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Executive Summary

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EXECUTIVE SUMMARY
COMMANDER'S OVERVIEW

- **Discusses Organization for and Fundamentals of Close Air Support**
- **Describes Close Air Support Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR)**
- **Describes Planning and Requesting Close Air Support**
- **Discusses Preparation for Close Air Support**
- **Outlines Execution of Close Air Support**

Fundamentals of Close Air Support

Close air support (CAS) is air action by fixed- and rotary-wing aircraft against hostile targets that are in close proximity to friendly forces and which require detailed integration of each air mission with the fire and movement of those forces.

Close air support (CAS) can be conducted at any place and time friendly forces are in close proximity to enemy forces. The word "close" does not imply a specific distance; rather, it is situational. The **requirement for detailed integration** because of proximity, fires, or movement **is the determining factor.** At times CAS may be the best means to exploit tactical opportunities in the offense or defense. CAS provides firepower in offensive and defensive operations to destroy, disrupt, suppress, fix, harass, neutralize, or delay enemy forces.

CAS may be used to mass the effects of combat power, in order to exploit opportunities in the offense and defense. **Each Service organizes, trains, and equips to employ CAS** within its roles as part of the joint force. As a result, **a variety of aircraft are capable of performing CAS.** The joint force commander (JFC) and his staff must be capable of integrating all CAS capabilities into the operation plan.

A joint terminal attack controller (JTAC) is a qualified (certified) service member who, from a forward position, directs the action of combat aircraft engaged in CAS and other air operations. A qualified and current JTAC will be recognized across Department of Defense as capable and authorized to perform terminal attack control.

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6.2.1.3.11 **Line 13.** This line displays remarks (RMKS) data. The RMKS data and the characters which follow it (maximum of 200) provide additional information.

The initial display of all remarks consists of two lines with a maximum of 26 characters per line. If the remarks data exceeds 52 characters, a downward pointing triangle is displayed at the end of the second line of remarks data. The up/down arrow options are used to select line 13, which allows display of the INCR option. INCR option allows scanning through the RMKS lines. When the last line is displayed, the INCR option and the downward pointing triangle are removed. Initial selection of the INCR option displays the DECR option. Initial selection causes display of an upward pointing triangle at the end of the first line of remarks data. This display indicator notifies the aircrew there is remarks data which can be reached by selection of the DECR option.

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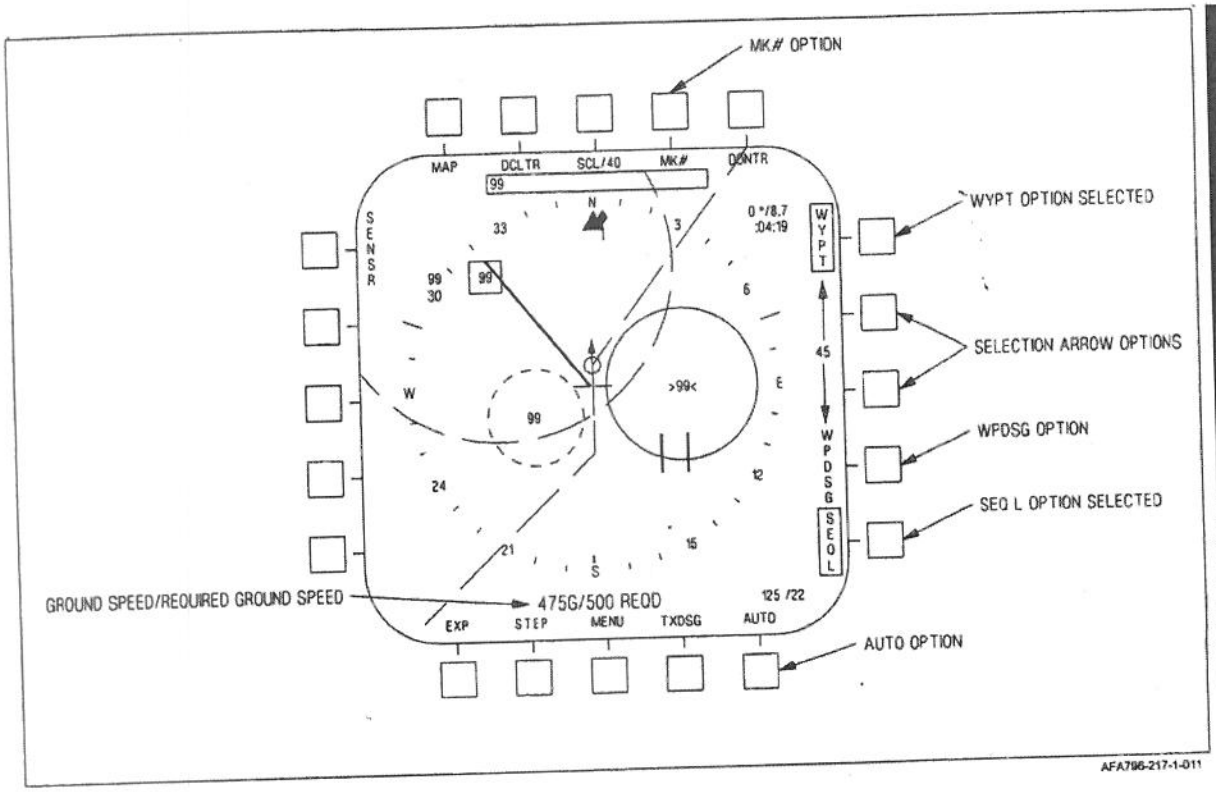
MK# OPTION
MAP
DCLTR
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SELECTION ARROW OPTIONS
WPDSG OPTION
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AUTO OPTION
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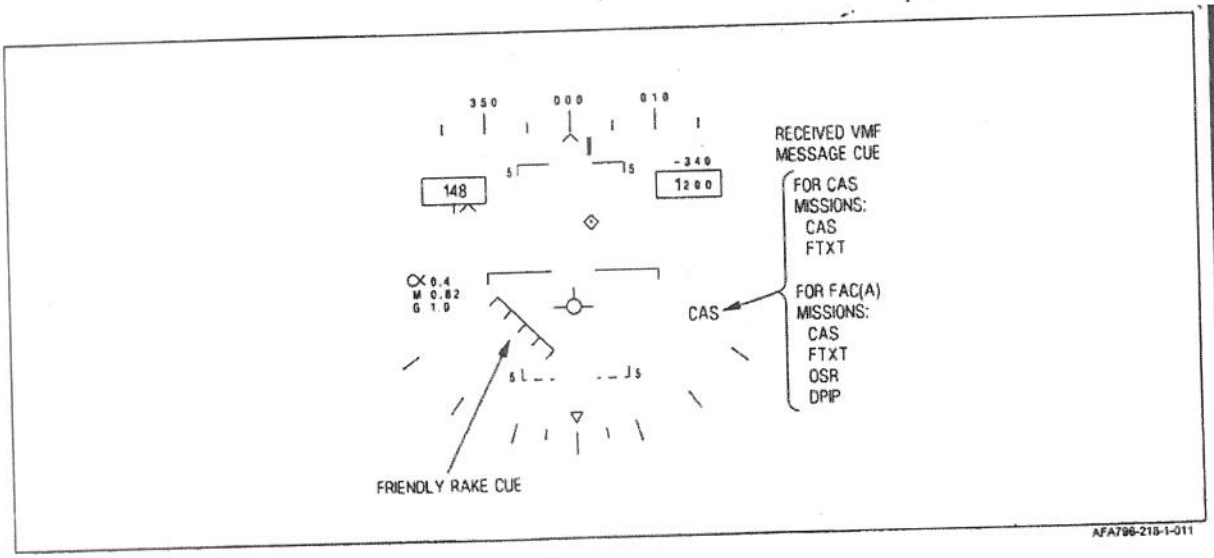
RECEIVED VMF MESSAGE CUE
FOR CAS MISSIONS:
CAS
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FOR FAC(A) MISSIONS:
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FRIENDLY RAKE CUE
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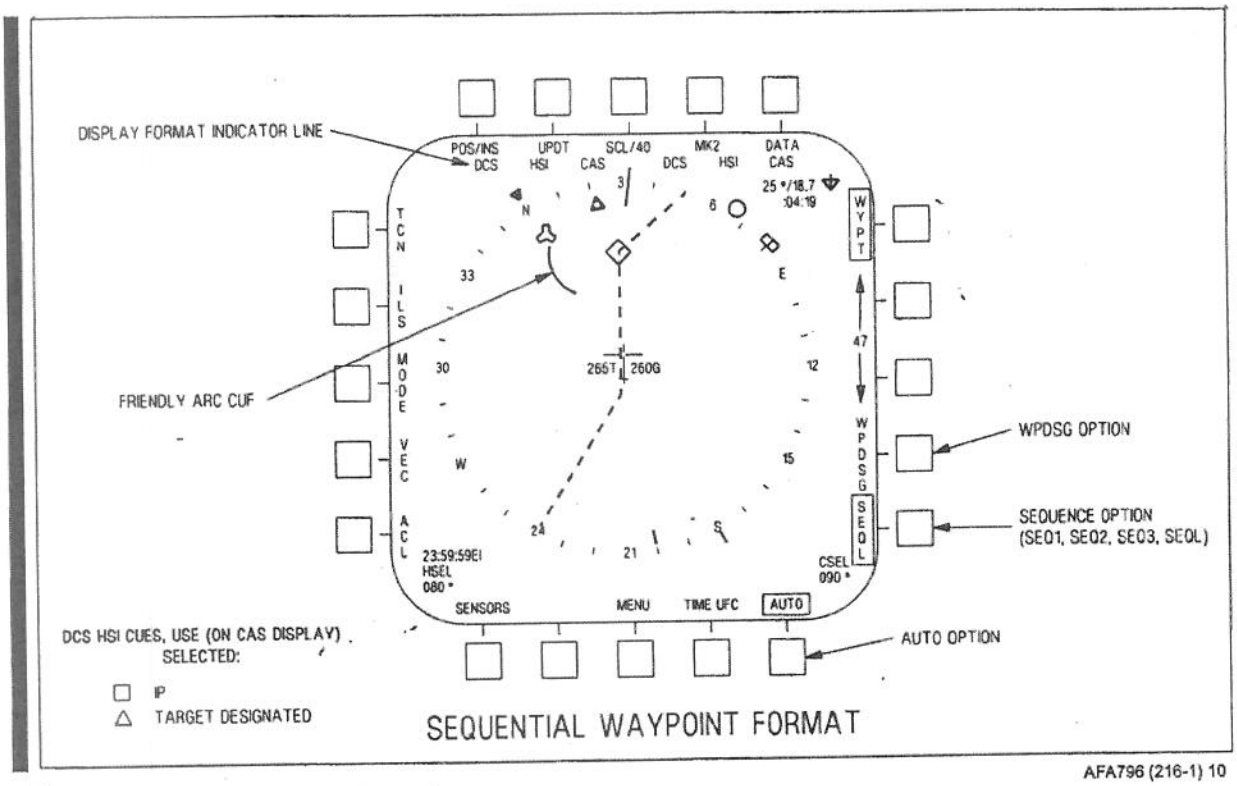

AFA796 (216-1) 10

(U) When the MSN option is set to CAS and a CAS or FTXT message is received, CAS or FTXT flashes.

(U) When the MSN option is set to FAC and a CAS or FTXT message is received, CAS or FTXT flashes. If an OSR message is received requiring acknowledgment, OSR flashes. If an OSR message is received not requiring acknowledgment, OSR flashes until another VMF message type is received or after 10 seconds, whichever occurs first.

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NWP 3-22.5-F/A18 Vol. I,

Part I Avionics

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PART I

AVIONICS

stabilized cue is displayed on the radar display at the computed position of the destination. A navigation designation of the waypoint/OAP selected on the HSI display is performed by actuating the NAVDSG option button. This action designates the aim point based upon the navigation coordinates previously entered for the point.

Once the TDC is released with the designated target less than 160 nm, the position is based on the nav stabilization from the INS or INS/GPS velocities and not the best available altitude.

4.4.8.6 Radar Designation. Two types of radar designations are available, navigation stabilized cursor designation and radar track designation. Radar track and navigation stabilized cursor designations are available in the MAP, EXP1, EXP2, EXP3, SEA, and GMT modes.

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Reuters News Article

(7 December 2006)

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http://today.reuters.co.uk/news/articlenews.aspx?type=topNews&storyid=2006-12-07T174318Z_01_L07129163_RTRUKOT_0_TEXT0.xml&WTmodLoc=NewsArt-R3-RelatedNews-1

Print this article Close This Window
Troops tell of fight to save Marine
Thu Dec 7, 2006 5:43 PM GMT

By Peter Graff

CAMP BASTION, Afghanistan (Reuters) - British troops struggled to save the life of a Royal Marine as Taliban guerrillas closed in on them during the heaviest battle yet in the southern part of Afghanistan's Helmand province.

A British soldier gave the first eyewitness account of the death of Royal Marine /, killed by what British forces suspect may have been allied aircraft sent to give close support during a sudden and ferocious Taliban counterstrike.

"We kept going for 20 minutes, but he had stopped breathing," said the soldier, his hands making gestures as if still pounding on his fallen comrade's chest to keep him alive.

The British military says may have been killed by strikes from either U.S. or British-flown aircraft.

The soldier, who cannot be named because he was not permitted to comment on the record on the death while it was still under investigation, said he was in no doubt they had been hit by a U.S.-flown attack plane, apparently missing a target.

"I saw it. It was the A-10. I was five feet away," he said. "We called in a strike on the next trench. Then I saw it swooping towards us. I will never forget that noise. It was horrible."

He also tended to another Marine hit in the same strike, wrapping a tourniquet around his arm to stop it bleeding.

All the while, they continued to take enemy fire.

"I threw myself on top of him to stop him getting hit," said the soldier.

British military spokesman Lieutenant Colonel Andy Price said at headquarters in Lashkar Gah, capital of Helmand province, that friendly fire may have killed

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"It is possible, but not confirmed, that Marine : death may have been the result of fire from ISAF aircraft operating in support," said Price.

British troops are battling the Taliban in southern Afghanistan's Helmand province as part of NATO's ISAF force.

SUDDEN COUNTERATTACK

The British troops had initially met only sporadic and poorly-organised resistance when they swept before daybreak into wheat fields at the north end of the mainly Taliban-held Garmser district in the lower valley of the Helmand River.

But that suddenly changed at midday on Tuesday, around the time of Marine ' death.

The Taliban launched their sudden counterattack, attempting to encircle the British troops round both flanks.

Wigley's group were on the right flank, where the Taliban appear to have come closest to surrounding the British position, according to a Reuters cameraman who was with marines in the central group and saw Wigley's comrades withdraw.

The British called in air strikes. At the time the two marines were hit, U.S.-piloted F-18 and A-10 fixed-wing attack planes were in the air, as were British-piloted Apache helicopters.

"There is no question that close air support saved the lives of many of our men that day," said spokesman Price.

A British armoured ambulance from C Squadron, the Light Dragoons, drove through mortar fire to reach the fallen men but arrived too late to save

Medical crew described a harrowing ride under fire over ditches as they fought to revive him while the other wounded marine writhed in pain from his shattered arm.

The remaining troops finally withdrew, forced to blast their way through walls to escape from mud-brick housing compounds as Taliban tried to encircle them, the soldier said.

The soldier, a demolitions expert, said he used up nearly an entire rucksack of explosives to create an escape route.

"We blew down one wall, the blast knocked us back five feet," he said.

Eventually they succeeded in withdrawing before nightfall, hiding behind armoured vehicles which they used as cover.

J-V

The marines withdrew to the "D.C. line" -- the district centre, a small road at a bridge-head at the north end of the otherwise mainly Taliban controlled valley, and have remained there for the two days since, fending off Taliban attacks.

"All our objectives were achieved, but very much at a high cost," said Price.

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NWP 3-22.5-F/A18

Vol. I, 20 mm Ammunition

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1.1.2 **20 mm Ammunition.** A 20 mm round consists of a steel cartridge case, an electric primer, propellant powder, and the projectile. The primer is ignited by 28-volt dc electrical power from the aircraft armament system. The primer ignites the propellant powder which forms a gas as it burns, forcing the projectile through the gun barrel. There are two classifications of ammunition (M50 series/PGU), the only significant difference being the projectile. See ammunition and projectiles in figure III-1-2 and 20 mm variants in figure III-1-3. See figure III-1-4 for 20mm projectile fragment envelope static explosion.

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The 20 mm, high-explosive incendiary (HEI) projectile is composed of an incendiary compound, an explosive compound, and a fuze. This type projectile is used against aircraft and light material targets. The PGU-28 SAPHEI projectile replaces the M56 HEI projectile and expands its use to air and ground targets including light armor.

The 20 mm ball projectile (TP) is a hollow steel body that does not contain a filler. This projectile is used for target practice. The PGU-27 TP projectile replaces the M55 as the target practice projectile.

The M221 target practice-tracer (TP-T) projectile is a steel body with forward and aft cavities. The forward cavity is empty and the aft cavity contains a tracer compound. The PGU-30 TP-T projectile replaces the M221 projectile. The tracer material is a magnesium-teflon-vitron mixture that has exceptionally good visibility in the daylight sun.

1.1.3 Gun Programming. Programming for the M61A1 20-mm gun may be performed in the NAV and A/G master modes. Parameters include the aiming mode, type of round loaded, gun fire rate, and HUD reticle depression angle in the MAN mode. These parameters may be changed inflight. Allowable entries are as follows:

1. Aiming mode - CCIP or MAN.

2. Type of round loaded - M50 or PGU (high speed round)

4. Reticle depression (MAN mode) - 0 to 270 mils.

, The HRM OVRD option provides the same function for gun firing as for bomb delivery.

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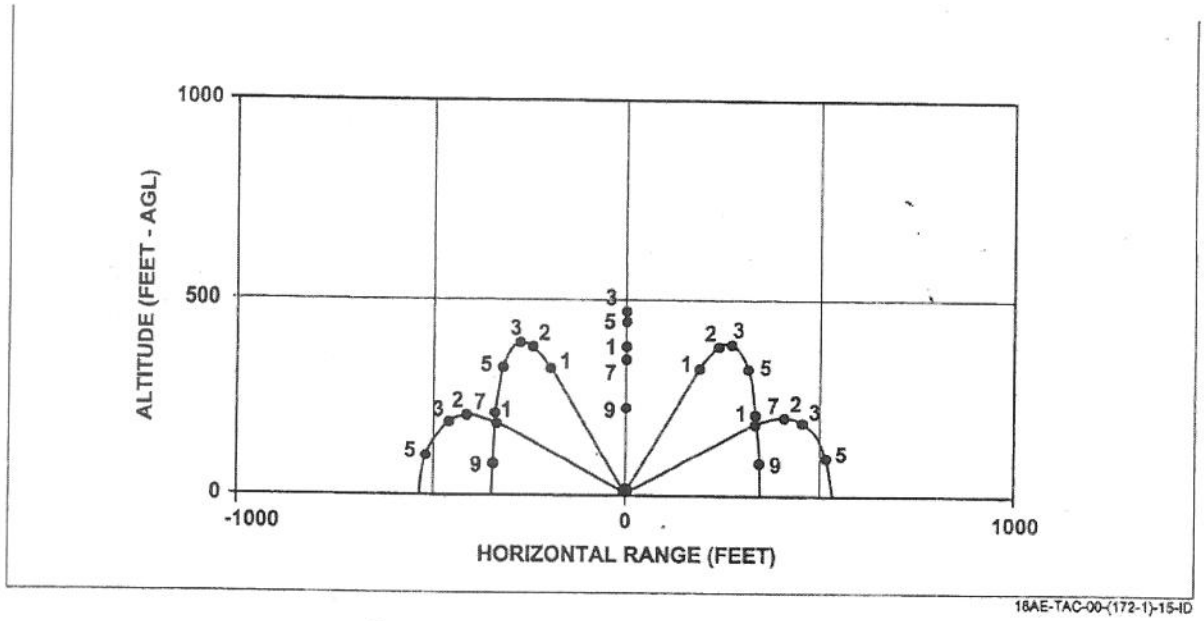

Figure III-1-4. Maximum Fragment Envelope, M56 20mm Projectile, Static Explosion

1.2 Gun Controls and Indicators

1.2.1 Gun Stores Display Options on the stores display enable the selection of weapons including the gun. Figure III-1-5 illustrates the various gun related stores symbology described in the following text.

1.2.1.1 Gun Option. The gun is selected by actuating the GUN option button on the stores display. The GUN option is used to either select the gun as the primary A/G weapon, or to enable gun firing in conjunction with delivery of another primary weapon. This latter condition is referred to as a hot gun selection and is only available when conventional/laser guided bombs or rockets are the primary weapon. This capability is selectable from the stores display by actuating the GUN option button after selecting the primary conventional/laser guided bomb or rocket. Gun firing can be initiated using the trigger since bomb release and rocket launch are initiated using the weapon release button. However, gun firing cannot be conducted simultaneously with the release/launch of the primary weapon. At least 1.5 seconds must transpire between gun firing and bomb release to accomplish both functions. If the trigger is pulled within 1.5 seconds after bomb release initiation, the gun firing is inhibited but the bomb is released. If bomb release is initiated during gun firing or within 1.5 seconds of releasing the trigger, the gun shuts down and bombs are not released. The hot gun selection is indicated on the HUD by display of a gun cross and on the stores display by both the primary weapon legend and the GUN legend being boxed.

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If another primary conventional/laser guided bomb or rocket is selected while the hot gun is selected, the hot gun selection is retained. If the primary weapon is deselected while in a hot gun condition, the system reverts directly to gun operation and provides symbology for the mode (CCIP or MAN) selected in the gun program. If another weapon is selected while in the gun mode, the gun is deselected, since the MC interprets this as the selection of a different primary weapon. When the hot gun is selected, only the low (4,000 rounds per minute) gun fire rate is allowed. Unlike the selection of other weapons, which may be preselected in NAV master mode prior to entering A/G master mode, the hot gun must be selected while in the A/G master mode, as it is automatically deselected by the MC when entering the A/G mode. It may also be deselected by actuating the GUN option button when the hot gun is selected.

The GUN option is removed and the gun deselected if selected when LTD/R TRIG option is selected on the FLIR/LTD/R display. When TRIG option is deselected, the GUN option is displayed again, but the gun must be reselected if desired.

1.2.1.2 **Gun Round Option.** If the gun is exclusively selected, two option buttons are provided to select ballistics computations for either the original M50 20-mm round or the high speed PGU-28B 20-mm round. Only one type of round can be loaded into the gun. M50 and PGU are alternately selected and boxed by actuation of the adjacent button. No provision is made to verify the accuracy of the selection in relation to the round type actually loaded.

1.2.1.3 **Gun Rounds Remaining ON F/A-18A/B aircraft and F/A-18C/D 163427 THRU 165206.** In the gun mode, the rounds remaining is displayed at the top between the wingform (figure III-1-5). XXX is displayed when no rounds are remaining or when no gun decoder is installed. A full gun load of 578 rounds is displayed when the gun decoder is reset regardless of the number of rounds actually loaded.

1.2.1.4 **Gun Rounds Remaining ON 165207 AND UP.** In the gun mode, the rounds remaining is displayed at the top between the wingform (figure III-1-5). XXX is displayed when no rounds are remaining. The armament computer weapon insertion panel (WIP) is used to select the gun and enter the amount of rounds loaded on the aircraft. A full load is 578 rounds.

1.2.1.5 **Firing Rate Option.** A single option button is provided to select either the HI firing rate or the LO firing rate. HI and LO are alternately selected and boxed for each actuation of the firing rate option button.

1.2.1.6 **UFC Option (Reticle Depression).** The display and selection capability for the HUD reticle depression angle are provided when the MAN gun mode is selected. Actuation of the UFC option button enables the UFC for reticle depression entry, and the RTCL option appears in the fourth option window of the UFC. Select the RTCL option and enter the desired reticle depression value based on the planned firing range to the target. The CSC allows entries from 0 through 270 mils. The value entered is displayed on the stores management display. See Gun HUD.

1.2.1.7 **Gun Mode Option.** Modes available for A/G gunnery are CCIP and MAN. Operation in these modes is very similar to operation in the CCIP and MAN modes for conventional bomb delivery. When one of the modes is selected the option is boxed and a cue appears on the heads up display. For information about these options see the Gunnery Modes.

J-VI

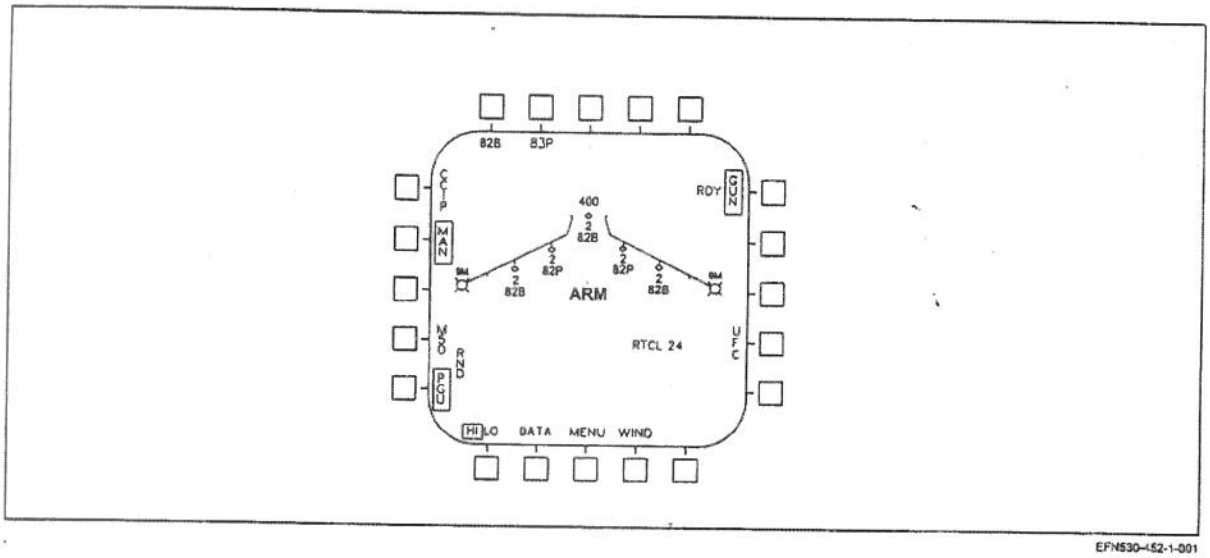

Figure III-1-5. Gun Stores Symbology

1.2.2 **Gun HUD.** Figure III-1-6 illustrates HUD symbology with GUN selected.

1.2.2.1 **Hot Gun Cross.** The hot gun cross is displayed when hot gun has been selected and the gun is ready for firing. This symbol is displayed at a fixed 15-mil depression angle from the gun boresight and indicates the gun aim point at 3,000 feet slant range. Hot Gun exists when gun is selected after selecting the primary conventional/laser-guided bomb or mine.

1.2.2.2 **Gun Mode.** CCIP or MAN mode gun symbology is displayed on the HUD immediately to the left of the reticle depression cue. The pitch ladder is occluded from the A/G gun reticle to reduce clutter.

1.2.2.3 **Reticle Depression Indication.** The selected reticle depression angle is displayed immediately to the right of the MAN mode legend. Reticle depression data also appears on the stores display. The pilot may adjust the reticle depression angle via the UFC if desired.

1.2.2.4 **In Range Cue.** An IN RNG cue is presented above the gun reticle in the CCIP mode if the radar or FLIR is angle tracking the target and slant range is inside the maximum firing range. Once a steering solution has been achieved for gun firing, the MC displays the SHOOT cue instead of the IN RNG cue.

1.2.2.5 **Aircraft True Airspeed.** Aircraft knots true airspeed (KTAS) is displayed beneath the KCAS indication in the gun mode. The indication is prefaced by the letter T.

1.2.2.6 **Shoot Cue.** SHOOT (figure III-1-7) is displayed above the reticle; it replaces the IN RNG cue when range parameters have been met. See In Range Cue.

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1.2.2.8 Maximum Firing Range Mark. In the CCIP mode, the calculated maximum firing range appears as a tic mark around the perimeter of the A/G reticle. A 5,000 feet. fixed range can be selected by pressing the cage/uncage switch on the throttle and the marker appears at 5,000 feet on the HUD reticle (see Cage/Uncage Button). The maximum firing range marker is not displayed in the manual mode.

1.2.2.9 Sensor Tracking Cue. The sensor cue represents the tracking source and will appear as LDT, FLIR, RDR or AGR. The cue flashes until the target is designated and then illuminates steady. LDT is the priority over FLIR and RDR. AGR is lowest priority and is displayed if valid.

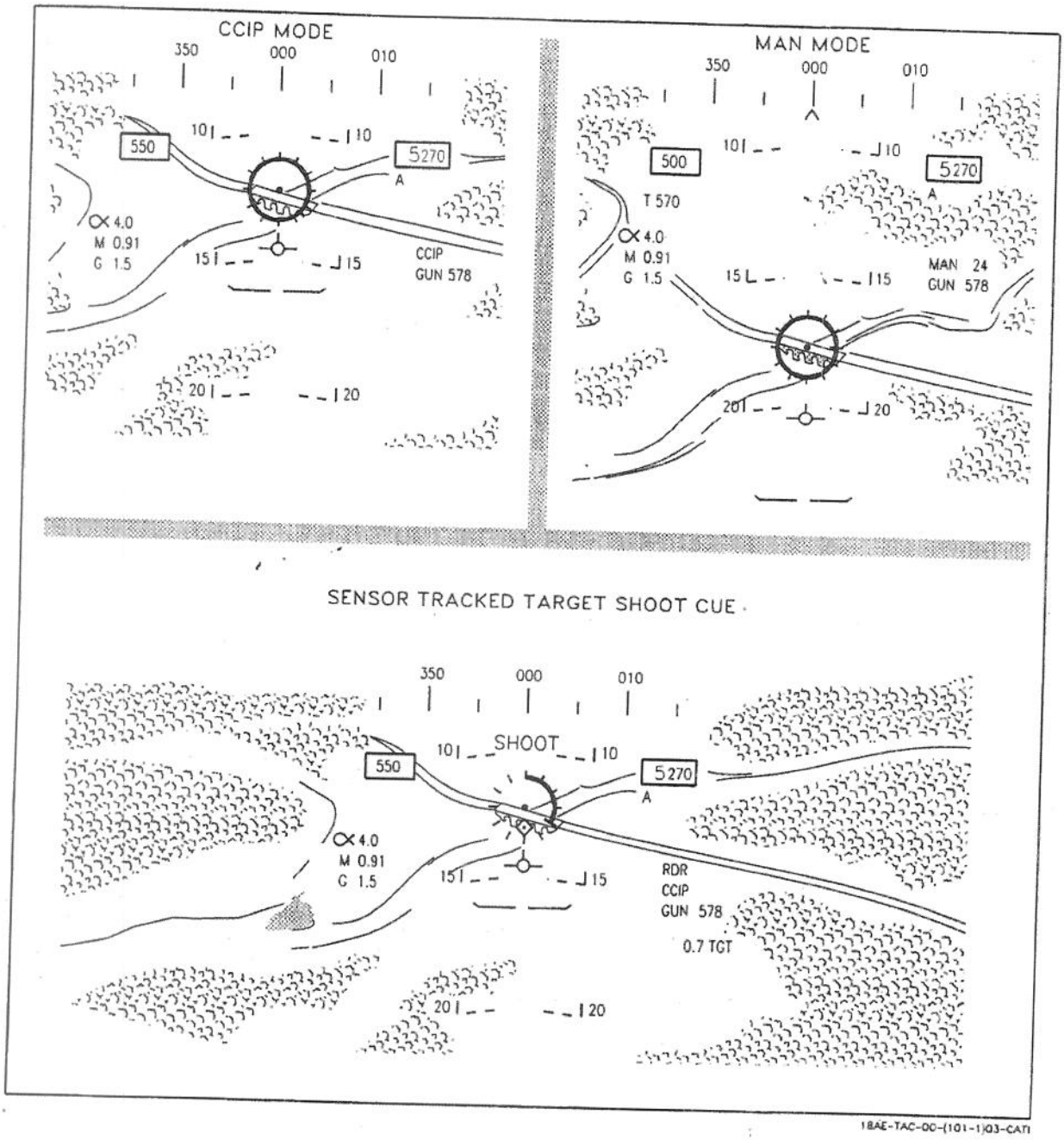

Figure III-1-7. A/G Gun Firing Displays

J-VI

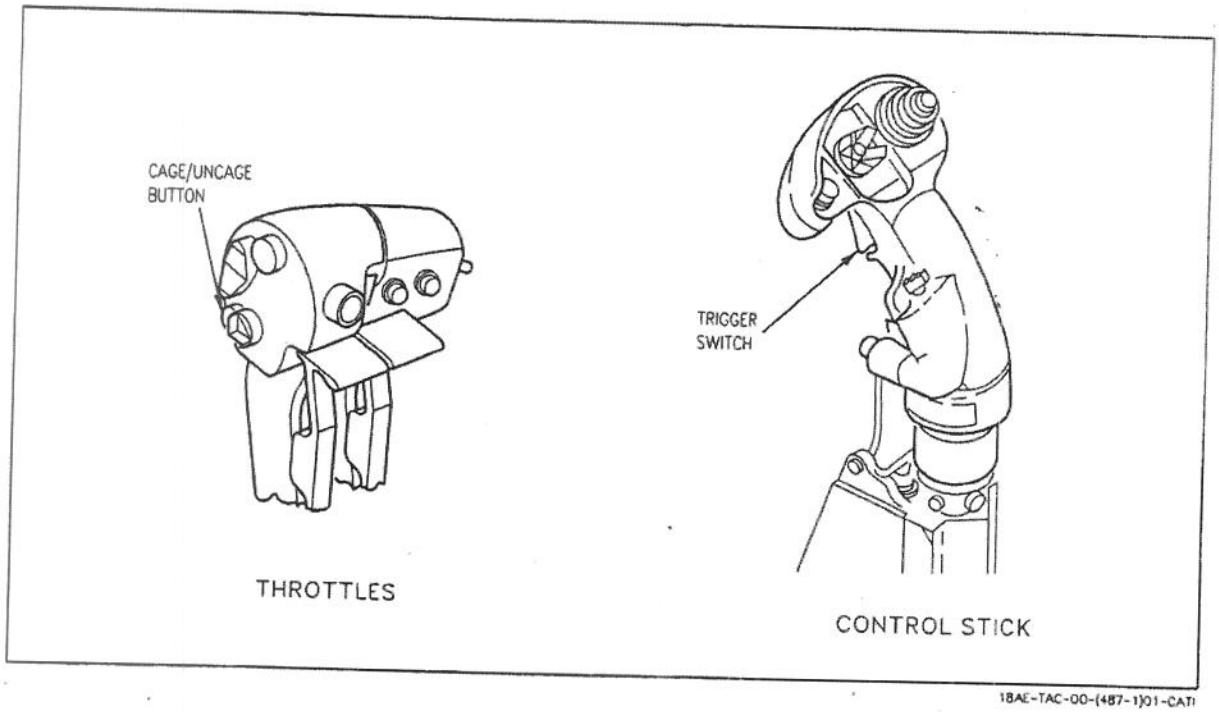

Figure III-1-8. Gun HOTAS Controls

1.2.3 Gun HOTAS Controls

1.2.3.1 Trigger Switch. The trigger switch (figure III-1-8) is a two-detent switch. Squeezing the trigger to the second detent initiates gun fire when the gun is selected.

1.2.3.2 Cage/Uncage Button. The cage/uncage button (figure III-1-8) is also used in CCIP gun mode to cage the CCIP reticle for a fixed target slant range. Pressing and releasing the cage/uncage button fixes the CCIP reticle for a fixed 5,000-foot target slant range (button is not held pressed). The gun CCIP computations are still based on the ballistics of the selected weapon when the reticle is caged. This function can be utilized when ranging appears to be a problem and the pilot decides to estimate the applicable fixed target range. Reactuation of the cage/uncage button uncages the reticle.

1.2.4 Gun Backup. A/A gun can be selected to perform A/G gunnery if MC 2 fails (backup A/A GUN). MC 1 displays the A/G gun cross at a 15-mil depression angle to provide a 3,000-foot aiming point for backup A/G gunnery.

1.2.5 **Gunnery Modes.** A/G gun mode options are available on the stores format when GUN is selected: CCIP and MAN. See figure III-1-7.

1.2.5.1 **CCIP Mode.** If the radar is in the AGR mode, the MC slaves the radar antenna to the reticle LOS and performs CCIP computations using radar range data. The FLIR is also slaved to the reticle LOS. For any sensor designation, the TD diamond provides an aiming reference for nonvisual targets. The best available slant range along the reticle LOS is indicated by the reticle range bar. The reticle also includes the maximum firing range marker (shown at 4,600 feet, figure III-1-6). When the slant range is inside the maximum firing range, an IN RNG cue is displayed above the reticle on the HUD. The MC uses best available velocity data to compute the maximum gun firing range, based upon bullet being supersonic at impact.

The MC uses the slant range along the reticle LOS (reticle range) in computations whenever the reticle range is less than the maximum firing range and the reticle displays the actual computed impact point. When the reticle range is greater than the maximum firing range, the MC uses the maximum firing range in the computations and displays the reticle at the impact point for the maximum firing range. If the radar ranging data is invalid, the MC computes slant range along the CCIP reticle LOS using alternate altitude data sources. The pilot may select the fixed 5,000-foot reticle by pressing and releasing the cage button. The MC uses the 5,000-foot fixed firing range in the CCIP mode computations and displays the maximum firing range cue at 5,000 feet. A second actuation of the cage button restores the computed firing range solution.

The aircraft is maneuvered to position the reticle on the target and the trigger pressed to the second detent to fire the gun when the range to the target is less than the maximum firing range. The SMS updates the rounds remaining status on the HUD and the stores management display.

The pullup/breakaway X cuing described for the computed conventional bomb delivery modes is also provided in the CCIP gun mode. The clearance criteria is 50 feet plus the vertical descent for a 1.5-second reaction time plus the altitude loss associated with a 4-g pull assuming a g buildup of 2 g per second. The clearance criteria is applied to the available altitude above the target.

The pilot may designate a moving target by commanding radar or FLIR track in the CCIP gun mode. Under these conditions, the MC computes the lead angle required for the target and positions the HUD reticle appropriately. When the gun firing ready indication is received from the SMS, the target is within the maximum firing range, and the pilot has achieved a steering solution for gun firing, the MC displays a SHOOT cue on the HUD. The SHOOT cue replaces the IN RNG cue.

1.2.5.2 **Manual Mode.** MAN gun mode HUD symbology is shown in figure III-1-7. The HUD reticle depression angle is selected based on desired firing range to the target for predetermined firing conditions. The angle is displayed immediately to the right of the MAN mode indication on the HUD. The MC slaves the radar (if in AGR mode) and FLIR to the reticle LOS and displays the best available slant range on the reticle range bar. In the MAN gun mode, the maximum firing range marker is not displayed on the reticle but true airspeed is displayed. The pullup/breakaway X mechanization described for the CCIP gun mode is also applicable to the MAN mode.

The aircraft is maneuvered to position the reticle on target and the trigger is pressed to fire the gun when the range to the target equals the desired firing range. The rounds count is updated on the displays to indicate the rounds remaining.

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Night Strafing Power Point

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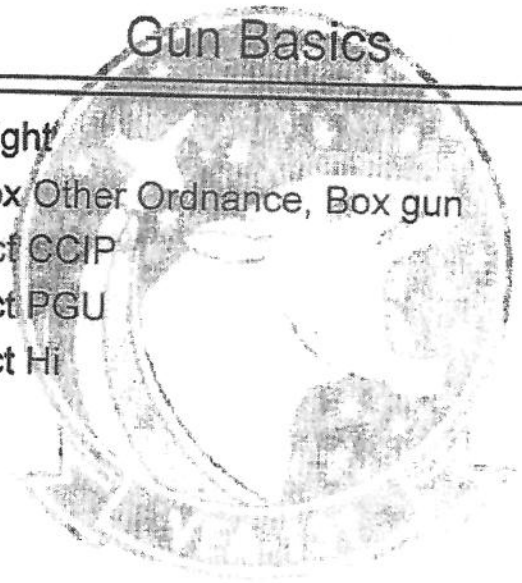
Night Strafing

Overview

- Gun Basics
- Training Requirements
- Night Patterns/symbology
- Night Execution
- Safety Concerns

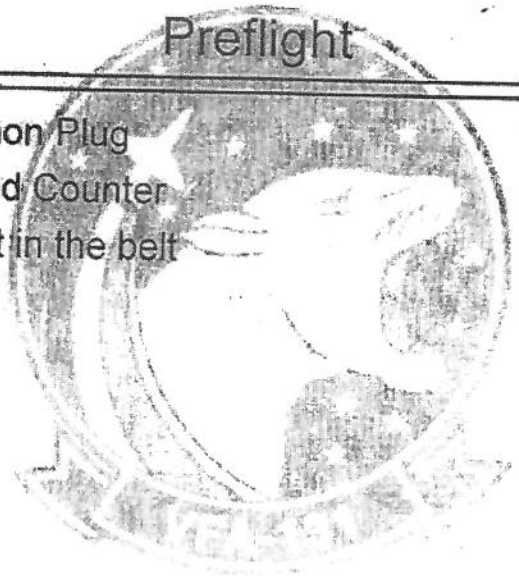
Gun Basics

- Preflight
- Unbox Other Ordnance, Box gun
- Select CCIP
- Select PGU
- Select Hi



Preflight

- Cannon Plug
- Round Counter
- Bullet in the belt



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Min Training Requirements

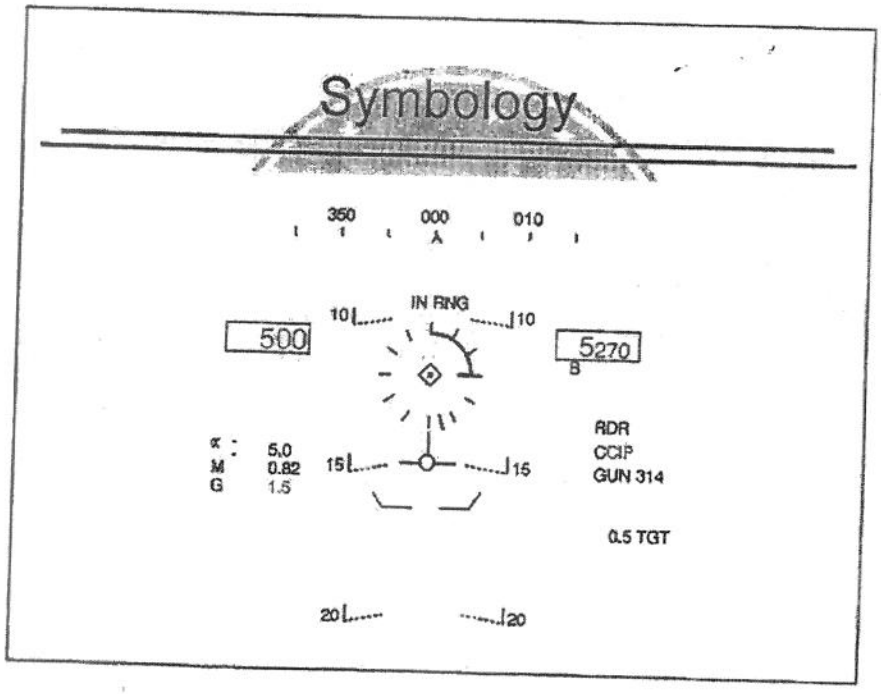
(Recommended)

- 0.0022 lux with > 15 deg lunar elevation
- Min 25 hours NVG time
- Flown Strafe day before night

Night Patterns

- Predicated on Wing NVG SOP
  - 1,000' above highest obstacle in non-mountainous terrain
  - 3,000' if mountainous

J-DII


Symbology
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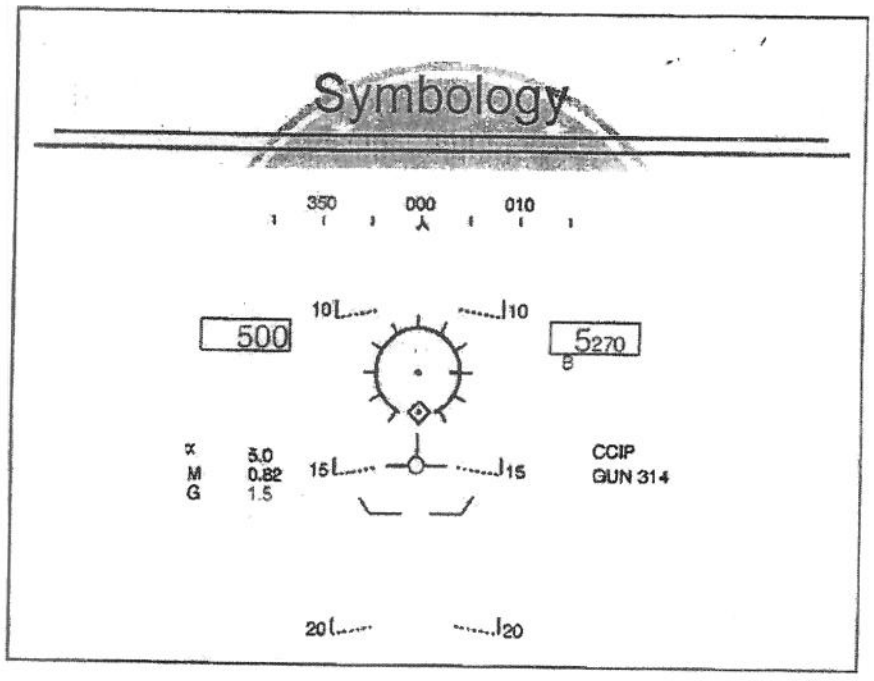
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GUN 314
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20

J-VII

Night Executions

- Roll-in w/ TDC to FLIR
- Scan btn FLIR and HUD
  - Z's allow extra time in chute to slew
- Heavy reliance on ALT bugs to "break the spell"
- More familiar scan if IZLID available

Safety Concerns

- Lack of light source on deck
- Target fixation
- The "light show"
- Safe Escape
- GLOC/overstress

J-III

NWP 3-22.5-F/A18

Vol. I, Page III-1-3

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The 20 mm, high-explosive incendiary (HEI) projectile is composed of an incendiary compound, an explosive compound, and a fuze. This type projectile is used against aircraft and light material targets. The PGU-28 SAPHEI projectile replaces the M56 HEI projectile and expands its use to air and ground targets including light armor.

The 20 mm ball projectile (TP) is a hollow steel body that does not contain a filler. This projectile is used for target practice. The PGU-27 TP projectile replaces the M55 as the target practice projectile.

The M221 target practice-tracer (TP-T) projectile is a steel body with forward and aft cavities. The forward cavity is empty and the aft cavity contains a tracer compound. The PGU-30 TP-T projectile replaces the M221 projectile. The tracer material is a magnesium-teflon-vitron mixture that has exceptionally good visibility in the daylight sun.

1.1.3 Gun Programming. Programming for the M61A1 20-mm gun may be performed in the NAV and A/G master modes. Parameters include the aiming mode, type of round loaded, gun fire rate, and HUD reticle depression angle in the MAN mode. These parameters may be changed inflight. Allowable entries are as follows:

1. Aiming mode - CCIP or MAN.
2. Type of round loaded - M50 or PGU (high speed round)
3. Firing rate - HI (6,000 rounds per minute) or LO (4,000 rounds per minute).
4. Reticle depression (MAN mode) - 0 to 270 mils.

The HRM OVRD option provides the same function for gun firing as for bomb delivery.

Top Gun Manual CAS-AR-SCAR, Ch 47, Section III, Pages 24 through 32 (June 2004)

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CAS Format Data Entry

When creating our own CAS mission, there is a specific order in which the information contained in lines 1, 2, 3, and 6 must be entered in order to avoid anomalies with the system.

J-TX

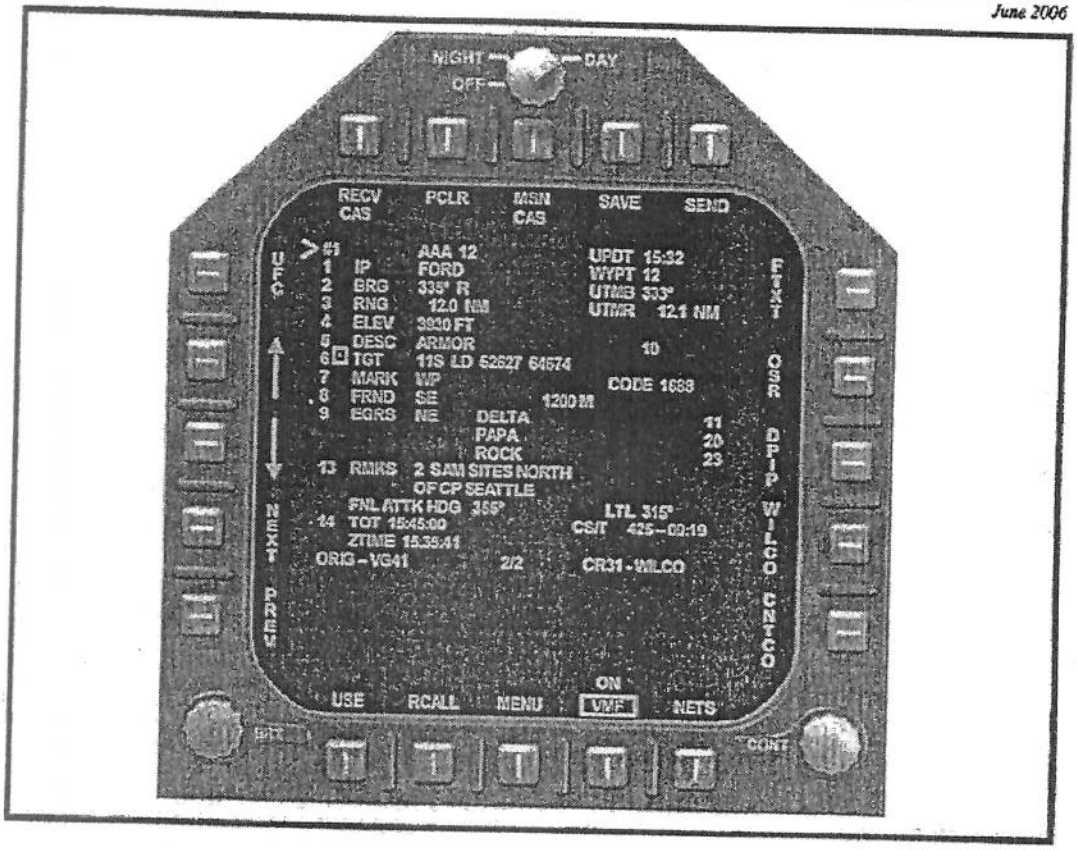

Figure 23
Data Entry of Lines 1, 2, 3, and 6

CAS Mission Brief Closure

Once we have either received a CAS mission brief through the DCS, created our own CAS mission brief in the DCS, or copied down the 9-Line onto a kneeboard card, there is a specific order in which we need to close out the 9-Line. This close out process ties directly into the team effort mindset that we previously discussed in the chapter. It is a process of checks and balances with the terminal attack controller.

Our first step is to look at the information and ensure that we have everything needed to accomplish our mission. If we missed a portion of the information, we should respond verbally in a "say again" format. *"Say again Line 3."* We should avoid using the word *"repeat"* since it is used specifically by indirect fire assets and means repeat a previous fire mission. If the terminal attack controller omitted information that we need, you should apply the team effort mindset and ask for it. A terminal attack controller may just pass a few lines to a 9-Line. We may

want to ask for more information in order to achieve success such as ingress information contained in Lines 1-3, a more accurate target description or the location of the nearest friendly forces.

, Once we are satisfied with the information, our next step is to provide reassurance to the terminal attack controller that we are clear as to where the intended target is and we understand exactly how the terminal attack controller intends to fold us into the target area.
and any restrictions passed, such as a final attack heading or a stay above altitude in the target area. We **will not** read this information directly from our kneeboard card or the DCS CAS page. If we are using the aircraft's navigation system to find our intended target,

. If we are using a GPS weapon that will autonomously guide to the target, we will read the target location and elevation directly from the weapon's display. When it comes to the DCS, after electing to use a CAS mission, the MC will download the target location and elevation into waypoint 47. We should select waypoint 47 and read back lines 4 and 6 from the data sublevel for that waypoint. There have been occasions in training and in combat where aircrew have confirmed lines 4 and 6 off a kneeboard card and then typed the information incorrectly into their systems or weapons. Friendly forces paid for this aircrew error with their lives.

When dealing specifically with GPS guided weapons such as
This becomes an issue when we are passed a target location for the weapon in grid and the weapon will only accept and display lat/long. We have two ways to tackle this issue. The first and best choice is to ask the terminal attack controller for Line 6 in lat/long. In most cases if the terminal attack controller has the ability to generate target coordinates worthy of a GPS weapon he should be able to provide target location in any format requested. This will allow us to type Line 6 directly into the weapon and read directly from the display, per doctrine.

) If in the outside chance the terminal attack controller cannot provide lat/long for Line 6,

, designate that waypoint and the

) When using the aircraft to convert coordinates from grid to lat/long, we should read back Line 6 from the weapon's display in lat/long and also from the HSI data sub-level in grid. This is an excellent example of where we will need to step in and explain to the terminal attack controller the situation at hand. Let him know that you are reading back a lat/long from the weapon that was derived by the aircraft from the original grid that was passed. The terminal attack controller can then decide whether he still wants you to release the ordnance. As aircrew, check and then double check to make sure that you performed the TOO method correctly or transposed the coordinates into a PP mode without any mistakes. Doctrine does not cover each an every possible scenario, use the team effort mindset, work with the terminal attack controller, and depending on the severity of the situation decide with him what the correct course of action should be.

Following a confirmation of lines 4 and 6 plus restrictions, the terminal attack controller will most likely pass a TOT or time-to-target (TTT). We are familiar with the TOT concept; however, we may not be familiar with the TTT technique. For TTT, the terminal attack controller will pass for example: *"...four minutes time to target, ready hack,"* and he will expect ordnance to impact the target 4 minutes following his "hack." Once we have received our timeline for the attack, we will confirm it with the terminal attack controller: *"Copy TOT 45"* or *"Copy hack."* Following our confirmation of the timeline, we have essentially closed out the 9-Line and have the information needed to conduct a successful attack.

Amplifying Remarks

. The terminal attack controller may elect to provide amplifying information if radio space is available. Amplifying information is SA enhancing communications such as a limited talk-on, specific DMPI assignments within a target array, or possibly follow-on tasking immediately after our initial attacks. In a team effort mindset, we can also initiate amplifying remarks. For example: *"...Caesar 31 is contact artillery impacts in the target area. Where is our target in relation to them?"* However, we must be cautious before initiating requests for amplifying information. The terminal attack controller may be busy coordinating other CAS attacks and supporting arms. Tying up precious radio space that the terminal attack controller needs for other duties may hurt the over all effort.

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Remember we are not the only game in town. If there is any doubt as to whether the terminal attack controller has time for amplifying remarks, stay silent and let him initiate them when he sees fit to do so.

Inbound / Holding Tasks

Prior to executing our CAS attack, additional inter-flight procedures should be executed in order to set ourselves up for mission success.

Step one is to confirm our "push time" with our wingman.

is showing. This is a quick way to QA required ground speed without having to set up the "auto" option on the HSI format. Of note, the CS/T cue on the CAS format is always ground speed required to make the TOT flying through the IP first. If you choose to use the "auto" function on the HSI, ground speed required may be different if you step past the IP waypoint and select the target waypoint.

, we will always calculate our push time using the "stubby pencil" method and then confirm it with our wingman, *"...Caesar 31 shows that we need to be at the IP at time 15:43:15,...Caesar 32 same."* When calculating our push time, plan for 480 KGS from contact point (CP) to IP and 510 KGS medium or high altitude IP to target, 540 KGS IP to target if low altitude. We also need to add in some extra time to account for our dive deliveries and weapon time-of-flight (TOF). For a rough rule of thumb (ROT), add 5 seconds for 15-degree dives, 10 seconds for 30-degree dives and then an additional 15 seconds for 45-degree dives. See Table 14 at the end of the chapter for knots ground speed (KGS) calculations.

For example, let us say we have an IP that is 9.2 nm from the target and we plan to execute a medium angle roll-in with a 30-degree dive angle. Our TOT is 12:05:00. We should plan to be at the IP, inbound to the target at 510 KGS at 12:03:45. It will take approximately 1 minute 5 seconds to travel from the IP to the target at 510 KGS and we add an additional 10 seconds to account for the 30-degree dive delivery.

The next step in our holding / inbound tasks is to conduct an alpha check to the target with our wingman and then plot the target's location on our gridded map. This will ensure that we are looking into the same target area as our wingman and allow us to study where the target is in relation to possible restrictions that the terminal attack controller passed during the remarks portion of the 9-Line. For example: *"...stay south of the 51 gridline."* We would then like to complete as many combat checks as possible prior to initiating our attacks. Reference, ***TOPGUN Manual***, Chapter 46, *Air-to-Ground Employment* and Chapter 48, *Tactical Crew Coordination* for a detailed list of the applicable combat checks during an A/G mission.

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The final step is to conduct a "big to small orientation" of the target area if time allows for it. A big to small orientation will help continue the terrain study process that we discussed in the mission planning section of this chapter. Look for large terrain features and significant landmarks that will help funnel our eyes and sensors onto the target. We would also like to establish a visual direction in the target area to aid in corrections from possible visible marks and a talk-on from the terminal attack controller. *Figure 24* is a 1:50,000 of a possible target area with our target at MD 302522. Let us assume that we plan to ingress the target area from the southwest. The first key point that we can derive from the 1:50,000 is that we should expect the target to be at an Y-intersection of a southwest to northeast running military supply route (MSR). There is a large well-defined ridgeline to the east of the target running from north to south. We can use this ridgeline to help establish visual direction in the target area and as a limiting feature for where to look for the target. On our ingress, there is no need to look beyond the ridgeline since we know the target is west of it. As we ingress from the southwest, we should pick up a smaller southwest to northeast ridgeline that parallels our ingress route. We can use this smaller ridgeline and the large one to the east to help funnel us into the target area. We should also be able to pick the southwest to northeast running MSR, follow it north to the first Y-intersection, and find our target there.

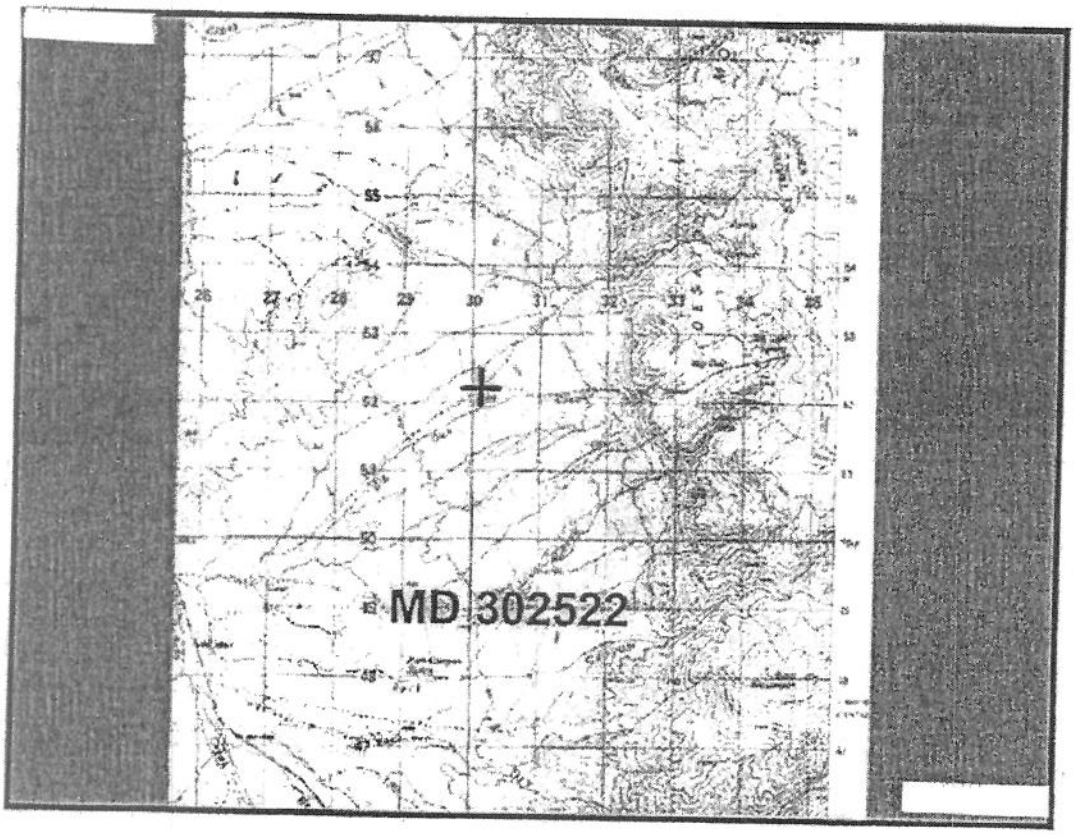

Figure 24
Big to Small Orientation

J-IR

J-IF

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J-IX

J-IX

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OAP or target may, in general, be redesignated using another method; however, the navigation, HUD reticle, overfly, and data link vector designation methods can only be used when the weapon system is in an undesignated state.

4.4.8.1 **Navigation Data Designation.** This designation method is used when a planned target or OAP cannot be located either visually or on the sensor displays. It is also used for target finding purposes. The MC slaves all operating sensors to the computed LOS to the selected designation. The

ORIGINAL

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ORIGINAL

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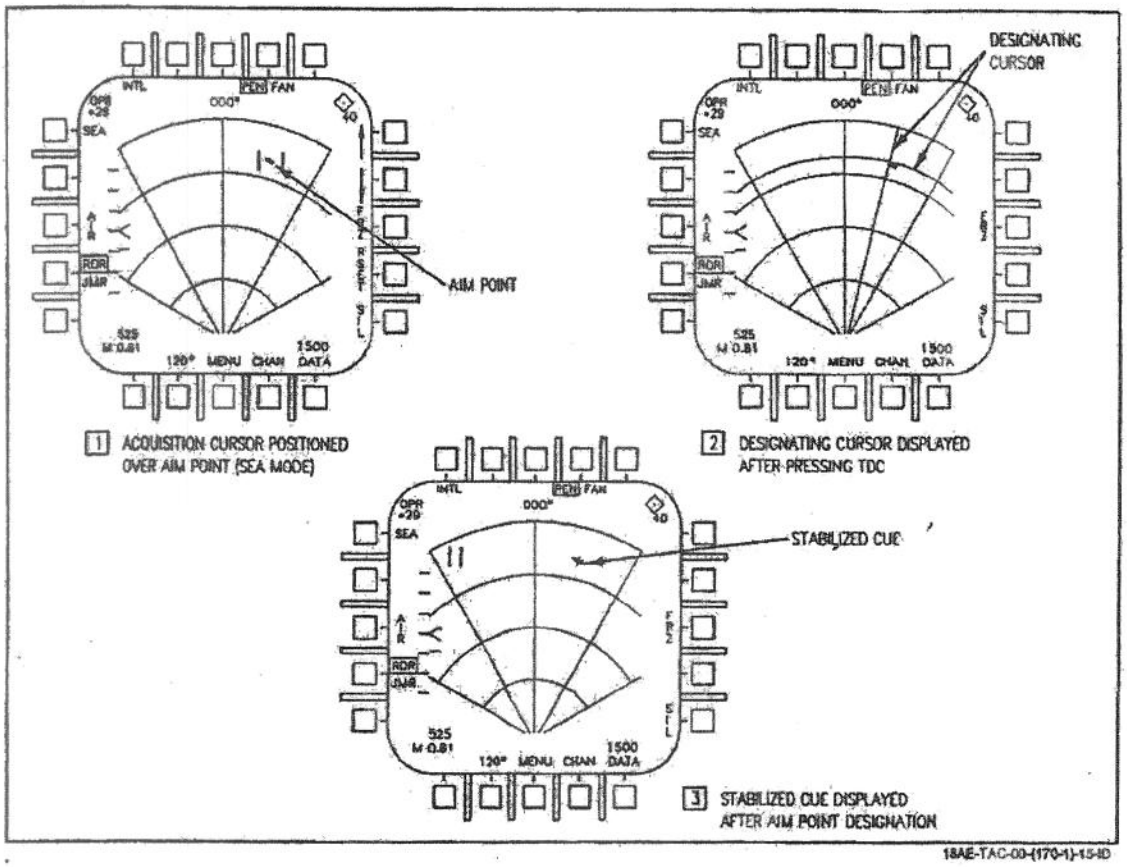
INTL
PENT FAN
000°
SEA
AIM POINT
DESIGNATING CURSOR
STABILIZED CUE
525
M 0.81
120°
MENU
CHAN
1500
DATA
1 ACQUISITION CURSOR POSITIONED OVER AIM POINT (SEA MODE)
2 DESIGNATING CURSOR DISPLAYED AFTER PRESSING TDC
3 STABILIZED CUE DISPLAYED AFTER AIM POINT DESIGNATION
18AE-TAC-00-(170-1)-15-ID

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ORIGINAL

JFB

Operation of the F/A 18 Avionic Subsystem for F/A 18A+/C/D Aircraft

(March 2006)

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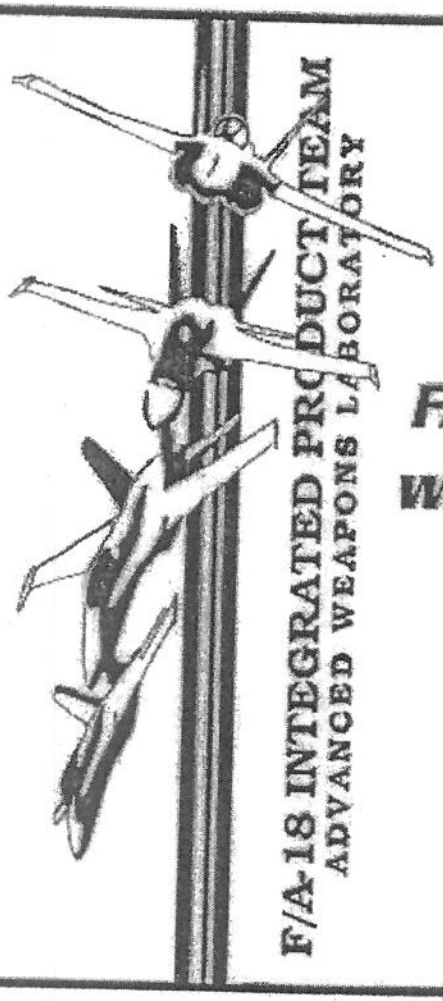
F/A-18 EXPORT CONTROLLED

19C GREYBOOK-U-209

MARCH 2006

NAVAIR



Operation of the F/A-18 Avionic Subsystem for F/A-18A+/C/D Aircraft with the 19C System Configuration Set (19C) FINAL

CODE 41110AD, NAVAL AIR WARFARE CENTER WEAPONS DIVISION, CHINA LAKE, CA 93555

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F/A-18 EXPORT CONTROLLED

J-XI

OPERATION OF THE F/A-18 AVIONIC SUBSYSTEM FOR F/A-18 A+/C/D AIRCRAFT WITH THE 19C SYSTEM CONFIGURATION SET FINAL

Report Number: F/A-18-19C-GREYBOOK-U-209

Edition: 19C GREYBOOK – FINAL

Date: MARCH 2006

Approved by:

CHARLES G. BECHTEL
F/A-18 AWL
CHIEF ENGINEER

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Memorandum for Record,

Undated

J-XII

MEMORANDUM FOR THE RECORD

1. The CAS format page in the F/A-18C is widely considered to be too cumbersome to train to and use. It is used by the two seat F/A-18F community when they conduct FAC(A) operations. When it is available on the battlefield network (either ground based or airborne) for automatic upload it is occasionally used. The normal condition requires the pilot to enter all the elements manually and pilots find it easier to use other onboard systems to accomplish the task.

2. This information was derived from an informal survey of multiple F/A-18 pilots, including a recent weapons school instructor, and the pilot member of the board.

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JP 3-09.3, Ch 1, Page I-2

J-XIII

Commanders integrate CAS with their fire and maneuver to achieve objectives.

c. **CAS can be conducted at any place and time friendly forces are in close proximity to enemy forces.** The word "close" does not imply a specific distance; rather, it is situational. The **requirement for detailed integration** because of proximity, fires, or movement **is the determining factor**. At times, CAS may be the best means to exploit tactical opportunities in the offense or defense. CAS provides fires in offensive and defensive operations to destroy, disrupt, suppress, fix, harass, neutralize, or delay enemy forces.

d. **CAS may be used to mass** the effects of combat power, in order to exploit opportunities in the offense and defense. The impact of effectively executed CAS in modern warfare draws credence from one of Napoleon's maxims, "XCII. In battle as in a siege, skill consists in converging a mass of fire upon a single point; when the fight is on he that has the skill to bring a sudden, unexpected concentration of artillery to bear upon a point is sure to win." **Each Service organizes, trains, and equips to employ CAS** within its roles as part of the joint force. As a result, a **variety of aircraft are capable of performing CAS.** The joint force commander (JFC) and his staff must be capable of integrating all CAS capabilities into the operation plan (OPLAN).

e. A joint terminal attack controller (JTAC) is a qualified (certified) Service member who, from a forward position, directs the action of combat aircraft engaged in CAS and other air operations. A qualified and current JTAC will be recognized across Department of Defense as capable and authorized to perform terminal attack control.

> Units and organizations that have a reasonable expectation to conduct terminal attack control in order to accomplish their assigned missions need to have individuals available trained to the appropriate standards to perform this activity (e.g., JTACs). However, experience has shown that there has, and will likely continue to be instances where terminal attack control will be requested by personnel/units that do not have JTACs present. In rare circumstances, the ground commander might require CAS when no JTAC is available. One reason for this would be as a result of some unforeseen consequence of combat operations. In these instances, JTACs, FAC(A)s, and/or CAS aircrews should attempt to assist these personnel/units to greatest extent possible to bring fires to bear in support of their combat operations.

J-TIT

Offset Execution JP 3-09.3,

Page V-9 and V-10

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indirect fire weapons (heavy machine gun tracer, mortars, artillery, or naval gunfire) or an airborne platform such as a FAC(A). See Figure V-8 for standard marking brevity terms.

1. **Marking by indirect fire.** Artillery, NSFS, or mortar fires are an effective means of enabling pilots to visually acquire the target. Before choosing to mark by artillery, NSFS, or mortars, observers should consider the danger of exposing these supporting arms to the enemy's indirect fire acquisition systems, and the additional coordination between supporting arms required for this mission. Caution must be applied when using a WP and/or red phosphorous mark on a crowded battlefield that the mark is not confused with other activities on the ground. Marking rounds should be delivered as close to CAS targets as possible, with WP marks timed to impact 30 to 45 seconds prior to the CAS TOT/TTT and illumination marks timed to impact 45 seconds prior to the CAS TOT/TTT (the illumination mark must be earlier than 45 seconds at night). This lead time ensures that the marking round is in position early enough and remains visible long enough for the JTAC to provide final control instructions and for the pilot of the attacking aircraft to acquire the target. Indirect fire marking rounds are most effective when delivered within 100 meters of the CAS target, but those within 300 meters of the CAS target are generally considered effective enough to direct CAS aircraft. When indirect fire marking rounds are not timely or accurate, JTACs should use a backup marking technique or verbal instructions to identify the target to CAS aircrew. If the situation requires precise marks, observers or spotters can adjust marking rounds to ensure that accurate marks are delivered to meet the CAS schedule.

2. **Marking by direct fire.** Direct fire weapons can be used to mark targets. While this method may provide more accuracy and timeliness than indirect fire marks, its use **may be limited by range and the visibility of the burst from the air and on the battlefield.**

3. **Laser designators.** For laser spot tracker (LST) equipped aircraft, designating/marking targets by laser is very effective. If using lasers (ground or airborne) to mark the

STANDARD MARKING BREVITY TERMS

CALL	MEANING
VISUAL	The joint terminal attack controller has the attack aircraft in sight, or the attack aircraft has positively identified the terminal attack controller's or friendly position.
CONTACT	Acknowledges the sighting of a specific reference point.
TALLY	The enemy position/target is in sight.
NO JOY	Aircrew does not have visual contact with the target/bandit/bogey/landmark. Opposite of tally.

Ref: FM 3-97.18; MCRP 3-25B; NWP 6-02.1, and AFTTP(I) 3-2.5, Multiservice Operations Brevity Codes

Figure V-8. Standard Marking Brevity Terms

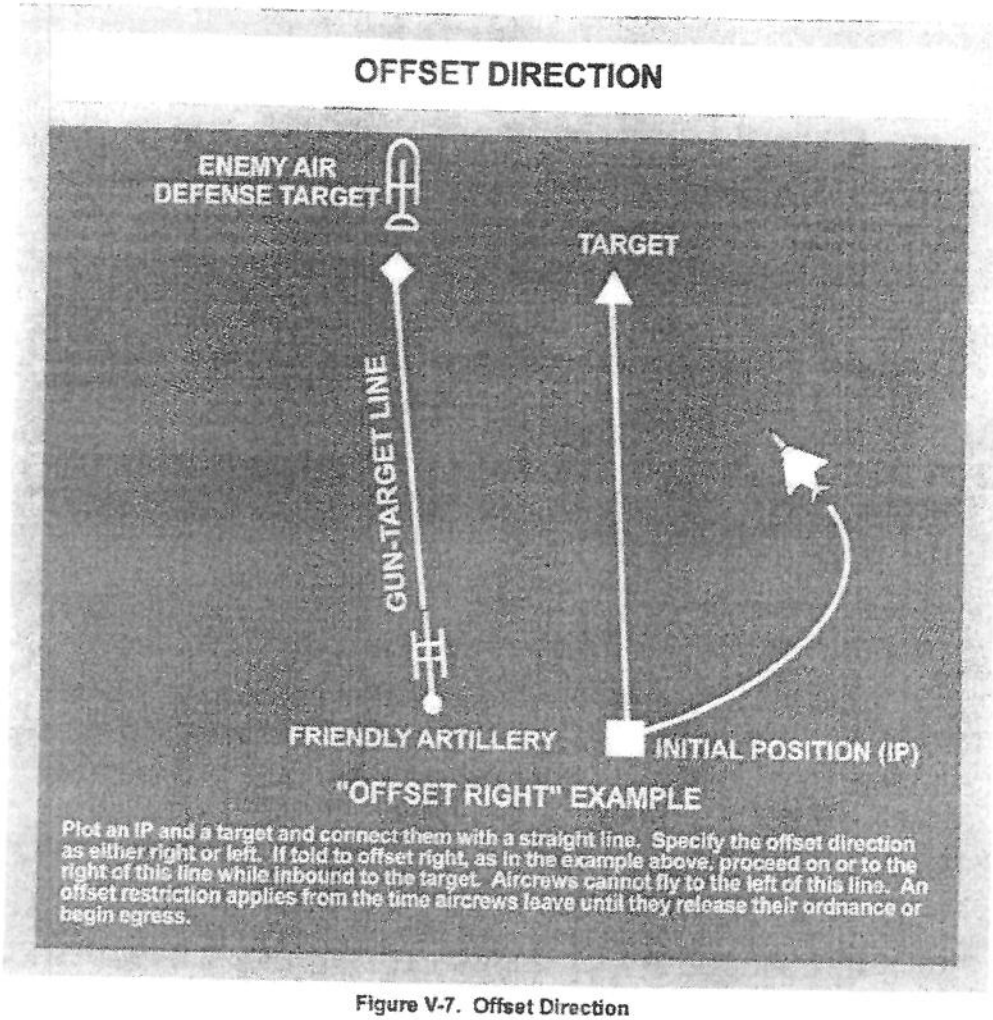

Figure V-7. Offset Direction

FSCC/FSE, and artillery) must use the same timing method. Refer to the two methods, TOT and TTT, described previously.

(3) **Fires that Support CAS.** There are two primary forms of surface fires that support the conduct of CAS missions: target marking and SEAD. They are often used in combination.

(a) **Marks.** A target mark should be provided for CAS aircraft whenever possible. Target marks should be planned to include sufficient time before weapons employment to ensure target acquisition by the CAS aircrew. The target mark can be provided by direct or

Joint Publication 3-09.3

(3 September 2003)

(2 September 2005)

J-XV

Joint Publication 3-09.3

Joint Tactics, Techniques, and Procedures for Close Air Support (CAS)

3 September 2003
Incorporating Change 1
2 September 2005

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WARNING

Use extreme caution when using an IR pointer or laser sources as the sole source for target mark/designation/verification. Attack aircraft may confuse IR pointer or laser energy source with the intended target. When using IR pointers or lasers to mark, include "IR POINTER" or "LASER" in the marks portion of the CAS briefing. JTACs should also provide the Pointer-Target-Line or Laser-Target-Line also known as the Designator-Target-Line in degrees magnetic from the operator to the target. JTACs should consider the use of a discriminate target mark whenever possible.

6. **Combination. JTACs should use a combination of marking methods when practicable** to aid in orienting the CAS aircrew to the target.

7. **Marking Friendlies. Marking friendlies is the least desirable method of providing a target mark. Marking friendlies can be confusing and should be used cautiously and only when no other method is available.**

(b) **Suppression of Enemy Air Defenses.** SEAD may be accomplished by surface- and air-delivered weapons. To minimize exposure of friendly aircraft to enemy air defenses, JTACs should first evaluate the option to route the aircraft away from known or suspected anti-air threats. If aircraft cannot be routed away from enemy air defenses, aircraft vulnerability must be balanced against the risk of exposing SEAD delivery systems.

1. **Objectives.** The primary objective of SEAD is to allow friendly aircraft to operate in airspace defended by an enemy air defense system, including the target area and ingress/egress routes.

2. **Coordination. Surface-delivered SEAD** involves planning and coordination by the FSCC/FSE and at the maneuver units down to the company level. **Air-delivered SEAD and EW** must be coordinated and deconflicted in order to provide necessary support during the time CAS is being conducted. For these reasons, SEAD is another critical timing factor associated with CAS. Effective SEAD also depends on accurate intelligence on the position and type of enemy weapons. The FSC/FSO, working with the JTAC and forward observer, must coordinate surface-delivered SEAD with target marking to minimize confusion.

See JP 3-01.2, Doctrine for Offensive Operations for Countering Air and Missile Threats. *for more information.*

f. **Weapons Release Authority.** The authority and responsibility for the expenditure of any ordnance on the battlefield rests with the supported commander. The supported commander will delegate weapons release clearance authority to his JTACs to facilitate CAS attacks. Weapons release authority grants JTACs the authority to provide the following to attacking aircraft:

(1) **"Cleared Hot"** — Term used by a JTAC during Types 1 and 2 control, granting weapons release clearance to an aircraft attacking a specific target.

(2) **"Cleared To Engage"** — Term used by a JTAC during Type 3 control, granting a "blanket" weapons release clearance to an aircraft or flight attacking a target or targets which meet the prescribed restrictions set by the JTAC.

g. **Tactical Risk Assessment.** As the battlefield situation changes, the supported commander and staff make continuous tactical risk assessments. Risk assessments involve the processing of available information to ascertain a level of acceptable risk to friendly forces or noncombatants. Based on the current risk assessment, the supported commander will weigh the benefits and liabilities of authorizing a particular type of terminal attack control. Specific levels of risk should not be associated with each type of terminal attack control. Information to consider when assessing risk includes:

(1) Confidence and training of the unit, staff, and key personnel.

(2) Timeliness of information.

(3) Absence of information.

(4) Information flow and communications.

(5) Confidence in battle tracking:

(a) Friendly force locations.

(b) Noncombatant locations.

(c) Enemy locations.

(6) Confidence in targeting information:

(a) Targeting information source and accuracy (HUMINT, signals intelligence, geospatial intelligence, visual, etc.).

(b) Stationary or moving.

(c) Ability to mark the target.

(d) Level of difficulty for aircrew to acquire mark/target.

(7) Ordnance available for attack:

(a) Capabilities.

(b) Limitations.

(c) Restrictions.

(d) Proximity of friendlies/noncombatants.

(8) Risk-Estimate Distance

(a) **Troops in Contact.** JTACs and aircrews must be careful when conducting CAS when friendly troops are within 1 kilometer (km) of enemy forces. The JTAC should regard friendlies within 1 km as a "troops in contact" situation and so advise the supported commander. However, friendlies outside 1 km may still be subject to weapons effects. JTACs and aircrews must carefully weigh the choice of munitions and types of terminal attack control against the risk of fratricide (e.g., troops in contact does not necessarily dictate a specific type of control). Risk-estimate distances allow the supported commander to estimate the danger to friendly troops from the CAS attack. They are described in terms of 10 percent probability of incapacitation (PI) and 0.1 percent PI. These estimates, listed in Appendix D, "Risk-Estimate Distances," are based on specific conditions. Different factors such as target elevation, terrain, buildings, trees, etc., can significantly reduce or increase PI.

(b) Danger close ordnance delivery inside the 0.1 percent PI distance will be considered "danger close." The supported commander must accept responsibility for the risk to friendly forces when targets are inside the 0.1 percent PI distance. Risk acceptance is confirmed when the supported commander passes his initials to the attacking CAS aircraft through the JTAC, signifying that he accepts the risk inherent in ordnance delivery inside the 0.1 percent PI distance. Risk-estimate distances allow the supported commander to estimate the danger to friendly troops from the CAS attack. When ordnance is a factor in the safety of friendly troops, the aircraft's axis of attack should be parallel to the friendly force's axis or orientation. This will preclude long and/or short deliveries from being a factor to friendly forces.

h. Types of CAS Terminal Attack Control. Recent technological advances in aircraft capabilities, weapons systems and munitions have provided JTACs additional tools to maximize effects of fires while mitigating risk of fratricide when employing air power in close proximity to friendly forces. GPS-equipped aircraft and munitions, laser range finders/designators, and digital system capabilities are technologies that can be exploited in the CAS mission area. There are three types of terminal attack control (Type 1-3). The commander considers the situation and issues guidance to the JTAC based on recommendations from his staff and associated risks identified in the tactical risk assessment. The intent is to offer the lowest level supported commander, within the constraints established during risk assessment, the latitude to determine which types of terminal attack control best accomplish the mission. Specific levels of risk should not be associated with each type of terminal attack control. The tactical situation will define the risk associated with a given type of terminal attack control, (e.g., GPS and digital targeting systems used in Type 2 control may be a better mitigation of risk than using Type 1). The three types of control are not ordnance specific.

(1) **Type 1 control** is used when the JTAC must visually acquire the attacking aircraft and the target for each attack. Analysis of attacking aircraft geometry is required to reduce the risk of the attack affecting friendly forces. Language barriers when controlling coalition aircraft, lack of confidence in a particular platform, ability to operate in adverse weather, or aircrew capability are all examples where visual means of terminal attack control may be the method of choice. **Type 1 control procedures** are as follows:

(a) JTAC will visually acquire the target.

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(b) JTAC will send a CAS briefing (9-line or theater standard) to attack aircraft (verbally or digitally).

(c) Attack aircraft will verify target location correlates with expected target area.

Note: Attack aircraft validates target location by cross-checking that the position is coincident with the expected target area by using all appropriate means: map plot, target designation displayed on digital map set, head-up display symbology, FLIR, radar, etc.

(d) Attack aircraft will read-back verbally or confirm digitally Line 4 (elevation), Line 6 (target location), and any restrictions provided by the JTAC.

(e) Aircraft will provide an "IP INBOUND" call if requested (verbally or digitally).

(f) JTAC will mark/designate target (as practicable).

(g) Attack aircraft will provide "IN" call indicating maneuvering for weapons firing solution (verbally or digitally).

(h) Attack aircraft will visually acquire target or mark.

(i) JTAC will visually acquire the attacking aircraft.

(j) JTAC will analyze attacking aircraft geometry to reduce the risk of the attack affecting friendly forces.

(k) JTAC will provide a "CLEARED HOT" or "ABORT" based on the above procedures being met (verbally or digitally).

Note: In the case where aircraft acquisition/analysis by the JTAC is difficult or not possible, attack aircraft may be forced to modify their attack profile to aid in acquisition.

The following scenario provides a step-by-step example of how ***Type 1*** *control is conducted.*

— JTAC visually acquires target and verifies target location. At the direction of the supported commander, the JTAC submits an immediate Joint Tactical Air Strike Request and receives two aircraft with 4 MK-82 low drag general-purpose bombs. The JTAC also coordinates with the fire support representative for integration of a target mark and SEAD.

— Attack aircraft checks in and receives the CAS briefing.

JTAC: "Dragon 31, this is Icebox 11, Type 1 in effect, advise when ready for 9-line."

Attack Aircraft: "Icebox 11, Dragon 31 ready to copy."

JTAC:

"PLYMOUTH

275 left

9.1

350

Platoon of infantry dug in

CM 367971

White Phosphorous (wp)

South 900, troops in contact

Egress east to DODGE

Advise when ready for remarks"

Attack Aircraft: "Ready to copy remarks"

JTAC: "Final attack heading 285-330. ZSU 23-4 (from the target) north 1000, continuous suppression, gun-target line 275, report IP inbound"

— Attack aircraft validates target location by cross-checking that the position is coincident with the expected target area by using all appropriate means: map plot, target designation displayed on digital map set, head-up display symbology, FLIR, radar, etc.

ATTACK Aircraft: "350, CM 367971, final attack heading 285-330"

JTAC: "Readback correct, TOT 50"

Attack Aircraft: "Roger, TOT 50"

— Prior to weapon release, each attack aircraft in the flight will provide JTAC with an "IN" call with direction.

Attack Aircraft: "Dragon 31 IP INBOUND"

JTAC: "Dragon 31 CONTINUE."

JTAC: "Mark is on the deck."

Attack Aircraft: "CONTACT the mark."

JTAC: "From the mark, south 100"

Attack Aircraft: "Dragon 31 "IN" from the east"

JTAC: "Dragon 31, CLEARED HOT"

Attack Aircraft: "Dragon 31 off, two away."

JTAC: "Dragon 32, from lead's hits, west 100"

Attack Aircraft: "Dragon 32 IN from the southeast."

JTAC: "Dragon 32, CLEARED HOT"

(2) **Type 2 control** is used when the JTAC requires control of individual attacks and any or all of the conditions highlighted in the following text box exist.

- JTAC is unable to visually acquire the attacking aircraft at weapons release.
- JTAC is unable to visually acquire the target.
- The attacking aircraft is unable to acquire the mark/target prior to weapons release.

Examples of when Type 2 control may be applicable are night, adverse weather, and high altitude or standoff weapons employment. Successful attacks depend on timely and accurate targeting data that may be provided by another source (e.g., scout, COLT, FIST, UAV, SOF, or other assets with accurate real time targeting information). Considerations for employing Type 2 control are emphasized below.

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- When employing unguided munitions using Type 2 control, consideration must be given to host aircraft navigation/weapons system accuracy.
- Inaccurate navigation/weapon systems can result in extensive miss distances.
- Weapon time of flight will be a factor relative to movement of enemy targets and friendly forces when employing standoff weapons incapable of receiving in-flight targeting updates. Detailed planning and preparation by both the JTAC and the aircrew are required to identify situations and locations conducive to standoff weapons attacks, and to address flight profile and deconfliction (aircraft/weaponry/terrain) considerations.
- Digital or data link systems capable of displaying aircraft track, sensor point of interest, etc., significantly enhance situational awareness and the effectiveness of terminal attack control.

Type 2 control procedures are listed in the following subparagraphs:

(a) JTAC visually acquires the target or acquires targeting data from a scout, COLT, FIST, UAV, SOF or other assets with accurate real-time targeting information.

(b) JTAC will send a CAS briefing (9-line or theater standard) to attack aircraft (verbally or digitally).

(c) Attack aircraft will verify target location correlates with expected target area.

Note: Attack aircraft validates target location by cross-checking that the position is coincident with the expected target area by using all appropriate means: map plot, target designation displayed on digital map set, head-up display symbology, FLIR, radar, etc.

(d) Attack aircraft will read-back verbally or confirm digitally Line 4 (elevation), Line 6 (target location), and any restrictions provided by the JTAC.

(e) When delivering GPS/INS guided weapons, attack aircraft will confirm that the briefed target location and elevation have been accepted by the selected munition. When using aircraft system targeting, aircrew will confirm the coordinates loaded into the waypoint, offset, or target points. Aircrew will verify correct data is selected prior to the "IN" call.

(f) Aircraft will provide an "IP INBOUND" call (verbally or digitally) if requested.

(g) Attack aircraft will provide the JTAC with an "IN" call indicating maneuvering for a targeting solution (verbally or digitally). Aircrew should make this call at the appropriate time to allow clearance before entering the release window. Given the extended time-of-flight and standoff ranges of some weapons at medium and high altitudes, aircrew employing standoff precision munitions may consider making a "ONE-MINUTE" call one minute prior to the "IN" call to build JTAC situational awareness.

(h) JTAC will provide a "CLEARED HOT" or "ABORT" (verbally or digitally).

The following scenario provides a step-by-step example of how ***Type 2*** *terminal attack control may be used for a coordinate-dependent, weapon employment.*

— JTAC is unable to acquire the target but receives accurate targeting information from a scout. The JTAC verifies target location and coordinates the use of an aircraft—with Joint Direct Attack Munition.

— Attack lead aircraft checks in, informs the JTAC regarding his onboard capabilities, and is provided the CAS briefing.

JTAC: "Hog 11, this is A3C, Type 2 in effect, advise when ready for 9-line"

Attack Aircraft: "A3C, Hog 11 ready to copy"

JTAC:

"MAZDA

360 right

9.9

450

T-80 dug in

NB 8652342745

NONE

South 900, troops in contact

Egress east to CHEVY

Final attack heading 300-345"

— Attack aircraft validates target location by cross-checking that the position is coincident with the expected target area by using all appropriate means: map plot, target designation displayed on digital map set, head-up display symbology, FLIR, radar, etc.

Attack Aircraft: "450, NB 8652342745, final attack heading 300-345"

JTAC: "Readback Correct. Report IP inbound, TOT 45"

Attack Aircraft: "Roger, TOT 45"

— Each attack aircraft in the flight may call "ONE MINUTE" if expected to release from standoff ranges.

— Prior to weapon release, each attack aircraft provides the JTAC with an "IN" call

Attack Aircraft: "Hog 11 IP INBOUND"

JTAC: "Hog 11 CONTINUE"

Attack Aircraft: "Hog 11 ONE MINUTE"

JTAC: "Hog 11 CONTINUE"

Attack Aircraft: "Hog 11 IN from the south"

JTAC: "Hog 11, CLEARED HOT"

(3) **Type 3 control** is used when the JTAC requires the ability to provide clearance for multiple attacks within a single engagement subject to specific attack restrictions. Like Type 1 and 2, only a JTAC can provide Type 3 control. During Type 3 control, JTACs provide attacking aircraft targeting restrictions (e.g., time, geographic boundaries, final attack heading, specific target set, etc.) and then grant a "blanket" weapons release clearance ("CLEARED TO ENGAGE"). Type 3 control does not require the JTAC to visually acquire the aircraft or the target; however, all targeting data must be coordinated through the supported commander's battle staff. The JTAC will monitor radio transmissions and other available digital information to maintain control of the

engagement. The JTAC maintains abort authority. Observers may be utilized to provide targeting data and the target mark during Type 3 Control. Type 3 is a CAS terminal attack control procedure and should not be confused with TGO or air interdiction. **Type 3 control procedures** are as follows:

(a) JTAC acquires the target or acquires targeting data from a scout, COLT, FIST, UAV, SOF, or other assets with accurate real-time targeting information.

(b) JTAC will send a CAS briefing (9-line or theater standard) to attack aircraft (verbally or digitally). Briefing must include area for attacks, restrictions/limitations, and attack time window.

(c) Attack aircraft will verify target location correlates with expected target area.

Note: Attack aircraft validates target location by cross-checking that the position is coincident with the expected target area by using all appropriate means: map plot, target designation displayed on digital map set, head-up display symbology, FLIR, radar, etc.

(d) Attack aircraft will read-back verbally or confirm digitally Line 4 (elevation), Line 6 (target location), and any restrictions provided by the JTAC.

Note: When delivering GPS/INS guided weapons, attack aircraft will confirm that the briefed target location and elevation have been accepted by the selected munitions. When using aircraft system targeting, aircrew will confirm the coordinates loaded into the waypoint, offset, or target points. Aircrew will verify correct data is selected prior to the "IN" call.

(e) Once satisfied the attacking aircraft have situational awareness (SA) of the target area, the JTAC will provide attack aircraft "CLEARED TO ENGAGE" (verbally or digitally).

(f) Aircraft will provide an "IP INBOUND" call (verbally or digitally) if requested.

(g) Prior to initial weapons release, the attack aircraft will provide "COMMENCING ENGAGEMENT" to the JTAC (verbally or digitally).

(h) JTAC will continue to monitor the engagement by all means available (visual, voice, digital, etc.). No other communications are required unless directed by the JTAC.

(i) Attack aircraft will provide "ENGAGEMENT COMPLETE" to the JTAC (verbally or digitally).

Note: The JTAC maintains abort authority in all cases.

The following scenario provides a step-by-step example of how ***Type 3*** *control may be used.*

— The supported commander has just been informed that a reconnaissance team has spotted a company of mechanized infantry approaching 15 km to the north. A very discernible river conveniently separates friendly forces from the enemy. The commander and staff are confident in their situational awareness of friendly force disposition provided by sound battle tracking, and the commander has authorized the JTAC to determine which type of CAS control best suites the situation. A division of AV-8Bs is currently in the CAS stack and has sensors in the target area verifying the recon team's sighting. Upon consideration of all these factors, the JTAC decides to utilize Type 3 terminal attack control against the mechanized company. The following 9-line is provided:

JTAC: "Razor 11, this is A3C, Type 3 in effect, advise when ready for 9-line."

Attack Aircraft: "A3C, Razor 11, Roger, Type 3, ready to copy"

JTAC:

"MAZDA

360

9.0

450

Mechanized company in the open

NB 922556

Laser 1111

South 3000

Egress S to MAZDA, advise when ready for remarks"

Attack Aircraft: "Razor 11 ready to copy"

JTAC: "Razor 11, you're "CLEARED TO ENGAGE" from time 45-55. Execute attacks north of the river. No attack run-ins from north to south. Cobra recon team is currently 3000 S in position to lase, as required. Contact him this TAD. Report COMMENCING ENGAGEMENT and ENGAGEMENT COMPLETE with BDA."

— Note: Attack aircraft validates target location and cross-checks that the position is coincident with the expected target area by using all appropriate means: map plot, target designation displayed on digital map set, head-up display symbology, FLIR, radar, etc.

Attack Aircraft: "A3C, 450, NB 922556, execute attacks north of the river with no north to south run-ins, TOT 45-55."

JTAC: "Razor 11, readback correct."

— Attack aircraft establishes communications with Cobra recon team.

Cobra: "Razor 11, your target's estimated to be a mechanized company of BRDMs and BMPs with dismounted infantry. Your target is located on the north side of the river, 100 meters west of the large brown suspension bridge with the burning vehicle about mid-span. Report "contact" that bridge."

Attack Aircraft: "Cobra, Razor 11 is "contact" the brown suspension bridge and a large staging area just to the west along the tree line that appears to have multiple vehicles parked in rows."

Cobra: "Razor 11 that's your target; wind in the target area is light and variable, designator target line 360, final attack heading 300 to 315, laser will be on the southernmost vehicle, confirm laser code 1111."

Attack Aircraft: "Laser code 1111. "

Attack Aircraft: "A3C, this is Razor 11, COMMENCING ENGAGEMENT."

— Cobra recon team and Attack Aircraft conduct terminal guidance of laser guided weapons using standard terminology. JTAC monitors progress of the mission via radio.

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— Attack Aircraft make multiple attacks within the time window while complying with other restrictions. Laser designation from Cobra recon team is provided for laser-guided weapon employment against the BRDMs and BMPs. The attacks continue until time 55.

Attack Aircraft: "A3C. ENGAGEMENT COMPLETE at time 55. Advise when ready to copy BDA."

— Aircrew passes BDA to JTAC.

(4) Because there is no requirement for the JTAC to visually acquire the target or attack aircraft in Type 2 or 3 control, JTACs may be required to coordinate CAS attacks using targeting information from an observer. An observer may be a scout, COLT, FIST, UAV, SOF, or other asset with real-time targeting information. The JTAC maintains control of the attacks, making clearance or abort calls based on the information provided by other observers or targeting sensors. The JTAC must consider the timeliness and accuracy of targeting information when relying on any form of remote targeting.

(5) JTACs will provide the type of control as part of the CAS brief. It is not unusual to have two types of control in effect at one time for different flights. For example, a JTAC may control helicopters working Type 2 control from an attack position outside the JTAC's field of view while simultaneously controlling medium or low altitude fixed-wing attacks under Type 1 or 3 control. The JTAC maintains the flexibility to change the type of terminal attack control at any time within guidelines established by the supported commander. Senior commanders may impose restrictions that will prevent subordinate commanders from choosing certain terminal attack control types. However, the intent is for senior commanders to provide guidance that allows the lowest level supported commander to make the decision based on the situation.

Note: The JTAC maintains abort authority in all cases.

While recent technological advances in weaponry and digital/data link systems have provided significant enhancements to the CAS mission, it is imperative that commanders and operators fully understand the capabilities and limitations of the systems being brought to the fight. Descriptive dialog between the JTAC and aircraft will often provide the best means of mitigating risk and producing the desired effect on target. It is essential that standard procedures and terminology be used by all CAS participants.

3. Close Air Support Target Engagement

This section will provide standard procedures for CAS execution. While theaters or specific commands may have unique requirements, JTACs, CAS aircrews, and fire supporters should be familiar with the standard formats used in passing key information between CAS participants. One way to ensure this is to follow standardized procedures. This begins with CAS aircraft check-in procedures, providing situation updates, and includes following standard TTP during final attack control. There may be instances where ground-based JTACs and FAC(A)s combine their efforts in support of a maneuver force. In these instances, it is critical that ground JTAC and FAC(A) actions are complementary.

a. **Ground JTAC to FAC(A) Coordination.** The responsibilities of the ground JTAC and the FAC(A) must be determined prior to the attack. These responsibilities may include coordination with maneuver elements, attack aircraft briefing, target marking, airspace deconfliction, SEAD execution, and who provides final attack clearance.

b. **CAS Aircraft Check-in.** Aircraft check-in procedures are essential for establishing the required flow of information between the CAS aircrews and control agencies. Controlling agencies should update all CAS assets on the current situation en route to the area of operations. Consequently, it is important for the JTAC to brief the current situation to the DASC/ASOC allowing CAS aircraft to arrive with the most current information available.

c. **Aircraft on the ATO.** If the aircraft are on the ATO, they may simply state "AS FRAGGED", which would eliminate the need to pass anything other than the mission number and abort code. **At check-in, the aircrew establishes the abort code for terminating the attack using AKAC authentication procedures.** This eliminates unnecessary heads-down time in the target area. Authentication and abort procedures are identified in the ATO SPINS. JTACs should have current SCLs available and confirm actual ordnance loads at aircraft check-in. The CAS check-in briefing format is found in Figure V-10.

d. **Situation Update**

(1) After CAS aircrew checks in, the JTAC will provide a current situation update. This update should include:

(a) Unit mission.

(b) Enemy disposition.

(c) Threat activity in target area.

(d) Weather (if required).

(e) Friendly positions.

(f) Current FSCMs.

8 (c) Illumination Table

Illumination Table

Station : 5 Dec 06 Site
Location :

Date : 05 December 2006

Time (UTC)	Solar Position (deg)		Lunar Position (deg)		Lunar Percent Illum.	Ground Illumination (mlux)
	Elvation Angle	Azimuth Angle	Elvation Angle	Azimuth Angle		
0500	25.1	140.6	-20.6	322.3	100	42929336.0
0530	28.9	147.1	-24.1	328.0	100	50595892.0
0600	32.0	154.3	-27.0	334.2	100	56785080.0
0630	34.4	162.1	-29.3	340.9	100	61330004.0
0700	35.9	170.4	-30.9	348.0	100	64157996.0
0730	36.5	178.9	-31.8	355.3	100	65244932.0
0800	36.2	187.5	-31.9	2.7	100	64585788.0
0830	34.9	195.9	-31.2	10.1	100	62183356.0
0900	32.7	203.8	-29.7	17.2	100	58055084.0
0930	29.7	211.1	-27.5	23.9	100	52258116.0
1000	26.1	217.8	-24.7	30.2	100	44931368.0
1030	21.9	223.8	-21.4	36.0	100	36348864.0
1100	17.2	229.3	-17.5	41.3	100	26970458.0
1130	12.2	234.2	-13.2	46.2	100	17465334.0
1200	6.9	238.7	-8.6	50.6	100	8683514.0
1230	1.5	242.8	-3.7	54.6	99	1744967.4
1300	-4.6	246.6	1.7	58.3	99	14692.5
1330	-10.6	250.1	6.9	61.8	99	49.2
1400	-16.7	253.5	12.4	65.0	99	38.8
1430	-22.9	256.8	18.0	68.0	99	59.9
1500	-29.2	260.0	23.8	70.8	99	83.5

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Illumination Table

1530	-35.5	263.3	29.7	73.5	99	107.2
1600	-41.9	266.8	35.7	76.1	99	129.8
1630	-48.3	270.5	41.8	78.7	99	150.2
1700	-54.7	274.7	47.9	81.3	99	167.8
1730	-61.1	279.9	54.1	84.0	99	182.3
1800	-67.4	286.9	60.4	86.9	99	193.9
1830	-73.3	297.5	66.6	90.3	99	202.7
1900	-78.5	316.9	72.9	94.8	99	208.8
1930	-81.3	354.0	79.0	102.1	99	212.5
2000	-79.6	35.3	84.9	122.8	99	213.9
2030	-74.8	58.5	86.5	217.4	99	213.1
2100	-69.0	70.8	81.1	254.0	99	210.2
2130	-62.8	78.5	74.9	263.5	99	205.1
2200	-56.4	84.1	68.7	268.6	99	197.8
2230	-50.0	88.5	62.4	272.2	99	188.2
2300	-43.6	92.3	56.2	275.3	99	176.2
2330	-37.2	95.8	50.0	278.0	99	161.7

J-8?