY/MORTAR DEFINITIONS

At My Command - The command used when the observer desires to control the exact time of delivery of fires.

Ammo/Fuse Types - Observer may request specific shell/fuse combinations during the initial call for fire or request a change in shell/fuse combinations during subsequent adjustments.

Check Firing - A command to cause a temporary halt in firing.

Danger Close - Within 2000 meters (m) for Multiple-Launch Rocket System (MLRS), 600m of friendly troops for

mortars and artillery; 750m for 5 inch (in) naval guns. The creeping method of adjustment will be used exclusively during danger close missions.

Direction - In artillery and naval gunfire support, a term used by a spotter/observer in a call for fire to indicate the direction from the observer to the target. Preferred units are mils, but the FDC will accept degrees. The observer must specify if using degrees.

End of Mission - Transmitted when the mission has been completed.

High Angle - Low angle is standard. If high angle is desired, you must request it.

Mark - Spotting round (normally white phosphorous [WP]) to indicate targets to aircraft, ground troops, or fire support.

Repeat - An order or request to fire again the same number of rounds with the same method of fire.

Surveillance - Battle damage assessment (BDA).

Shot - Announced by the FDC to alert the observer that rounds have been fired.

Splash - In artillery and naval gunfire support, word transmitted to an observer or spotter 5 seconds (sec) before the estimated time of impact of a salvo or round.

Time of Flight - The time in seconds from shot to impact of a round.

Time on Target - The desired time the observer wants the round(s) to impact.

ADJUST FIRE MISSION
(Grid Method)

Observer: "_____ **this is** _____ **Adjust Fire, Over"**
(FDC's Call Sign) (Observer's Call Sign)

"Grid _____**, Over"**
(6-Digit UTM)

Target Description "_____**"** (Target Description, Size, Activity)

Method of Engagement (Optional) (Danger Close, Mark, High Angle, Ammo/Fuse Type)

Method of Fire and Control (Optional) (At My Command, Time on Target, Request Splash, Request Time of Flight, "Over")

FDC may challenge after they read back the above. The observer should be prepared to authenticate.

Message To Observer
*= Mandatory Call

Units to Fire* (Firing Unit, Adjusting Unit)

Changes to Call for Fire (If Any)

Number of Rounds* (Per Tube)

Target Number*

Time of Flight (Seconds)

Given After Message To Observer

"Direction _____**, Over"** (Mils or Degrees, Magnetic)

Adjustments

"Left/Right _____**"** (Meters, from Impact to Observer Target Line)

"Add/Drop _____**"** (Meters, Distance from Impact to Target)

Once on target call: **"Fire for Effect, Over"**

Mission Completion

"End of Mission, _____**, Over."**
(BDA and Target Activity)

Figure 1. Adjust Fire Mission Format

FIRE FOR EFFECT MISSION
(Grid Method)

"_____ this is _____ Fire for Effect, Over"
(FDC's Call Sign) (Observer's Call Sign)

"Grid _____, Over"
(6-Digit UTM)

Target Description "_____"(Target Description, Size, Activity)

Method of Engagement (Optional) (Danger Close, Mark, High Angle, Ammo/Fuse Type)

Method of Fire and Control (Optional) (At My Command, Time on Target, Request Splash, Request Time of Flight, "Over")

FDC may challenge after they read back the above. The observer should be prepared to authenticate.

Message To Observer
*= Mandatory Call

Units to Fire*

Changes to Call for Fire (If Any)

Number of Rounds* (Per Tube)

Target Number*

Time of Flight (Seconds)

Adjustments

"Direction _____, Over"
(Prior to 1st Adjustment) (Mils or Degrees, Magnetic)

"Left/Right _____"(Meters, from Impact to Observer Target Line)

"Add/Drop _____"(Meters, Distance from Impact to Target)

"Fire for Effect, Over"

"Repeat, Over"

Mission Completion

"End of Mission, _____, Over."
(BDA and Target Activity)

Figure 2. Fire For Effect Mission Format

MARKING MISSION
(Grid Method)

"_____ this is _____ Fire for Effect, Over"
(FDC's Call Sign) (Observer's Call Sign)

"Grid _____, Over"
(6-Digit UTM)

"Mark, WP, At My Command, Request Time of Flight, Over"

Method of Engagement (Optional) (Danger Close, Mark, High Angle, Ammo/Fuse Type)

Method of Fire and Control (Optional) (At My Command, Time on Target, Request Splash, Request Time of Flight)

FDC may challenge after they read back the above. The observer should be prepared to authenticate.

Message To Observer
*= Mandatory Call

Units to Fire*	(If Any)
Changes to Call for Fire	(Per Tube)
Number of Rounds*	
Target Number*	(Seconds)
Time of Flight	

Mission Completion

"End of Mission, Over."

Figure 3. Marking Mission Format

ARTILLERY/MORTAR QUICK SMOKE REQUEST

Observer "_____ this is _____ Adjust Fire, Over"
(FDC's Call Sign) (Observer's Call Sign)

"Grid _____, Over"
(6-Digit UTM)

Target Description "_____

_____ **Smoke/WP in Effect, Over"**

a. L: Length of Smoke Screen Desired _____

b. M: Maneuver-Target Line _____

c. Dir: Wind Direction _____ (Head, Tail, Right Cross, Left Cross, Headwind, Tailwind)

d. T: Time or Duration of the Smoke Screen is to be effective _____

Adjust Fire Up/Down

For Ground Burst **"up 100"**

NOTE: ***High explosive (HE) will be used to adjust rounds onto the desired target area. Once properly adjusted, the observer will request shell smoke; adjustments will be made if necessary. Then Fire for Effect is requested.***

Figure 4. Artillery/Mortar Quick Smoke Request Format

ARTILLERY/MORTAR ILLUMINATION REQUEST-CALL FOR FIRE

WARNING: Use of illumination requires care and adequate coordination to avoid adverse impact on the operations of adjacent and supporting units and those using night-vision devices.

Observer "_____**this is** _____**"**
(FDC's Call Sign) (Observer's Call Sign)

Warning order: **"** _____**, Over"**
(Such As **Adjust Fire, Fire for Effect**)

Target Location: **"**_____**, Over"** (Such as **Grid, Polar, Shift**)

Target Description: **"**_____**"** (Target Description, Size, Activity)

Method of Engagement: **"Illumination"**

Method of Fire and Control: **"**_____**, Over"** (Such as **by Shell, at My Command**)

"Direction _____**,Over"**
Adjustment of illumination:

Note: Observer will give direction if grid mission.

Corrections include—

"Right/left	**" In 200m Increments**
"Add/drop	**" In 200m Increments**
"Up/down	**" In 50m Increments**

Adjust illumination over adjusting point/target. When maximum target illumination is obtained, the observer transmits: **"Illumination mark."** When target is verified, observer transmits "coordinated illumination" and attacks with desired munitions using the call for fire format. **NOTE:** Coordinated illumination directs the FDC to calculate and direct the firing of the illumination and the attack munitions at a time that should result in the attack munitions impacting when the target is at maximum illumination. Observers desiring to control the firing of both the illumination and the attack munitions transmit: **"By shell, at my command."** To receive 2 or 4 gun illumination during an illumination mission transmit the following:

For 2-gun illumination: **"Range spread"** or **"Lateral spread."**

For 4-gun illumination: **"Range and lateral spread."**

Figure 5. Artillery/Mortar Illumination Mission Format

Table 1. Artillery Weapons Capabilities

105mm WEAPONS & AMMO	BASIC RANGE (m)	EXTENDED RANGE (m)	DPICM RANGE (m)	RAP RANGE (m)	SUSTAIN-MENT RATE (RPM)
M102	11,400	N/A	10,500	15,300	3
Applicable Ammo	HE, WP, ILLUM, HC, APICM, SMK		DPICM (M916) FY99*	RAP (M548)	
M119A1	11,500	14,000	14,100	19,500	3
Applicable Ammo	HE, WP, ILLUM, HC, APICM, SMK	HE (M760)	DPICM (M915) FY99*	RAP (M913)	

**Expected year-in inventory*

105mm WEAPONS & AMMO	BASIC RANGE (m)	DPICM RANGE (m)	BBDPICM RANGE (m)	RAP RANGE (m)	SUSTAIN-MENT RATE (RPM)
M109A5/A6	18,200	17,900	28,100	30,000	1
Applicable Ammo	HE, WP, ILLUM, HC, APICM, SMK	DPICM, M825 SMK, FASCAM	BBDPICM (M864)	RAP (M549A1)	
M198	18,300	18,000	28,200	30,100	2
Applicable Ammo	HE, WP, ILLUM, HC, APICM, SMK	DPICM, M825 SMK, FASCAM	BBDPICM (M864)	RAP (M549A1)	

Copperhead range for M109s and the M198 is 16,000 meters

M270 LAUNCHER	MUNITION	RANGE	PAYLOAD
MLRS	M26	32,000	DPICM
	ER MLRS FY99*	45,000	DPICM
ATACMS	M39	165,000	APAM
	BLK 1A FY98*	300,000	APAM
	BLK 2 FY01*	140,000	BAT
	BLK 2A FY04*	300,000	BAT2

**Expected year-in inventory*

For planning purposes danger close is considered 2000m for MLRS and rocket fires, 600m from friendly troops for mortar and artillery fires

Table 2. Mortar Weapons Capabilities

GUN/ MORTAR	MAX RANGE (m)	MIN RANGE (m)	MAX RATE OF FIRE (RPM)	SUSTAIN-MENT RATE (RPM)	AMMO	FUSES
60mm	3500	70	30	20	HE, WP, ILLUM	PD, VT, TI, delay
81mm M252/ M29A1	5800/ 4790	80/70	30/25	15/8	HE, WP, ILLUM	PD, VT, TI, delay
107mm M329A2	6840	770	18	3	HE, WP, ILLUM	PD, VT, TI delay
120mm	7200	200	15	4	HE, WP, ILLUM	PD, VT, TI delay

Table 3. Targets and Suggested Ammunition

TARGETS	SHELL/FUSE
Personnel or Light Vehicles	DPICM
Covered Positions or Heavy Vehicles	DPICM
Vehicles or Personnel	HE/VT/MT
Bunkers	HE/CP
Armor, Bunkers	Copperhead

Table 4. Artillery/Mortar Illumination Factors

WEAPON	SHELL TYPE	HOB (m)	BURN TIME (SEC)	RATE OF FALL (m/SEC)
60mm	M83A1	160	25	6
60mm	M83A2/3	160	32	6
81mm	M301A3	600	60	6
105mm	M314A2	750	60	10
105mm	M314A3	750	70-75	10
107mm	M335	700	60	10
107mm	M335A1	700	70	10
107mm	M335A2	400	90	5
155mm	M118	750	60	10
155mm	M485A	600	120	5

NAVAL SURFACE FIRE SUPPORT

5"/54 GUN DATA:

Maximum Range: 23,100m (Full Charge)
12,200m (Reduced Charge)
29,181m rocket assisted projectile (RAP)

Sustained Fire Rate: 20 rounds per minute (RPM)

Ammo: HE, Illum, WP

Fuses: quick (Q), mechanical time (MT), controlled variable time (CVT), variable time (VT), delay (del)

Illumination: Height of burst (HOB) (m) = 500; Burn Time (sec) = 45/72; Rate of Fall (m/sec)= 10/2

DANGER CLOSE MISSIONS (< 750m)

Give cardinal direction and distance to friendlies.
Use first salvo offset and "creeping" method for adjustments at 50m increments.

DIRECTIONS

Directions are normally given in mils in relation to grid north. Any other combination may be used but must be specified (for example, "direction 180 degrees magnetic").

POLAR PLOT:

"Direction _____**"** in mils/degrees

"Distance _____**"** in meters

"Up/Down _____**"** in meters
(vertical shift)

SHIFT FROM KNOWN POINT:

"Shift _____**"**
(target number/reference point)

"Direction _____**"** in mils/degrees
(from observer to target)

"Spotter-TGT Line_____**"** in mils/degrees

"Right/Left _____**"** in meters
(lateral shift)

"Add/Drop _____**"** in meters
(range shift)

"Up/Down _____**"** in meters
(vertical shift)

NGF CALL FOR FIRE
(Given in two transmission)
(Grid Method)

"_____ this is _____ Fire Mission, Target # _____, Over"
(Ship Call Sign) (Observer's Call Sign) (Assigned by observer)

"Grid _____, Altitude _____, Direction _____ Over"
(6-Digit UTM) (Meters MSL) (Mils/Grid)

Target Description	(Target Description, Size, Activity, Cover)
Method of Engagement	(Danger Close, Ammo/Fuse Type, # Salvos, # Guns, Reduced Charge, TOT)
Method of Control	(Fire for Effect, Ship Adjust, Spotter Adjust, Cannot Observe, At My Command)

Message To Observer

Gun-Target Line	(From Gun To Target)
Ready/Time of Flight/Line of Fire (if firing Illum)	(Time of Flight in Seconds)
First Salvo at Offset	(Danger-Close Missions Only)
Summit	(Max Ord in Feet for Air Spotter, Meters for Ground Spotter)
Changes to Call for Fire	

Figure 6. Naval Gunfire Call For Fire Format

CLOSE AIR SUPPORT

IMMEDIATE CLOSE AIR SUPPORT (CAS) REQUEST

(This format is also used to request USMC close-in fire support and USAF AC-130 gunship support.)

1. TACP: "_____**this is**_____ **with an immediate CAS request."**
(ASOC/DASC/AOC) (TACP's ID)
SACC)

NOTE: Await acknowledgment.

2. "Immediate"

3. Target Description: "_____"

4. Target Location: "_____" elevation
(UTM Grid Coordinates)
"_____" feet

5. Time on Target: "_____"

6. Desired Ordnance/Results: "_____"

Note: When identifying position coordinates for joint operations, include the map data that location coordinates are based on.

7. Final control.

"Call Sign: _____"

"Frequency: _____"

"Contact Point of IP: _____"

8. Remarks, such as—

"Friendly Location: _____"

"Weather: _____"

"Threats: _____"

Figure 7. Immediate Close Air Support Request Format

CAS CHECK-IN BRIEFING
Aircraft Transmits to Controller

Aircraft: "_____ this is _____"
(Controller Call Sign) (Aircraft Call Sign)

Note: Authentication and appropriate response suggested here. The brief may be abbreviated for brevity or security ("as fragged" or "with exception").

Identification/Mission Number: "_____"

Number and Type of Aircraft: "_____"

Position and Altitude: "_____"

Ordnance: "_____"

Play Time: "_____"

Abort Code: "_____"(If applicable)

*Remarks: "_____ (NVG, LST, Special Mission Items)
_____"

*Optional Entry

Figure 8. CAS Check-In Briefing

CAS BRIEFING FORMAT (9-LINE)

(Omit data not required, do not transmit line numbers. Units of measure are standard unless otherwise specified. *denotes minimum essential in limited communications environment. BOLD denotes readback items when requested.)

Terminal controller: "_____ this is _____"
(Aircraft Call Sign) (Terminal Controller)

*1. **IP/BP:** "_____"

*2. Heading: "_____" (Magnetic)
(IP/BP to Target)

Offset: "_____" (Left/Right)

*3. Distance: "_____"
(IP-to-Target in Nautical Miles/BP-to-Target in Meters)

*4. Target Elevation: "_____"
(in Feet/MSL)

*5. Target Description: "_____"

*6. **Target Location:** "_____" (Latitude/Longitude or Grid Coordinates or Offsets or Visual)

*7. Type Mark: "_____" Code: "_____"
(WP, Laser, IR, Beacon) (Actual Code)
Laser to Target Line: "_____ Degrees"

*8. **Location of Friendlies:** "_____"
Position Marked By: "_____"

9. Egress: "_____"

Remarks (as appropriate): "_____"
(Threats, Restrictions, Danger Close, Attack Clearance, SEAD, Abort Codes, Hazards)

"Time on Target (TOT): "_____" or Time to Target (TTT):

"Stand by_____ plus _____, Hack."

NOTE: When identifying position coordinates for joint operations, include the map datum data. DESERT STORM operations have shown that simple conversion to latitude/longitude is not sufficient. The location may be referenced on several different databases; for example, land-based versus sea-based data.

Figure 9. CAS 9-Line Briefing

Figures 10a and 10b are provided for multiple missions.

Call Sign			
Mission #			
Number/Type Aircraft			
Position and Altitude			
Ordnance			
Playtime			
Abort Code			
	LST/Datum /NVG	LST/Datum /NVG	LST/Datum /NVG
1. IP/BP			
2. Heading Offset L/R			
3. Distance F/W NM, R/W M			
4. Tgt Elevation (mean sea level)			
5. Tgt Description			
6. Tgt Location			
7. Mark Laser Code__ Laser to Target Line			
8. Friendlies			
9. Egress			
Remarks (Threat, Hazards, Weather, ACAs, Restrictions) Final Attack Heading Altitude Restriction Other Fires (SEAD, etc.) Follow-on (Re-attack, etc.)			
TTT/TOT			

Figure 10a. CAS Briefing Worksheet

Call Sign			
Mission #			
Number/Type Aircraft			
Position and Altitude			
Ordnance			
Playtime			
Abort Code			
	LST/Datum/NVG	LST/Datum/NVG	LST/Datum/NVG
1. IP/BP			
2. Heading Offset L/R			
3. Distance F/W NM, R/W M			
4. Tgt Elevation (mean sea level)			
5. Tgt Description			
6. Tgt Location			
7. Mark Laser Code__ Laser to Target Line			
8. Friendlies			
9. Egress			
Remarks (Threat, Hazards, Weather, ACAs, Restrictions) Final Attack Heading Altitude Restriction Other Fires (SEAD, etc.) Follow-on (Re-attack, etc.)			
TTT/TOT			

Figure 10b. CAS Briefing Worksheet

JOINT AIR ATTACK TEAM (JAAT)

Briefings

JAAT Air Mission Commander (AMC) to the tactical air control party (TACP)/forward air control (FAC)/tactical air coordinator (airborne) TAC[A])

(Omit data not required; do not transmit line numbers.)

JAAT AMC: "_____, this is _____"
(FAC Call Sign) (JAAT AMC Call Sign)

1. Target Description: "_____"

2. Target Location: "_____"
(Grid Coordinates [See note below])

3. Type Mark: "_____" Code: "_____"
(WP, Beacon, Laser) (Beacon, Laser)
For laser target marking, include laser-to-target line.

4. Location of Friendlies: "_____"

5. Time over target: "**TOT**_____" or Time to Target (TTT): "**Hack time will be**_____"

6. Type of Attack/Timing: "_____"

7. Threats: "_____"
(Type and Location)

8. Restrictions: "_____"

NOTE: After initial contact with the attack aircraft, the TACP/FAC/TAC(A) will brief the flight lead using the appropriate standardized J-Fire briefing format (9-line or NATO). In the Remarks section of the brief, the TACP/FAC/TAC(A) will provide the AMC's call sign and radio frequency, then direct the flight lead to contact the AMC.

JAAT AMC to Attack Aircraft Flight Lead

(Format is flexible and depends on TACP/FAC/TAC(A) availability.)

JAAT AMC: "_____, this is _____"

1. Target Description: "_____"

2. Target Location: "_____"
(Grid Coordinates and Visual Reference, if possible.)

3. Threats: "_____"

4. Type of Attack/Timing: "_____"

5. Time over target: "**TOT**_____"
or
Time to target (TTT): "**Stand by** _____"
(Minutes)
plus_____, **hack.**"

6. Restrictions: "_____"

7. Coordination Call: "**Call** _____ **seconds.**"

8. Remarks: "_____"
(Specific Attack Roles, Laser Codes)

Attack Aircraft Flight Lead to JAAT AMC

1. Departing IP: "_____, **Departing IP.**"

2. Coordination/Weapon Call: "_____,
(Aircraft Call Sign)
_____seconds, _____"
(Ordnance)

AC-130 CALL FOR FIRE

1. Observer/Warning Order: *"_____ , this is _____, Fire Mission, Over."*
(AC-130) (Observer)

2. Friendly Location/Mark: *"My position* _____
marked by _____ (TRP, Grid, etc.)
(Beacon, IR Strobe, etc.)

3. Target Location: "_____."
(Bearing (magnetic) & Range (meters), TRP, Grid, etc.)

4. Target Description/Mark: "_____, *marked by* _____, *Over."* (Target Description)
(IR Pointer, Tracer, etc.)

5. Remarks: "_____."
(**THREATS,** danger close clearance, restrictions, at my command, etc.) "

As Required

1. Clearance: Transmission of the fire mission is clearance to fire. Danger close is 200m with the 105mm and 125m with the 40mm, 25mm, and the 20mm. For closer fire, the observer must accept responsibility for increased risk. State ***"Cleared Danger Close"*** on line five. This clearance may be preplanned.

2. At my command: State ***"At My Command"*** on line five. The gunship will call ***"ready to fire"*** when ready.

3. Adjust Fire: Only adjust for marking rounds or incorrect target. Adjust from impact by giving range (meters) and cardinal (North, South, East, West) direction.

Don'ts

1. Do **not** ask the gunship to identify colors.
2. Do **not** reference clock positions.
3. Do **not** pass run-in headings/no-fire headings.
4. Do **not** correct left/right or short/long.

TERMINAL CONTROLLER'S CALLS

Abort Directive/informative to cease action/ attack/event/mission.

Cleared Hot Ordnance release is authorized.

Continue Continue present maneuver, does not imply clearance to engage or expend ordnance.

Continue Dry Ordnance release not authorized.

WARNING

The word "CLEARED" will only be used when ordnance is actually to be delivered. This will minimize the chances of dropping ordnance on dry passes further reducing the risk of fratricide.

Table 5. Abort Call Illustration

(The FAC is "NAIL 11"; the CAS attack flight is "SPIKE 41." SPIKE 41 flight has chosen "BR" (authenticated "D") as the abort code.)	
Radio Call	**Action Taken**
(During the CAS check-in briefing): "NAIL 11, this is SPIKE 41, abort code BRAVO ROMEO."	NAIL 11 notes the correct reply for "BR" is "D."
(The FAC calls for an abort) "SPIKE 41, NAIL 11, ABORT DELTA, ABORT DELTA, ABORT DELTA."	SPIKE 41 aborts the pass.

NATO INFORMATION

NATO Briefing Formats

NATO Fighter Check-In Briefing (Permissive Environment) (Be prepared to use this format with NATO forces.)

Aircraft Transmits to Controller

1. Aircraft Call Sign: "_____"

2. Mission Number: "_____"

3. Authentication: "_____"

FAC Authentication Response: "_____"

4. Number and Type of Aircraft: "_____"

5. Ordnance: "_____"

6. Position: "_____"

7. Playtime: "_____"

8. Abort Code: "_____"

NATO Fighter Check-In Briefing (Uncertain/ Hostile Environment) (Be prepared to use this format with NATO forces.)

Aircraft Transmits to Controller

1. Aircraft Call Sign: "_____"

2. Mission Number: "_____"

3. Authentication: "_____"

FAC Authentication Response: "_____"

4. Briefing Termination: "_____"

NATO Forward-Air-Controller-to-Attack Aircraft Briefing

MISSION C/S _____ABORT CODE_____

Note: 1. A-J are mandatory brief items, K-O are optional.
2. Items A, D, C, H <u>underlined</u> are mandatory readback (even if "NONE").
3. Heading and bearings magnetic unless true is requested.

<u>A</u>. IP "_____"

B. BEARING "_____"

C. DISTANCE "_____**nautical miles**"

D. TARGET LOCATION UTM OR LAT/LONG "_____
_____"

E. TARGET ELEVATION "_____"

F. TARGET DESCRIPTION "_____"

G. MANDATORY ATTACK HEADING "_____"

H. FRIENDLY FORCES "_____"

I. ATTACK TIME TOT/TTT "_____"

J. ATTACK CLEARANCE FAC C/S _____ TAD _____

K. TARGET INDICATION:

REFERENCE PT [ ] SMOKE [ ] LIGHT/MIRROR [ ]

LASER CODE "_____"

LASER TO TARGET LINE "_____"

BEACON FREQUENCY "_____"

BEARING "_____"

DISTANCE "_____"

ELEVATION "_____FT "

L. THREATS "_____"

M. WEATHER (IF SIGNIFICANT) "_____ "

N. HAZARDS "_____ "

O. EGRESS "_____"

NATO Fighter Departing Initial Point

(Information sent to coordinating element as a one-line transmission.)

"_____**departing IP,** _____"
(Mission Number) (Abort Code)

CHECK-IN INFORMATION			
Call Sign			
Mission #			
Authentication			
#/Type Aircraft			
Ordnance			
Position			
Playtime			
Abort Code			
	LST/Datum/NVG	LST/Datum/NVG	LST/Datum/NVG

Figure 11. NATO CAS Worksheet (Check-In Information)

FAC TO FIGHTER INFORMATION			
A. IP			
B. Bearing			
C. Distance "nautical miles"			
D. Tgt Location (UTM) Lat/Long			
E. Tgt Elevation			
F. Target Description			
G. Mandatory Attack Heading			
H. Friendly Forces			
I. Attack Time TOT/TTT			
J. Atk Clearance FAC C/S/TAD	/	/	/
K. Target Ind Laser Code Laser to Target Beacon Freq Distance Elevation	Ref Pt/Smoke/ Lt Mirror	Ref Pt/Smoke/ Lt Mirror	Ref Pt/Smoke/ Lt Mirror
L. Threats			
M. Weather (if significant)			
N. Hazards			
O. Egress			

Note:
1. A-J are Mandatory Brief items, K-O are optional.
2. Items A, D, G, H underlined are mandatory read-back (Even if "NONE").
3. Heading and bearings Magnetic unless true is requested.

Figure 12. NATO CAS Worksheet (FAC to Fighter Information)

AIRCRAFT CAPABILITIES

Table 6. Fixed-Wing Aircraft Weapons and Capabilities

Aircraft M/D/S	Using Service	Ordnance	Laser Capability LST	Laser Capability LTD	Marking Capability	Beacon Capability	Other Systems
AV-8B Harrier II	USMC	Laser-guided bombs* AGM-65 Maverick GP bombs CBUs Napalm Aerial mines 2.75" rockets 5.0" rockets LUU-2 flares 25mm cannon AGM-122 Sidearm	YES	NO	Rockets	None	TV NVG GPS
AV-8B Harrier II (APG-GS-Radar) "II Plus"	USMC	As above	NO	NO	Rockets	None	NVG FLIR Radar GPS
A/OA-10A	USAF	Laser-guided bombs* AGM-65 Maverick GP bombs CBUs Aerial mines 2.75" rockets LUU-1/-2 flares LUU-5/-6 flares 30mm cannon	YES	NO	WP rockets 30mm HEI LUU-1 LUU-5 LUU-6	None	NVG
AC-130H	USAF (SOF)	105mm howitzer 40mm cannon 20mm cannon	NO	YES note1	GLINT 105mm WP 105mm HE 40mm misch LTD (1688 only)	PPN-19 SST-181 SSB PLS	FLIR LLLTV Radar GPS
AC-130U	USAF SOF	105mm howitzer 40mm cannon 20mm cannon	NO	YES	GLINT 105mm WP 105mm HE 40mm misch codable LTD	PPN-19 SST-181	FLIR LLLTV Radar GPS
B-1B	USAF	GP bombs	NO	NO	None	PPN-19	Radar
B-52H	USAF	AGM-142 Have Nap GP bombs CBUs Aerial mines Laser guided bombs	NO	NO	None	PPN-19 PPN-20	FLIR LLLTV Radar NVG GPS

Table 6. (Continued)

Aircraft M/D/S	Using Service	Ordnance	Laser Capability LST	Laser Capability LTD	Marking Capability	Beacon Capability	Other Systems
F-14 LANTIRN	USN	Laser-guided bombs GP bombs 20mm cannon CBUs Aerial mines LUU-2 flares	YES	YES	Laser Rockets	None	NVG FLIR
F-15-E	USAF	Laser-guided bombs GP bombs CBUs 20mm cannon	NO	YES	Laser	PPN-19 PPN-20	FLIR Radar
F-16 (less LANTIRN	USAF	Laser-guided bombs* AGM-65 Maverick GP bombs CBUs 20mm cannon	NO	NO	WP rockets	None	Radar NVG GPS**
F-16C/D (with LANTIRN)	USAF	Laser-guided bombs* AGM-65 Maverick GP bombs CBUs 20mm cannon	NO	YES	Laser	None	FLIR GPS NVG Radar
F/A-18	USN (A/C) USMC (A/C/D)	Laser-guided bombs AGM-65 Maverick AGM-62 Walleye AGM-84 SLAM AGM-88 HARM GP bombs CBUs Aerial mines 2.75" rockets 5.0" rockets LUU-2 flares Napalm/FAE 20mm cannon	YES	YES	Laser WP rockets HE rockets	None	FLIR GPS NVG Radar
S-3B	USN	BP bombs CBUs 2.75" rockets 5.0" rockets Aerial mines LUU-2 flares	NO	NO	WP rockets	None	FLIR Radar

LST: Laser Spot Tracker. LTD: Laser Target Designator.
Note 1: The AC-130H can only designate laser code 1688.
***Though these aircraft can carry and release LGBs, they require off-board designation for terminal guidance**
****GPS on some aircraft (Blocks 40/41; 50/52)**

Table 7. Rotary-Wing Aircraft

Aircraft M/D/S	Service	Ordnance	Laser Capability		Marking Capability	Other Systems
			LST	LTD		
UH-1N	USMC	7.62 MG .50 cal MG 2.75" rockets	NO	NO	Rockets	LRF NVG FLIR GPS
AH-1F	USA	BGM-71 TOW 2.75" rockets 20mm cannon	NO	NO	Rockets	NVG
AH-1W[2]	USMC	BGM-71 TOW AGM-114 Hellfire FAE 5" rockets 2.75" rockets 20mm cannon LUU-2 flares AGM-122 Sidearm	NO	YES	Rockets Laser	FLIR NVG GPS
AH-64 A[1]	USA	AGM-114 Hellfire 2.75" rockets 30mm cannon	YES	YES Note 1	Laser Rockets	FLIR 39.8x NVG DTV 127x
AH-64D (including Longbow)	USA	AGM-114L Hellfire 2.75" rockets 30mm cannon	YES	YES Note 1	Laser Rockets	FLIR 39.8x NVG DTV 127x Radar (air and grnd tgt modes) IDM GPS
OH-58D (Kiowa Warrior)	USA	AGM-114 Hellfire 2.75" rockets 50 cal MG	YES	YES	Laser Rockets	FLIR 66 2/3x TVS 50x NVG

Note [1] The AH-64 helicopters cannot designate laser codes 1711 to 1788.
Note [2] The AH-1W can designate codes 1111-1488, but has max effectiveness from 1111-1178.
"IDM" = Improved Data Modem

Table 8. Attack Helicopter Weapons Capabilities

Weapon	Effective Max Range (m)	Maximum Load (Rounds) *
2.75RX, 10-lb	7500	76
2.75RX, 17-lb	6000	76
2.75 MK 66/M151 22.95-lb[2]	6900	38
7.62 mm mini-gun	1000	5000
50 cal machine-gun	1830	500
20mm cannon	1500	750
30mm cannon[1]	3000	1200
40mm grenade launcher[1]	1600	265
TOW	3750	8
Hellfire	8000	16
5.00RX[2]	7200	8
CBU-55FAE[2]	NA	4

**Reflects maximum rounds A/C can carry however mission may dictate less ammunition being carried.*

---

[1] USA only.
[2] USMC only.

NIGHT CAS PLANNING CONSIDERATIONS

Weather

- Ceiling/visibility
- Altitude winds (for flare drift)
- Sunset/EENT
- Moon rise/set
- Moon position
- Percent of illumination (illum)

Equipment

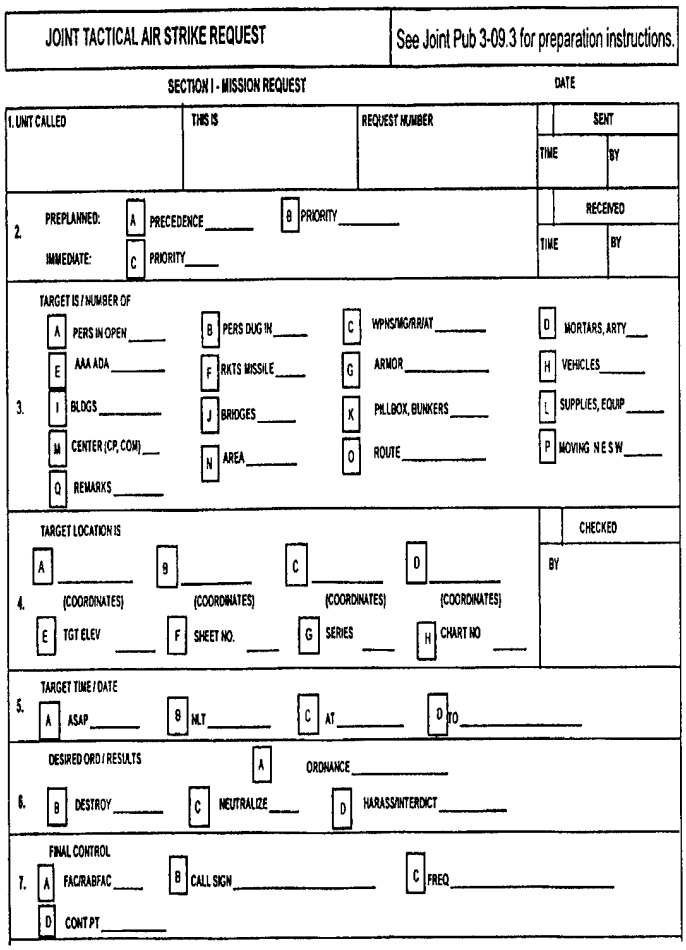
- Marking flares
- NVDs
- Strobes
- Compass
- Laser (Colt Team)
- IR pointer/marking devices/IR chem sticks
- Arty (for illum rounds)
- Mortars (for illum rounds)

Rules of Thumb

- 5000' ceiling with no clouds below (possible 3000' with LANTIRN)
- 5 miles visibility
- IP must be identifiable
- Target must be lighted or illuminated (flares, IR wands, or lights on tgt) (NA for LANTIRN)
- Identify friendly locations

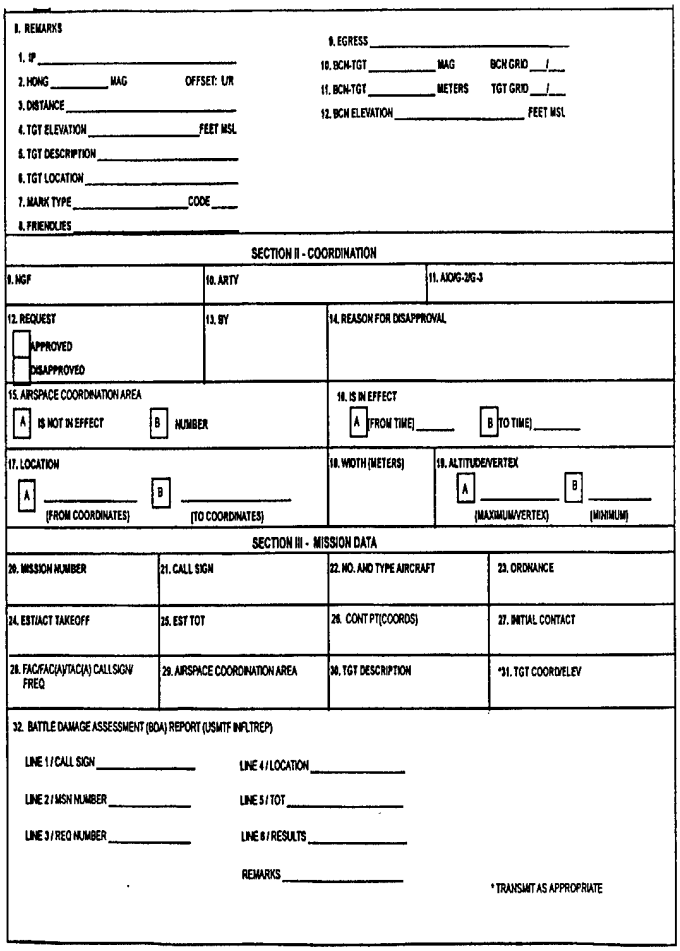
Techniques

- Bring aircraft to target area with vectors
- Point out range restrictions (if applicable)
- Vector aircraft and call for flare release
- Give 10 second warning before flare drop
- Brief bombing pattern (orbit direction, roll-in heading, laser-tgt line, etc.)
- Give direction from flare to target



DD 1972 (Revised) 15 Nov 94 (Supersedes DD Form 1972, 1 Apr 75)

Figure 13. Joint Tactical Air Strike Request Form



5. REMARKS 1. IP _____ 2. HDNG _____ MAG OFFSET: L/R 3. DISTANCE _____ 4. TGT ELEVATION _____ FEET MSL 5. TGT DESCRIPTION _____ 6. TGT LOCATION _____ 7. MARK TYPE _____ CODE ____ 8. FRIENDLIES _____		9. EGRESS _____ 10. BCN-TGT _____ MAG BCN GRID ___/___ 11. BCN-TGT _____ METERS TGT GRID ___/___ 12. BCN ELEVATION _____ FEET MSL	
SECTION II - COORDINATION			
9. NGF	10. ARTY	11. AIOIG-2G-3	
12. REQUEST APPROVED DISAPPROVED	13. BY	14. REASON FOR DISAPPROVAL	
15. AIRSPACE COORDINATION AREA A IS NOT IN EFFECT B NUMBER		16. IS IN EFFECT A (FROM TIME) _____ B (TO TIME) _____	
17. LOCATION A _____ (FROM COORDINATES) B _____ (TO COORDINATES)		18. WIDTH (METERS)	19. ALTITUDE/VERTEX A _____ (MAXIMUM/VERTEX) B _____ (MINIMUM)
SECTION III - MISSION DATA			
20. MISSION NUMBER	21. CALL SIGN	22. NO. AND TYPE AIRCRAFT	23. ORDNANCE
24. EST/ACT TAKEOFF	25. EST TOT	26. CONT PT(COORDS)	27. INITIAL CONTACT
28. FAC/FAC(A)/TAC(A) CALLSIGN/ FREQ	29. AIRSPACE COORDINATION AREA	30. TGT DESCRIPTION	*31. TGT COORD/ELEV
32. BATTLE DAMAGE ASSESSMENT (BDA) REPORT (USMTF INFLTREP) LINE 1 / CALL SIGN _____ LINE 4 / LOCATION _____ LINE 2 / MSN NUMBER _____ LINE 5 / TOT _____ LINE 3 / REQ NUMBER _____ LINE 6 / RESULTS _____ REMARKS _____ * TRANSMIT AS APPROPRIATE			

DD 1972 (Revised) 15 Nov 94 (Supersedes DD Form 1972, 1 Apr 75)

Figure 13. (Continued)

ASSAULT SUPPORT REQUEST FORM

1. Action Addressee: _____ this is _____ Request No _____

2. Request For: _____Helicopter _____ Fixed-Wing Transport

3. Mission Precedence: ____ Mandatory ___ Emergency ___Urgent
___ Priority ___ Routine ___

4. Type of Mission: _____Troop Lift _____ SAR _____ Retraction
____Logistics ____VIP Code ____Photo ____Recon Insert
____Spot/Obs ____Unit Cdr ____MEDEVAC ____Liaison
____Other

5. Mission Description: # of Troops ___Internal Cargo: (weight/cube)
Largest Item (LxWxH) ___x____x___ External Cargo: weight ____lbs

6. Instructions: Pick up Time Coordinates LZ Time Coordinates

A.	_____	_____	_____	_____
B.	_____	_____	_____	_____
C.	_____	_____	_____	_____
D.	_____	_____	_____	_____

7. LZ Description: Size _____ Obstacles _____
Wind Direction _____ Friendly Positions _____
Secure/Insecure _____ Enemy Position _____

8. LZ will be: _____Unmarked ____Marked with _____ (color)
_____Panels _____Flares _____Smoke _____Lights
____Other

For A/C and LZCP/TACP
9. Comms___ P/U Zone Call Sign/Channel_____/____Freq____
LZ Call Sign/Channel _____/_____Freq _____

10. Local Date/Time _____Authentication _____

Figure 14. Assault Support Request Form

LASER OPERATIONS

GROUND FORWARD AIR CONTROLLER (GFAC) RESPONSIBILITIES

♦ Include Laser Code and Laser-Target-Line (LTL) on Line 7 of the 9-line brief.

♦ Avoid the 20 degree safety zone whose apex is at the target and extends 10 degrees either side of the LTL for aircraft run-ins.

♦ The optimal attack zone is a 120 degree fan whose apex is at the target and extends to 60 degrees either side of the LTL, leaving an ideal attack zone of 50 degrees either side excluding the safety zone.

♦ Anticipate aircraft will show up with either Laser Spot Trackers (LSTs) or Laser Guided Weapons (LGWs).

♦ Prebrief pilot if possible.

♦ Plan early and get the FO/FIST ready for mission.

♦♦ Laser code: ensure code in Laser Target Designator (LTD) matches code that pilot passed.

♦♦ Explain ordnance and aircraft characteristics.

♦♦ Explain minimum safe distances of ordnance being used.

♦♦ Laser-Target (LT) line is no more than 5 degrees off briefed LT line.

♦♦ Explain that you are in control and that the LTD is operated at YOUR Command.

♦♦ Ensure communications are in place–the simpler the better.

♦♦ Get coordinates of all friendly locations and ensure that no friendlies are in the flight path.

PILOT CALLS

♦ **Laser Operations:**

♦♦ **"10 Seconds"** - Directive to terminal controller to standby for Laser on call in approximately 10 seconds.

♦♦ **"Laser On"** - Directive to start laser designation.

♦♦ **"Spot"** - Acquisition of laser designation.

♦♦ **"Shift"** - Directive to shift laser illumination energy from offset to target.

♦♦ **"Terminate"** - Cease laser designation. (During peacetime prompt pilot if call is not heard within 20 seconds after "Laser on" call is made or after weapons impact. Wartime: laser time may exceed 20 seconds; however, be aware of battery life.)

♦ **Night IR CAS Brevity Terms:**

♦♦ **"Rope"** - Call made by exception if the terminal controller is to illuminate the aircraft with an IR pointer.

♦♦ **"Visual"** - The terminal controller has the attack aircraft in sight, or the attack aircraft has positively identified the terminal controller's or friendly position.

♦♦ **"Contact"** - Acknowledges sighting of a specified reference point.

♦♦ **"Snake"** - Call made for the terminal controller to jiggle the IR beam on the target.

♦♦ **"Sparkle"** - Terminal controller marks the target with an IR pointer. Also used by AC-130s to mark the target with 40mm misch.

♦♦ **"Tally"** - The enemy position/target is in sight; opposite of NO JOY.

♦♦ **"Steady"** - Terminal controller steadies the beam.

♦♦ **"Stop"** - Terminal controller stops the beam.

♦ **Others:**

♦♦ **"Bingo"** - Prebriefed fuel state that is needed for recovery using prebriefed parameters.

♦♦ **"Blind"** - No visual contact with friendly aircraft/ ground position–opposite of term "Visual."

♦♦ **"Chattermark"** - Begin using briefed radio procedures to counter jamming.

♦♦ **"Joker"** - Fuel state above Bingo at which separation/ bugout/event termination should begin.

♦♦ **"No Joy "** - Aircrew does not have visual contact with the target/bandit/landmark–opposite of TALLY.

♦♦ **"Winchester"** - No ordnance remaining.

LASER DESIGNATION ZONES

♦ **Acquisition Areas and Safety Zones.** Figure 15 depicts the acquisition areas and safety zones as defined by FMFM 5-41, *CAS*, 28 Oct 92 and FMFM 5-42, *DAS*, 4 Mar 93. Reference to Laser Guided Weapons in general, this is the most current template for LGW employment. This depiction conforms to the Joint Warfighting Center Laser safety issues message regarding a recommended change to the J-Laser designator safety zone due to the A-10 incident at Fort Sill, OK (R081957Z JAN 96).

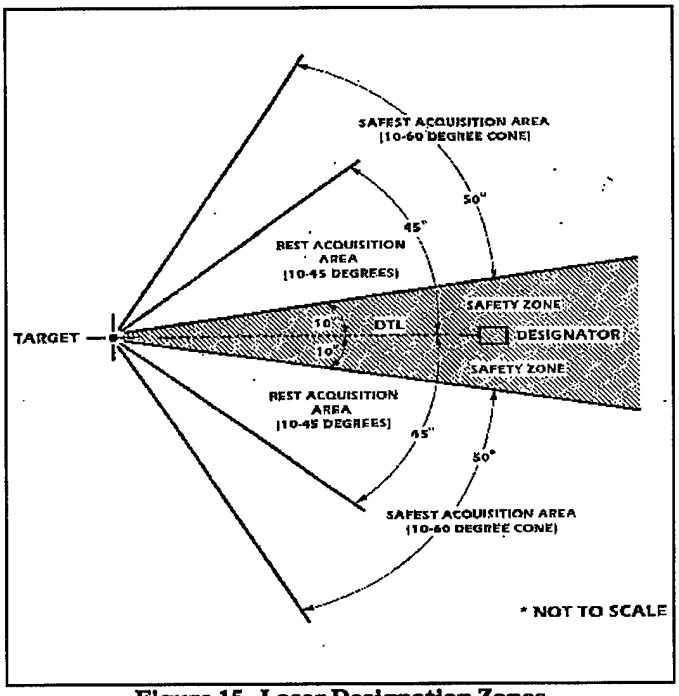


Figure 15. Laser Designation Zones

♦ **Hellfire Designator Exculsion Zone.** Figure 16 depicts the Hellfire designator exclusion zone. This is the most current template for Hellfire employment. This diagram will be listed in the AH-1W TACMAN (Revision F) and the US Army's Point Target Weapon Handbook as the standard exclusion zone diagram for Hellfire employment.

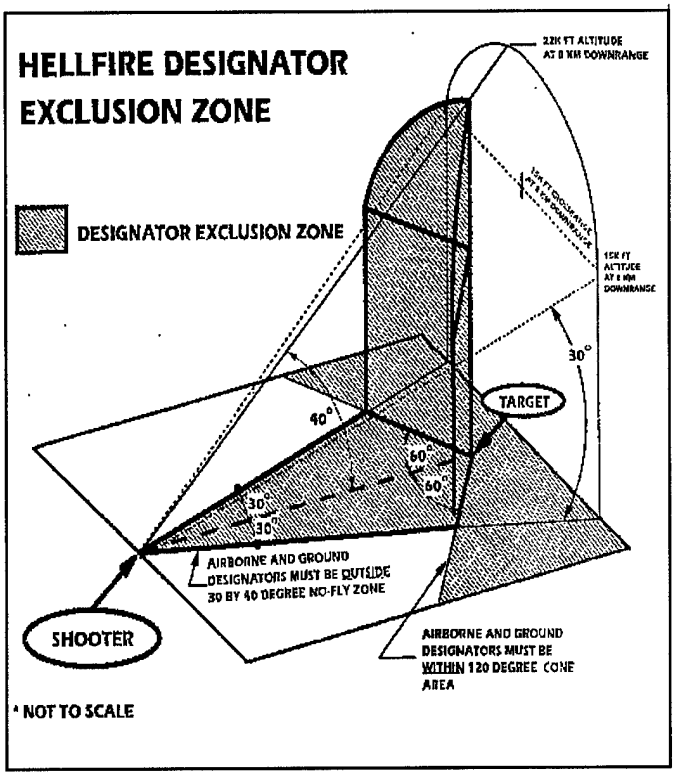


Figure 16. Hellfire Designation Exclusion Zone

♦ **Hellfire Missile Surface Danger Zones**

♦♦ Figure 17a depicts the surface danger zone (SDZ) for a Hellfire launch in which the missile was receiving laser energy prior to launch, regardless of the mode selected. Because of the large surface danger zone and the limited range of the designators, it may be necessary to place designator operators within the surface danger zone. Diagram NOT TO SCALE.

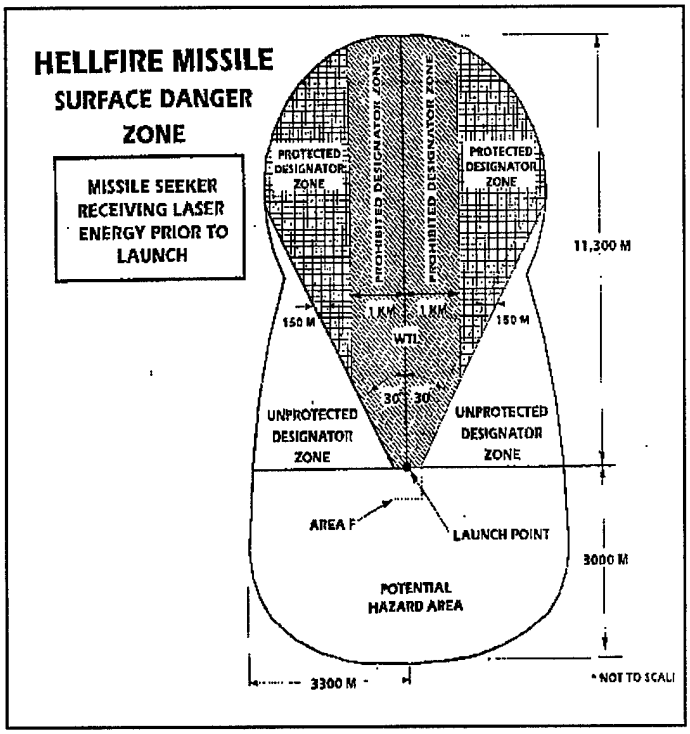


Figure 17a. Hellfire Surface Danger Zone

♦♦ Figure 17b depicts the SDZ for a Hellfire launch in which the missile was not receiving laser energy before launch. The surface danger zones provide for all firing modes of the Hellfire missile at fixed targets to include the effects of the warhead functioning at the edge of the impact area. Three designator zones and their specific range requirements are provided.

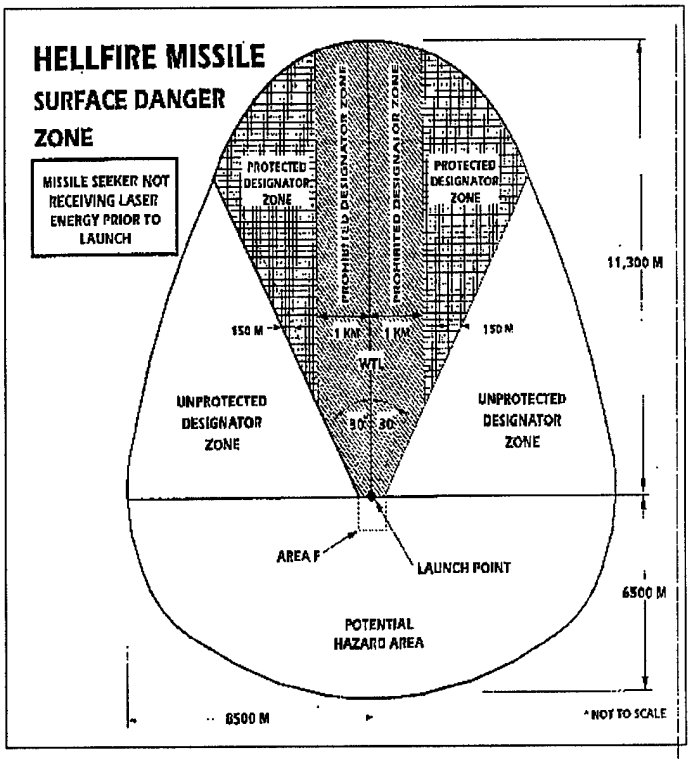


Figure 17b. Hellfire Surface Danger Zone

♦♦♦ **Prohibited Designator Zone.** No designator operators are allowed in this zone due to the unacceptable probabilities associated with the following hazards: (1) there are remote scenarios where the missile seeker can track the laser backscatter energy at the exit aperture of the designator or along the path of the laser beam, and (2) the probability of random missile failures is the highest within this zone.

♦♦♦**Protected Designator Zone.** Designator operators are not vulnerable to a normally functioning missile tracking the laser backscatter energy within this zone. However, there is a possibility that the missile may track and impact an obstruction (for example, trees, grass, or hills) near the designator operator if it is accidentally illuminated by the laser beam. There is a possibility of being injured by a random missile failure impact. The probability of a random missile failure impacting within 150 meters of a designator operator in this area is less than 4 in 10 million.

♦♦♦♦ Ground designator operators shall wear flak jackets and military issue helmets and be located in protected positions.

♦♦♦♦ The designator shall have a clear unobstructed line-of-sight to the target. Special care must be taken to ensure designator line-of-sight is unobstructed across the entire path of a moving target during the time of missile flight to impact.

♦♦♦**Unprotected Designator Zone.** Although designator operators are not vulnerable to a normally functioning missile tracking the backscatter or false targets in this zone, there is still a possibility of being injured by a random missile failure. The probability of a random missile failure impacting within 150 meters of the designator operator is smaller in this zone than in the protected designator zone.

♦♦♦♦ At a minimum, ground designator operators shall wear flak jackets and military issue helmets.

♦♦♦♦ The designator shall have a clear unobstructed line-of-sight to the target. Special care must be taken to ensure designator line-of-sight is unobstructed across the entire path of a moving target during the time of missile flight to impact.

♦♦♦♦ Ground designator operators must ensure that they do not inadvertently lase through dust caused by personnel, vehicles, etc.

♦♦♦♦ Airborne designators must ensure that they are either over ground conditions which do not create dust or are at altitudes where rotor downwash does not create dust.

♦♦ Two additional areas within the SDZ are–

♦♦♦ **Potential Hazard Area** - an area designated to contain a malfunctioning missile at the point of launch. Only mission essential personnel may occupy this area.

♦♦ **Area F** - an area to the rear of the launch point 30 meters wide and 15 meters long. Hazards are launch motor blast, high noise levels, overpressure, and debris. Serious casualties or fatalities may occur to any personnel occupying this area.

Note: The Hellfire SDZs depicted in figures 17a and 17b are for fixed targets. The footprints must become dynamic when engaging moving targets.

GENERAL INFORMATION

TARGET WEATHER INFORMATION (TARWI)

The TARWI code is a technique for transmitting detailed information about en route or target area weather observations.

Table 9. TARWI Data

Example: "3, 6, 8, 9, X-ray, Kilo, November"—this code indicates weather at the target was 3/8 cloud at 3000 AGL, visibility at least 8 km (5 NM), thunderstorms, WX suitable for mission, higher terrain obscured, thunderstorms en route.

#	Cloud	#	Ht (AGL)	#	Vis (NM)	#	WX
0	None	0	None	0	0+	0	Not obs
1	1/8	1	500'	1	1+	1	None
2	1/4	2	1000'	2	2+	2	Sleet
3	3/8	3	1500'	3	3+	3	Dist/Smoke
4	1/2	4	2000'	4	4+	4	Fog/Haze
5	5/8	5	2500'	5	5+	5	Drizzle
6	3/4	6	3000'	6	6+	6	Rain
7	7/8	7	3500'	7	7+	7	Snow
8	8/8	8	4000'	8	8+	8	Showers
9	Not obs	9	Not obs	9	Not obs	9	T-storms

A	WX SIM for Exercise	N	T-Storms En route
B	Cloud HT X 10	O	Ice/Freezing Rain
C	No Med Cloud	P	SFC Wind NEG
D	Scattered Cloud	Q	SFC Winds SE
E	Broken Overcast	R	SFC Winds SW
F	Contrails AT FL	S	SFC Winds NW
G	Mainly IFR	T	WX Better to North
H	Mainly VFR	U	WX Better to East
I	Gusty SFC Winds	V	WX Better to South
J	Fog In Valley	W	WX Better to West
K	Hilltops Obscured	X	WX Suitable
L	VIS Varies in Showers	Y	WX Marginal
M	T-storms	Z	WX Unsuitable

Note: The following tables can be used to figure the number of min/secs that it will take a fighter to go from the IP to the target at speeds (G/S). Also a chart is provided to convert meters to feet that will be used on 9-line briefings.

Table 10. Speed and Time Conversions

A/S (Knots)	NM/ MIN	8NM	9NM	10NM	11NM	12NM	13NM	14NM	15NM
300	5	1:36	1:48	2:00	2:12	2:24	2:36	2:48	3:00
360	6	1:20	1:40	1:40	1:50	2:00	2:10	2:20	2:30
420	7	1:09	1:17	1:26	1:34	1:43	1:51	2:00	2:09
450	7.5	1:04	1:12	1:20	1:28	1:36	1:44	1:52	2:00
480	8	1:00	1:08	1:15	1:23	1:30	1:38	1:45	1:53
510	8.5	:57	1:04	1:11	1:18	1:25	1:32	1:39	1:46
540	9	:53	1:00	1:07	1:13	1:20	1:27	1:33	1:40

CAS Aircraft Run-In Speeds

A/C	A/S (knots)
AC-130 H/U	210-250
A-10	300-350
AV-8B	420-480
F-16	480-540
F/A-18	480-520

Table 11. Distance Conversion Table
(Distance Meters to Feet Multiply by 3.28)

METERS	FEET	METERS	FEET	METERS	FEET
25	82	525	1722	1025	3362
50	164	550	1804	1050	3444
75	246	575	1886	1075	3526
100	328	600	1968	1100	3608
125	410	625	2050	1125	3690
150	492	650	2132	1150	3772
175	574	675	2214	1175	3852
200	656	700	2296	1200	3936
225	738	725	2378	1225	4018
250	820	750	2460	1275	4100
275	902	775	2542	1275	4182
300	984	800	2624	1300	4264
325	1066	825	2706	1325	4346
350	1148	850	2788	1350	4428
375	1230	875	2870	1375	4510
400	1312	900	2952	1400	4592
425	1394	925	3034	1425	4674
450	1476	950	3116	1450	4756
475	1558	975	3198	1475	4838
500	1640	1000	3280	1500	4920

MUNITIONS DESCRIPTIONS

♦ **General Purpose Bombs**

♦♦ **MK-82, LD, 500 lb; MK-83, LD, 1000 lb; MK-84, LD, 2000 lb** - All are similar in construction and vary only in size and weight. Streamlined cylindrical body with conical fins designed for low drag. Effects: Blast, frag, and deep cratering (with a delayed fuse).

♦♦ **MK-82 HDGP (SNAKE-EYE)** - MK-82 with four MK-15 retarding fins. Selectable high or low drag. Effects: blast, frag, and deep cratering (with a delayed fuse).

♦♦ **MK-82 Air Inflatable Retarder (AIR) HDGP - GP** bombs with AIR tail assembly.

♦♦ **MK-84 (AIR) HDGP** - Uses a ballute as a retarding device. Selectable HDALD. Effects: blast, frag.

♦♦ **MK-36 (DESTRUCTOR)** - MK-82 snake-eye with a MK-75 arming kit which converts the bomb into a land or water mine. Deployed HD only. Timed self-destruct or magnetic fusing.

♦♦ **BLU-109/B (I-2000) Penetrator Bomb** - 2000 lb improved GP bomb. Effects: cratering and hard target penetration. See GBU-24 A/B.

♦♦ **M-1 17, 750 lb GP Bomb** - Effects: Same as other GP bombs.

♦♦ **M-1 17R** - Selectable HD/LD by means of a retarding tail assembly.

♦♦ **M-1 17D (DESTRUCTOR)** - Equipped with a MK-75 arming kit for ground implant and shallow water mining. High drag releasable only!

♦♦ **M-118 3000 lb Demolition Bomb** - Effects: blast, frag, cratering. Not good for penetration.

♦ **Guided Bombs**

♦♦ **GBU-10/GBU-12** - Laser guided, maneuverable, free-falling weapons. GBU-10 is a MK-84 and the GBU-12 is a MK-82. Effects: Same as MK-82/84 bomb series.

♦♦ **GBU-16** - Laser guided maneuverable free-falling weapon. Effects: Same as MK-83.

♦♦**GBU-24/B LLLGB** - Low level, laser guided, maneuverable free-fall weapon. MK-84 body. Can be released at very low altitudes. Bomb bumps up approx 450 ft above release altitude. Effects: Same as MK-84.

♦♦ **GBU-24A/B LLLGB** - Same as GBU-24/B but uses BL-109/B bomb body. Used for hard target penetration.

♦♦ **GBU-15** - TV or IR guided, automatically or manually by the WSO. MK-84 or BLU-109 body. Effects: Same as MK-84/ BLU-109.

♦ **Missiles**

♦♦ A**GM-65 Missile (MAVERICK)** - A and B models are guided based on visual contrast. D and G models use infrared guided. The Marine Corps E model is laser guided. Designed for standoff acquisition and destruction of point targets. Effects: Shaped charge produces a good penetration of hard targets such as tanks and bunkers.

♦♦ **AGM-130** - Rocket powered version of GBU-15. Standoff range out to 15NM.

♦♦ **AGM-114B Hellfire Missile** - Solid propellant laser/ radar guided antiarmor missile. Max range in excess of 8000 meters.

♦♦ **BGM-71A TOW Missile** - Solid propellant, wire guided antiarmor missile. Min range 500m; max range 3750m; max time of flight 21.5 sec.

♦ **Guns**

♦♦ **7.62 Mini-Gun** - Up to 6000 rounds per minute. TP, AP, and tracer.

♦♦ **.50 Cal** - 1150 to 1250 rounds per minute. TP, AP, API, and tracer.

♦♦ **20mm** - 750 to 850 rounds per minute. AP, HE, and incendiary.

♦♦ **20mm Gattling** - 2500 to 6000 rounds per minute. TP, HEI, API, TPI, HEIT.

♦♦ **GAU-8, 30mm Gattling** - 4200 rounds per minute. 1.5 lb projectile TP, HEI, API on the A/OA-10 only.

♦ **Practice Bombs**

♦♦ **BDU-33** - 24 lb practice bomb with spotting charges.

♦♦ **BDU-48/B** - Practice bomb that simulates Mk-82 HD ballistics. (Similar to Mk-106)

♦♦ **BDU-50** - MK-82 inert 500 lb practice bomb.

♦♦ **MK-106** - Practice bomb simulating HD ballistics with spotting charge.

♦♦ **MK-76** - Navy version of BDU-33.

♦ **Flares**

♦♦ **LUU-1/B, 5B, 6D (Target Marking Flares [LOGS])** - Designated for a 30 minute burn time on the ground providing a colored flame. LUU-1 burns red, LUU-5 burns green, and LUU-6 burns maroon.

♦♦ **LUU-2A/B Flare** - Parachute flare with a 4.5 minute burn time at an average of 2 million candle power.

♦♦ **M257 Flare** - Parachute flare with a minimum burn time of 100 seconds at an average of 1 million candle power.

♦ **Rocket Launchers**

♦♦ **LAU-3/A, A/A, B/A,-60A/61** - 2.75 inch, 19 tubes, ripple fire only.

♦♦ **LAU-10** - 5 inch zuni, 4 tubes, single or ripple fire.

♦♦ **LAU-68** - 2.75 inch, 7 tubes, single or ripple fire.

♦♦ **LAU-5003/A** - 19 tubes; launches the Canadian hypervelocity CRV-7 rocket.

♦ **Rocket Warheads**

♦♦ **MK-1** - HE, 2.75 inch. Effects are blast and frag.

♦♦ **MK-5** - HEAT, 2.75 inch shaped charge. Excellent armor penetrator, very little lateral blast effect.

♦♦ **MK-61** - TP. A practice MK-1.

♦♦ **MK-67 mod 0** - Smoke WP.

♦♦ **MK-67 mod 1** - Smoke RP.

♦♦ **M-151** - HE, 2.75 inch. Primarily frag.

♦♦ **M-156** - WP, 2.75 inch. Used for target marking.

♦♦ **WDU-4A/A, WDU-13/A** - Flechett for antipersonnel.

♦♦ **WTU-1/B** - TP. A practice M-151.

♦♦ **CRV-7** - Canadian hypervelocity rocket with various combinations of warheads and fuses.

♦ **Clusters Bombs**

♦♦ **CBU-24** - SUU-30 loaded with 665 BLU-26 bomblets. The BLU-26 submunition is baseball sized, spins to arm, and detonates on impact. Fragmentation results from small steel balls in the casing. ***Note: Dispersion pattern is torus or donut shaped.***

♦♦ **CBU-30** - SUU-13 with 40 canisters containing 32 CS bomblets each. Bomblets will start dispensing CS gas 5 to 6 seconds after release and will dispense for 10 to 15 seconds. ***Note: Dispersion is linear and target must be overflown due to downward dispensing SUU-13.***

♦♦ **CBU-38** - SUU-13 containing 40 BLU-49 antimaterial HE bomblets that will penetrate jungle canopies. ***Note: Dispersion is linear and target must be overflown due to downward dispensing SUU-13.***

♦♦ **CBU-49** - Same as CBU-24 except bomblets have delay timers to detonate at random times after impact. ***Note: Dispersion pattern is torus or donut shaped.***

♦♦ **CBU-52** - SUU-30 loaded with 220 BLU-61 softball sized bomblets with an incendiary lining and a scored steel casing for fragmentation. ***Note: Dispersion results in a torus or donut shaped pattern.***

♦♦ **CBU-55** - Slow speed Fuel Air Explosive (FAE). Used against blast sensitive targets. Kills by over pressurization.

♦♦ **CBU-58** - SUU-30 loaded with 650 BLU-63 baseball sized bomblets with incendiary pellets and scored casings for fragmentation. ***Note: Dispersion results in a torus or donut shaped pattern.***

♦♦ **CBU-71** - Same as CBU-58 except submunitions have delay fuses that detonate at random times after impact. ***Note: Dispersion results in a torus or donut shaped pattern.***

♦♦ **CBU-87 (Combined Effects Munitions [CEM])** - SUU-65 loaded with 202 BLU-97 bomblets. BLU-97 has a shaped charge for armor, steel scored liner for fragmentation, and incendiary ring. ***Note: Dispersion is rectangular.***

♦♦ **CBU-89 (GATOR)** - SUU-64 loaded with a mix of 72 BLU-91/B antiarmor and 22 BLU-92/B antipersonnel mines with preset self-destruct time. ***Note: Dispersion varies from circular at high angles to linear at low angles.***

♦♦ **CBU-97/B (Sensor Fused Weapons)** - SUU-64 with an airbag dispensing system and 10 BLU-108/B submunitions designed to provide multiple kill per pass capability against tanks, armored vehicles, artillery, APCs and support vehicles.

♦♦ **MK-20 (ROCKEYE)** - MK-7 loaded with 247 MK-118 antiarmor submunitions with antipersonnel capabilities. **Note:** ***Dispersion varies from circular at high angles to linear at low angles.***

♦♦ **BL-755** - European munitions loaded with 147 antiarmor submunitions. Designed for low altitude low angle deliveries against armor but produces more fragmentation than the MK-20 ROCKEYE. ***Note: Dispersion is rectangular.***

♦♦ **GBU-55/72** - High speed Fuel Air Explosive (FAE). Used against blast sensitive targets. Kills by over pressurization.

RISK-ESTIMATE DISTANCES

Risk-estimate distances are based on the following assumptions. Any changes to the assumptions will increase the risk-estimate distances from those given in Table 12. Risk-estimate distances allow the ground forces commander or combat air commander to estimate the risk in terms of the percent of friendly casualties that may result from an air strike against an enemy threat along the forward line of own troops (FLOT). Risk-estimate distances are based on fragmentation patterns.

COMPUTATIONS

All attacks are parallel to the FLOT. Distances are computed from the intended impact point of the center of a stick of bombs or a pod of rockets. Deflection distance (from the aiming point toward the friendly troops) is built into the risk-estimate distance. The deflection distance equals the distance from the aircraft centerline to the farthest outboard station, plus the lateral distance that a weapon travels because of rack-ejection velocity. ***Risk-estimate distances are for combat use and are not minimum safe distances for peacetime training use.***

RELATIONSHIPS BETWEEN WEAPON IMPACTS AND POINT OF INTERSECTION

For all determinations in Table 12, the position of a prone man was assumed to be on a line perpendicular to the line of flight (or line of weapon impacts) at the midpoint of the line (stick) of weapons. For all sticks of weapons, a weapon was assumed to impact at the point of intersection of these two lines. Thus, for the weapons evaluated, the following relationships between weapon impact and the point of intersection were assumed:

- GP bombs - center bomb of stick impacts at point of intersection.
- Rockets - center rocket.
- Cluster weapons - pattern center of the center dispenser.
- Guns - center of pattern.
- Maverick - single-weapon delivery impacting at point of intersection.

WEAPON RELIABILITY AND DELIVERY PARAMETERS

A weapon reliability of 1.0 was used for all weapons evaluated. Delivery parameters and considerations for specific weapons are in (S) FM 101-50-36-CD/61A1-3-11-CD/ FMFM 10-2-CD/NA 00-130AA-1-3-11-CD.[1]

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[1] ***Joint Munitions Effectiveness Manual/Air-to-Surface (JMEM/AS): Risk Estimates for Friendly Troops, 1 Nov 95.***

CASUALTY CRITERION

The casualty criterion is the 5-minute assault criterion for a prone soldier in winter clothing and helmet. The probability of incapacitation (PI) means a soldier is physically unable to function in an assault within a 5-minute period after an attack. The 0.1 percent PI value can be interpreted as being less than or equal to one chance in one thousand.

TROOPS IN CONTACT

The FAC should regard friendlies within 1 kilometer of targets as a *troops-in-contact* situation and advise the ground commander accordingly. The ground commander must accept responsibility for friendly risk when targets are inside 0.1 percent PI. The passing of the ground commander's initials indicates his acceptance of the risk for intentional ordnance delivery inside the 0.1 percent PI distance.

Table 12. Risk-Estimate Distances for Aircraft Delivered Ordnance

Item	Description	Risk-Estimate Distance (m) 10% PI	0.1% PI
MK-82 LD	500-lb Bomb	250	425
MK-82 HD	500-lb Bomb (Retarded)	100	375
MK-82 LGB	500-lb Bomb (GBU-12)	250[1]	425[1]
MK-83 HD/LD	1000-lb Bomb	275	475
MK-83 LGB	1000-lb Bomb (GBU-16)	275[1]	475[1]
MK-84 HD/LD	2000-lb Bomb	325	500
MK-84 LGB	2000-lb Bomb (GBU-10/24)	225[1]	500[1]
MK-20[2]	Rockeye (Antiarm or CBU)	150	225
MK-77	500-lb Napalm (FAE)	100	150
CBU-55/77[2]	Fuel-Air Explosive (FAE)	[1]	[1]
CBU-52[2]	CBUs (All Types)	275	450
CBU-58/71[2,3]	CBUs (All Types)	350	525
CBU-87[2]	CBUs (All Types)	175	275
CBU-89[3]	CBUs (All Types)	175	275
2.75 FFAR	Rocket with Various Warheads	160	200
5.00 FFAR	Zuni with Various Warheads	150	200
SUU-11	7.62mm Mini-gun		
M 4, M 12, SUU-23,M 61	20mm Gattling Gun	100	150
GAU-12	25mm Gun	100	150
GPU-5A, GAU-8	30mm Gattling Gun	100	150
AGM-65[4]	Maverick (TV, IIR, Laser Guided)	25	100
MK-1/MK-21	Walleye II (1000-lb TV Guided Bomb)	275	500
MK-5/MK-23	Walleye II (2400-lb TV Guided Bomb	[1]	[1]
AGM-123A	Skipper (1000-lb Laser Guided Rocket-Booster Bomb)	275[1]	500[1]
AC-130[5]	20mm, 25mm, 40mm	35	125
	105mm Cannon	80	200

Table 12. (Continued)

Warning: Risk-estimate distances are for combat use and are not minimum safe distances for peacetime training use.

1. Risk-estimate distances are to be determined. For LGBs, the values shown are for weapons that do not guide and that follow a ballistic trajectory similar to GP bombs.

2. Not recommended for use near troops in contact.

3. CBU-71/CBU-84 bombs contain time-delay fuses that detonate at random times after impact. CBU-89 bombs are antitank and antipersonnel mines and are not recommended for use near troops in contact.

4. The data listed applies only to AGM-65A, B, C, and D models. AGM-65E and G models contain a larger warhead and risk-estimate distances are not currently available.

5. This distance is used for all AC-130 engagements as it has the largest fragmentation pattern for the largest weapon system on board.

COMMUNICATIONS

Note: To request CAS use the tactical air request net/ Air Force Air Request Net (AFARN). Control of CAS aircraft should be conducted on a tactical air direction net.

Table 13. Ground Communications Equipment

Component	Radios	Frequency Band (Note 1)	Frequency Hopping	Secure Capable
US Army *FIST*	AN/PRC-119	VHF-FM	SINCGARS	KY-57
	AN/PRC-177	VHF-FM	No	
	AN/VRC-12		No	
	AN/VRC-24		No	
USAF *TACP*	AN/GRC-206	HF	No	KY-65/99
	AN/GRC-206	VHF-FM	No	KY-57
	AN/GRC-206	VHF-AM	No	KY-57
	AN/GRC-206	UHF	Have Quick II	KY-57
	AN/PRC-77	VHF-FM	No	KY-57
	AN/PRC-119	VHF-FM	SINCGARS	KY-57
	AN/PRC-104	HF	No	KY-65/99
	AN/PRC-113	VHF-AM	No	KY-57
	AN/PRC-113	UHF	Have Quick II	KY-57
USMC *TACP*	AN/PRC-77	VHF-FM	No	KY-57
	AN/PRC-119	VHF-FM	SINCGARS	KY-57
	AN/PRC-104	HF	No	KY-65/99
	AN/PRC-113	VHF-AM	No	KY-57
	AN/PRC-113	UHF	Have Quick II	KY-57
	AN/VRC-12	VHF-FM	No	No
SOF *SOTAC*	AN/PRC-117D	VHF-FM	No	KY-57
	AN/PRC-117D	VHF (Note 2)	No	KY-57
	AN/PRC-117D	UHF (Note 3)	No	KY-57
	AN/PRC-126	VHF-FM	No	KY-57
	LST-5	UHF SATCOM	No	KY-57
	LST-5			

Note 1: Frequency bands for ground radios are as follows:
HF: 2.000 to 29.999 MHz in 1 kHz increment.
VHF-FM: 29.950 to 75.950 MHz in 50 kHz increments.
VHF-AM: 116.000 to 149.975 MHz in 25 kHz increments.
UHF: 225.000 to 399.975 MHz in 25 kHz increments.
Note 2: AN/PRC-117D VHF-AM/FM frequency range is 116.000-173.995 MHz.
Note 3: AN/PRC-117D UHF-AM/FM frequency range is 225.000-419.995 MHz.

Table 14. Rotary-Wing Communications Equipment Summary

Aircraft Type	Radios	Freq Band (Note 1)	Freq Hopping	Secure Capable
AH-1W	2-AN/ARC-182	(Note 2)	No	KY-58
UH-1N	2-AN/ARC-182	(Note 2)	No	KY-58
UH-60	1-AN/ARC-201	VHF-FM	SINCGARS	KY-58
	1-AN/ARC-201	VHF-FM	No	KY-58
	1-AN/ARC-115	VHF-AM	No	No
	1-AN/ARC-164	UHF	Have Quick II	KY-58
OH-58C (Note 4)	2-AN/ARC-201	VHF-FM	SINCGARS	KY-58
	1-AN/ARC-115	VHF-AM	No	No
	1- AN/ARC-164 or AN/ARC-116	UHF		No No
OH-58D (Note 5)	2-AN/ARC-201	VHF-FM	SINCGARS	KY-58
	1-AN/ARC-186	VHF	No	KY-58
	1-AN/ARC-164	UHF	Have Quick II	KY-58
	1-AN/ARC-199	HF	No	KY-75
AH-64	1-AN/ARC-201	VHF-FM	SINCGARS	KY-58
	1-AN/ARC-164	UHF	Have Quick I	KY-58
	1-AN/ARC-186	VHF (Note 3)	No	No

Note 1: Frequency bands are as follows:
HF = 2.000 to 29.999 MHz in 1 kHz increments.
VHF-FM = 29.950 to 87.975 MHz in 25 kHz increments.
VHF-AM = 108.000 to 151.975 MHz in 25 kHz increments.
UHF = 225.000 to 399.975 MHz in 25 kHz increments.
Note 2: The AN/ARC-182 is a multiband radio that operates in any one of four bands: standard VHF-FM, VHF-AM, UHF, or 156.0-173.975 MHz VHF-FM. It can monitor only one band at a time.
Note 3: The AN/ARC-186 operates either in the VHF-AM or VHF-FM band. Each radio can monitor only one band at a time.
Note 4: Only one AN/ARC-201 is connected to the KY-58. The other one is unsecure.
Note 5: The OH-58D has two KY-58s. One is dedicated to an AN/ARC-201. The other KY-58 is shared between the other three radios.

Table 15. Fixed-Wing Aircraft Communications Summary

Aircraft Type	Radios	Freq Band (Note 1)	Freq Hopping	Secure Capable
AC-130	2-AN/ARC-164	UHF	Have Quick II	KY-58
	1-AN/ARC-164	SATCOM	No	KY-58
	3-AN/ARC-186	VHF (Note 3)	No	KY-58
	2-AN/ARC-190	HF	No	KY-75
EA-6B	2-AN/ARC-159	UHF	No	
	1-AN/ARC-175	VHF	No	
	1-AN/ARC-105	HF	No	KY-58
AV-8B	2-AN/ARC-182	(Note 2)	No	KY-58
A/OA-10	1-AN/ARC-164	UHF	Have Quick II	KY-58
	1-AN/ARC-186	VHF-FM	No	KY-58
	1-AN/ARC-186	VHF-AM	No	No
B-1B	2-AN/ARC-164	UHF or SATCOM	Have Quick I	KY-58
	1-AN/ARC-190	HF	No	No
B-52H	1-AN/ARC-164	UHF	Have Quick II	KY-58
	1-AN/ARC-171	UHF or SATCOM	No	No
	1-AN/ARC-190	HF	No	No
F-14	1-AN/ARC-182	(Note 2)	Have Quick I	KY-58
	1-AN/ARC-59	UHF	No	KY-58
F-15E	2-AN/ARC-164	UHF	Have Quick I	KY-58
F-16	1-AN/ARC-164	UHF	Have Quick II	KY-58
	1-AN/ARC-186	VHF (Note 3)	No	
F/A-18 (Note 4)	2-AN/ARC-182	(Note 2)	No	KY-58
	2-AN/ARC-210	VHF	Have Quick I	KY-58

Note 1: Frequency bands are as follows:
HF = 2.000 to 29.999 MHz in 1 kHz increments.
VHF-FM = 29.950 to 87.975 MHz in 25 kHz increments.
VHF-AM = 108.000 to 151.975 MHz in 25 kHz increments.
UHF = 225.000 to 399.975 MHz in 25 kHz increments.
Note 2: The AN/ARC-182 is a multiband radio that operates in any one of four bands: standard VHF-FM, VHF-AM, UHF, or 156.0-173.975 MHz VHF-FM. It can monitor only one band at a time.
Note 3: The AN/ARC-186 operates either in the VHF-AM or VHF-FM band. Each radio can monitor only one band at a time.
Note 4: F/A-18s are fitted with either two AN/ARC-182 radios or two AN/ARC-210 radios.

Table 16. USMC Fire Support Request Nets

Net	Purpose	Net Control	Stations on Net	Freq
Arty conduct of fire	FOs request and adjust arty fire	DS arty BN	DS arty BN, firing battery, arty LNO at BN, FOs, REIN arty Units	VHF
GCE air spot net	Naval aviation observers	Arty regt	NAO, arty BN, firing battery, FOs, FSCCs, GCE HQ	VHF
Tactical air request	To request immediate air support	TACC – afloat DASC – ashore	TACC, DASC, FSCCs, FAC parties, airborne controllers, HDC, TADC	HF
Tactical air direction	Direction of aircraft in CAS missions by a terminal controller	TACC – afloat DASC – ashore	TACC, DASC, FSCCs, FAC parties, airborne controllers, OAS aircraft and TAC as required	UHF/VHF aircraft dependent
NGF ground spot	Spot teams request and adjust NGF	NGLO at BN FSCC	BN NGLO, NGF spot TMs, DS ship, GS ship as required	HF PRI VHF ALT
NGF air spot	NAOs request and adjust NGF	SACC – afloat TACC – afloat as required GCE FSCC ashore	SACC, TACC, FSCCs, DS&GS ships, NAOs	UHF/VHF aircraft dependent
BN mortar	Mortar FOs request and adjust fires	Mortar PLT cmdr	Mortar PLT cmdr, mortar FOs, BN FSCC	VHF

Table 17. Army Fire Support Request Nets

Net	Purpose	Net Control	Stations On Net	Freq
MVR BN fire support	Calls for fire from non FA observers	MVR BN FSE	MVR BN FSE, MVR BN FSO, FOs, MVR BN Mortar FDC, FIST HQ, any FDC, FSO, or COLTS as required, MVR BDE FSO	FM
MVR BN mortar FD	Tactical and technical fire direction and calls for fire to the mortar FDC	MVR BN mortar FDC	MVR BN FSE/FSO, MVR CO FOs, MVR BN mortar FDC, FIST HQ, COLT(S), any FSO or observer as required	FM
DS BN fire direction	Tactical and technical fire direction and calls for fire to FA BN, btry, or PLT FDCs	DS BN FDC	DS BN FDC,PLT FDCs, FIST HQ, FOs, AN/TPQ-36 radar, COLT(S), BN FSE/FSO, MVR Bde FSE/FSO, FA btry FDCs, FA PLT FDCs	FM
Air Force air request net	TACP request immediate air support	ASOC	TACPs, ASOC, ALO, CAS AC, FAC(A)	HF
NGF ground spot	Fire control teams request and adjust NGF	SALT AT BN FSE	CO FCT, BN FSE and SALT, Bde FSE and ANGLICO TM, Div FSE and ANGLICO TM, DS Ship, GS ship as required.	HF PRI VHF ALT

LIAISON ELEMENTS

ARMY FIRE SUPPORT ELEMENTS (FSEs)

Mission

Responsibility for command, control, and coordination of fire support begins with the force commander. From the corps down to the company and team, all levels have FSEs. The FSEs assist the maneuver commander in the decision and execution process, advise on fire support capabilities, and assist in the planning and coordination of fire support.

Organization

FSEs have a fire support coordinator (FSCOORD) and a supporting staff but will otherwise vary according to the available fire support assets. An FSE will usually include an air liaison officer (ALO); representatives from such elements as the air and naval gunfire liaison company (ANGLICO); Army aviation units, and electronic warfare support elements (EWSEs); mortars; and other assets required by the force commander.

Echelons Above Corps. The battlefield coordination detachment (BCD) mission is to establish Commander Army Forces (COMARFOR) liaison and interface with the Joint Forces Air Component Commander (JFACC) to facilitate the coordination and synchronization of JFACC air and ground operations. The BCD performs its mission through the exchange of operational and intelligence data between the JFACC and COMARFOR. Additionally, the BCD interprets the land battle situation for the JFACC and the air operations situation for the COMARFOR. It operates on a 24 hour a day basis.

Corps and Division. The section within the corps commander's command post that performs the deep attack function is called the deep operations coordination cell (DOCC). The DOCC is the centralized planning, coordination and execution center for deep attack operations within the corps area of operations. The DOCC maintains linkages to USAF via the BCD located at the AOC and the Navy via a Navy Surface Fires Liaison Team located in the DOCC. The FSEs provided at the corps and division levels are similar in structure. They are located in the main and tactical command posts, usually with representatives in the rear command post.

Brigade and Battalion. The FSCOORD at brigade level is the commander of the direct support field artillery battalion. The brigade FSCOORD establishes fire support organizations in each maneuver battalion and company. The FSEs at brigade and battalion levels are located in the brigade/battalion command post.

Company. The fire support organization at company level is the fire support team (FIST). The FIST is headed by the company FSO, who is also the company FSCOORD. The field artillery and mortars provide the primary fire support to the company. The FIST coordinates these assets and, when available, coordinates CAS and naval resources through the appropriate agencies. The FIST also provides forward observer capabilities to the company.

MARINE CORPS TACTICAL AIR CONTROL PARTY

Mission

The Marine TACP establishes and maintains facilities for liaison and communications between supported units and appropriate control agencies. The TACP is led by the air

officer (AO), who informs and advises the ground unit commander on the employment of supporting aircraft and requests and coordinates air support missions.

Organization

The battalion TACP has two forward air control (FAC) parties, while the regimental and division TACPs have none.

Division. The division TACP has 2 officers and 11 enlisted communications personnel. They assist the division AO by monitoring all immediate air support requests from supporting units, by supervising the operation of aviation nets in the division fire support coordination center (FSCC), and by keeping the fire support coordinator (FSC) advised of the general air situation and specific requests of subordinate units.

Regiment. The regimental TACP has one regimental air officer (RAO) and four enlisted communications personnel. The RAO advises and assists the regimental commander regarding all aviation matters, consolidates all preplanned and support requests from subordinate units, coordinates with the regimental FSC, functions as the air representative with the regimental FSCC, and facilitates the disposition of immediate air support requests if necessary.

Battalion. The battalion TACP has 3 officers and 12 enlisted communications personnel. The senior naval aviator/ naval flight officer functions as the battalion air officer, and each of the other two officers is the leader of a FAC party.

AIR/NAVAL GUNFIRE LIAISON COMPANY

Mission and Employment

The ANGLICO can support a US Army or allied division, or elements thereof, by providing the control and liaison agencies for the employment of naval surface fire and naval air support in amphibious assault or other operations. The ANGLICO is normally attached to the supported force for a joint or combined operation in which US fleet assets are employed. The ANGLICO can control fleet firepower to help offset the lack of heavy combat support initially available in most expeditionary environments. To support airborne and special operations forces, the ANGLICO maintains an airborne capability.

Organization

The ANGLICO maintains a high degree of organizational flexibility and can task-organize to meet the needs of the supported force. A company, if fully committed, can support an entire US Army division of three maneuver brigades. An ANGLICO consists of a company headquarters and three air/naval gunfire liaison platoons. The ANGLICO headquarters performs command and staff functions necessary to administer, plan, direct, and supervise the execution of assigned missions and to advise the supported commander on the employment of the company.

The company headquarters can form a task-organized division air/naval gunfire liaison team as necessary to support a division or comparable-sized allied unit. Each platoon has one brigade liaison team to effect fire support coordination at the US Army combat brigade or equivalent level, two supporting arm liaison teams (SALTs) to effect fire support at the maneuver battalion level, and four firepower control

teams (FCTs) to provide control of naval surface support, naval air support, and artillery support at the company level.

Division Air/Naval Gunfire Liaison Team. The division air/naval gunfire liaison team can provide support to an Army division or comparable-sized allied unit. The division team usually attaches to the supported division headquarters FSCC, FSE, or a comparable agency for planning, liaison, control, coordination, and employment of supporting arms.

Brigade Air / Naval Gunfire Team. The brigade air/naval gunfire liaison team can support a maneuver brigade. The air/naval gunfire teams are task-organized to support an Army maneuver battalion or comparable-sized allied unit. The brigade air/naval gunfire liaison team usually attaches to the supported brigade TOC or comparable supporting arm for an Army brigade or comparable-sized allied unit.

Battalion Supporting Arms Liaison Team. SALTs provide the capability to support a battalion. They are task-organized to support an Army maneuver battalion or a comparable-sized allied unit. The SALT usually attaches to a supported battalion TOC or a comparable agency for planning, requesting, coordinating, and controlling supporting arms for an Army battalion or comparable-sized unit, as well as for liaison.

Firepower Control Team. FCTs provide terminal control of naval gunfire and USN and USMC CAS to a supported maneuver company. They are task-organized to support an Army maneuver company or a comparable-sized allied unit. Company commanders employ FCTs much as they would TACPs, FISTs, or comparable agencies-to plan, request, coordinate, and provide terminal control of supporting arms for an Army maneuver company or comparable-sized allied unit—as well as for liaison.

AIR FORCE TACTICAL AIR CONTROL PARTY

Mission

The Air Force TACP is a control element stationed with and supporting an Army combat unit. The TACP provides the interface between the Army unit it supports and the combat Air Force unit that provides combat air support. The TACP advises the ground commander on the capabilities and limitations of combat aircraft and weapons and assists in planning for combat air support. The airborne forward air controller (AFAC), the air liaison officer (ALO), and the enlisted terminal attack controller (ETAC) in the TACP provide final attack control for CAS missions.

Organization

TACPs are located at corps, division, brigade, and battalion levels and are tailored in manning and skills to the Army unit they support. While employed, TACPs are under the operational control of an air support operations center (ASOC) or the senior TACP element deployed.

Corps and Division. At corps and division levels and sometimes at the field army level, the TACP has a senior ALO, plus the fighter and airlift liaison officers and tactical air command and control specialists (TACCSs).

Brigade. The brigade TACP has a brigade ALO, fighter and airlift liaison officers, and TACCs.

Battalion. The battalion TACP has one ALO and two TACCSs assigned. At least one TACCS will also be ETAC-qualified.

FIRE SUPPORT AND AIRSPACE COORDINATION

FORMAL COORDINATION

The FSCOORD establishes fire support and airspace coordination, with input from his ALO counterpart at the appropriate level of command and control. Formal measures are usually published in the fire support plan and the airspace coordination order (ACO). Formal coordination can be either permissive or restrictive.

PERMISSIVE

Permissive coordination consists of the following:

Fire Support Coordination Line (FSCL). A line established by the appropriate land or amphibious force commander to ensure coordination of fire not under the commander's control but which may affect current tactical operations. The FSCL is used to coordinate fires of air, ground,, or sea weapons systems using any type of ammunition against surface targets. The FSCL should follow well-defined terrain features. The establishment of the FSCL must be coordinated with the appropriate tactical air commander and other supporting elements. Supporting elements may attack targets forward of the FSCL without prior coordination with the land or amphibious force commander provided the attack will not produce adverse surface effects on or to the rear of the line. Attacks against surface targets behind this line must be coordinated with the appropriate land or amphibious force commander.

Coordinated Fire Line. A line beyond which conventional or improved conventional indirect fire weapons (mortars, field artillery, and naval gunfire) may fire at any time within the zone of the establishing headquarters without additional coordination.

Free-Fire Area. A designated area in which any weapon system can fire conventional or improved munitions without additional coordination and is normally established on identifiable terrain.

RESTRICTIVE

Restrictive coordination consists of the following:

No-Fire Area. An area in which no fires or the effects of fires are allowed without prior clearance from the establishing headquarters, except if the commander's force must defend against an engaging enemy force within the no-fire area.

Restrictive Fire Area. An area in which specific restrictions are imposed and into which fires that exceed those restrictions are prohibited without prior coordination from the establishing headquarters.

Restrictive Fire Line. A line established between converging friendly forces. It prohibits fires or the effects of fires across the line without coordination from the establishing headquarters.

Airspace Coordination Area (ACA). An ACA is a three-dimensional block of airspace in a target area, established by the appropriate ground commander, in which friendly aircraft are reasonably free from friendly surface fires. The airspace coordination area may be informal or formal.

Informal. An informal ACA is most often used and is preferred. An informal ACA is normally in effect for a very short time. It can be established by using lateral altitude or time separation or any combination of these separations.

Formal A formal ACA is a three-dimensional block of airspace in which friendly aircraft are reasonably safe from friendly surface fires. A formal ACA is usually in effect longer than an informal ACA. Altitude is in feet above sea level.

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Glossary

A

A/C	aircraft
A/C/D	aircraft designator
AAGS	army air-ground system
ABCCC	airborne battlefield command and control center
ACA	airspace coordination area
ACC	air component commander
ACE	airborne command element (USAF); air combat element (NATO); aviation combat element (USMC)
ACIF	artillery counterfire information form
ADA	air defense artillery
ADAFCO	air defense artillery fire control officer
ADAM	area-denial artillery munitions
ADCOORD	air defense coordinator
AFAC	airborne forward air controller
AFARN	Air Force Air Request Net
AFDC	Air Force Doctrine Center
AGL	above ground level
ALSA	Air Land Sea Application
ALO	air liaison officer
AMC	air mission commander
AMLS	airspace management liaison section
ammo	ammunition
ANGLICO	air/naval gunfire liaison company
AO	air officer (USMC); aviation ordnance person, area of operations
AOC	air operations center (USAF)
AP	attack position/antipersonnel; average point
APAM	antipersonnel antimateriel

APERS-T	antipersonnel-tracer
APICM	anti personnel improved conventional munition
ARLO	air reconnaissance liaison officer
arty	artillery
ASOC	air support operations center
ATACMS	Army Tactical Missile System
ATK	attack
AWACS	airborne warning and control system
A2C2	army airspace command and control

B

BAT	brilliant antiarmor technology submunition
BBDPICM	Base Bleed Dual Purpose Improved Conventional Munitions
BCD	battlefield coordination detachment
BD	base detonating
BDA	battle damage assessment
BLK	block
BOMREP	bombing report
BP	battle position

C

cal	caliber
CAS	close air support
CBU	cluster bomb unit
CFL	coordinated fire line
chem	chemical
COC	combat operations center (USMC)
COMARFOR	Commander Army Forces
CP	concrete-piercing; command post; contact point; collection point

CPHD	copperhead
CRC	control and reporting center
CRP	control and reporting post
C/S/TAD	call sign tactical air direction
CVT	control variable time fuse

D

DASC	direct air support center (USMC)
DEL	delay
DIR	direction
DPICM	dual-purpose improved conventional munitions
DTACC	deployed tanker/airlift control center
DTV	day television

E

EENT	early evening nautical twilight
ER	extended range
ET	electronic time
ETAC	enlisted terminal attack controller
EWSE	electronic warfare support element

F

FA	field artillery
FAC	forward air controller, forward air control
FAC-A	forward air controller (airborne)
FAE	fuel-air explosive
FASCAM	family of scatterable mines
FCT	firepower control team
FDC	fire direction center
FFA	free fire area
FFAR	folding-fin aerial rocket

FFE	fire for effect
FIST	fire support team
FL	flight level
FLIR	forward-looking infrared radar
FLOT	forward line of own troops
FM	frequency modulation; field manual
FO	forward observer
frag	fragmentation
freq	frequency
FSC	fire support coordinator (USMC)
FSCC	fire support coordination center
FSCL	fire support coordination line
FSCOORD	fire support coordinator (USA)
FSE	fire support element
FSO	fire support officer
FTR	fighter
F/W	fixed wing
FY	fiscal year

G

GFAC	Ground Forward Air Controller
GLINT	Gated Laser Intensifier
GLO	ground liaison officer
GP	general group
GPS	Global Positioning System
grnd	ground
GTL	gun to target line

H

HARM	high-speed antiradiation missile
HC	smoke
HD	high drag (also snakeye and air-inflatable retarded (AIR)

HE	high explosive
HEAT	high explosive, antitank
HEI	High Explosive Incendiary
HEP	high explosive, plastic
HES	high explosive, spotting
HOB	height of burst
HT	height

I

ICM	improved conventional munitions
ID	identification
IDM	improved data modem
IFR	instrument flight rules
IIR	imaging infrared
illum	illuminating; illumination
in	inch
ind	indicator
IP	initial point

J

J-SEAD	joint suppression of enemy air defenses
JAAT	joint air attack team
JFACC	joint forces air component commander
JOC	joint operations center

K

kHz	kilohertz
km	kilometer

L

L/R	left/right
LANTIRN	low-altitude navigation and targeting infrared for night
LAT	latitude
lb	pounds
LCC	land component commander
LD	low drag
LGB	laser guided bomb (GBU-10/12/24)
LGW	laser guided weapon
LLLTV	low-light level television
LOAL	lock-on after launch
LOBL	lock-on before launch
LONG	longitude
LRF	laser range finder
LST	laser spot tracker
LT	laser-target
LTD	laser target designator
LTL	laser-target-line
LZ	landing zone

M

m	meter; minute
m/d/s	model/designator/series
mm	millimeter
MAG	magnetic
MAGTF	Marine air-ground task force
max	maximum
MCCDC	Marine Corps Combat Development Command
med	medium
MG	machine gun
mHz	megahertz

min	minimum
MLRS	multiple-launch rocket system
mm	millimeter
MORTREP	mortar bombing report
MSL	mean sea level
MT	mechanical time
MTSQ	mechanical time, superquick

N

NA	not applicable
NAO	naval aviation officer
nap	napalm
NATO	North Atlantic Treaty Organization
NAVAIR	naval air
NCC	naval component commander
NDC	Naval Doctrine Command
NEG	negative
NFA	no fire area
NM	nautical mile
NSFS	naval surface fire support
NVG	night vision goggles
NW	northwest

O

obs	obscured
OPRs	offices of primary responsibility
ord	ordnance

P

PD	point detonating/delay
PI	probability of incapacitation
pt	point

Q

Q	quick

R

RAAM	remote antiarmor mine system
RAO	regimental air officer
RAP	rocket-assisted projectile
RECCE	reconnaissance
Ref	reference
rev	revolutions
RFA	restrictive fire area
RFL	restrictive fire line
RPM	rounds per minute
R/W	rotary wing

S

SACC	supporting arms coordination center
SALT	supporting arms liaison team
SATCOM	satellite communications
SDZ	surface danger zone
SE	southeast
SEAD	suppression of enemy air defenses
sec	second
SFC	surface wind speed
SHELREP	shelling report
SIM	simulation
SINCGARS	Single-Channel Ground and Airborne Radio System
SLAM	standoff land attack missile
SMK	smoke
SOF	special operations forces

SOTAC	special operations terminal attack controller
STT	special tactics team
sust	sustained
SW	southwest

T

T	tracer
T-Storms	thunderstorms
TAC(A)	tactical air coordinator (airborne)
TACC	tactical air control center (USN); tactical air command center (USMC); tanker airlift control center (USAF)
TACCS	tactical air command and control specialist
TACP	tactical air control party
TACS	theater air control system (USMC)
TALCE	theater airlift coordination element
TALO	theater airlift liaison officer
TAOC	tactical air operations center (USMC)
TAR	tactical air reconnaissance
TARWI	target weather information
TGL	target to gun line
tgt	target
TI	time
TOC	tactical operations center
TOT	time on target
TOW	tube-launched, optically tracked, wire-guided missile
TTT	time to target
TV	television
TVS	television sensor

U

UFN	until further notice
UHF	ulta high frequency
USA	United States Army
USAF	United States Air Force
USMC	United States Marine Corps
USN	United States Navy
UTM	universal transverse mercator (grid)

V

VFR	visual flight rules
VHF	very high frequency
VIS	visual
VT	variable time

W

WOC	wing operations center
WP	white phosphorus
WX	weather

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