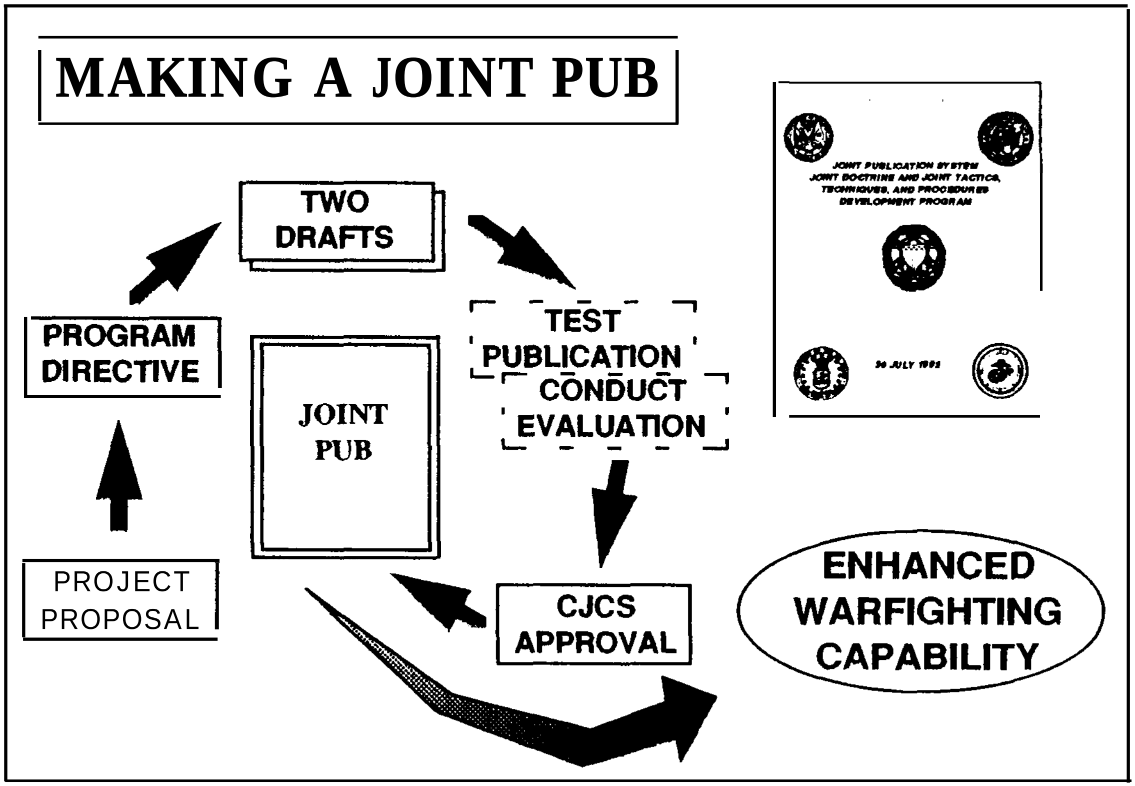
JOINT PUB 3-09.2

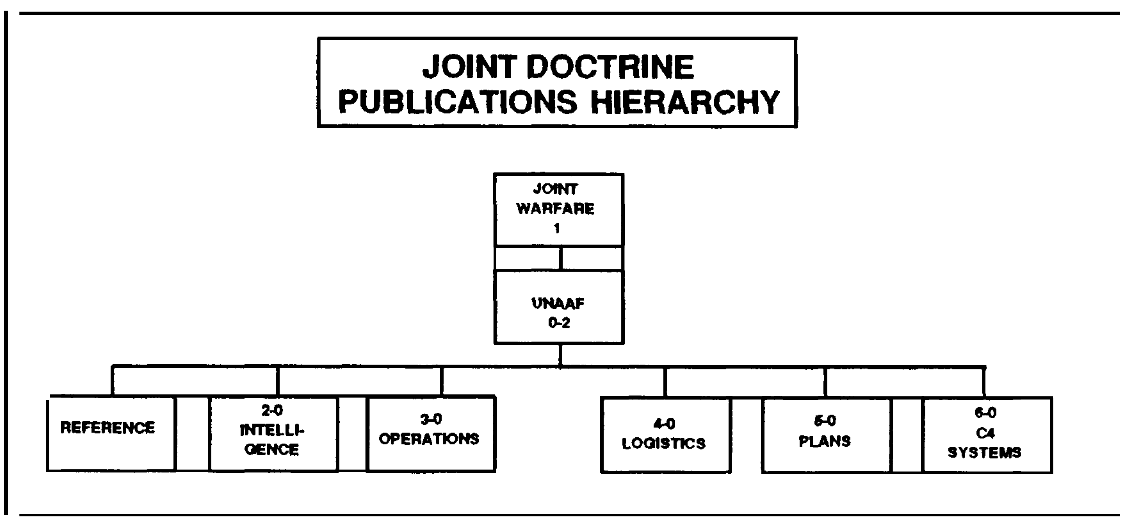
JTTP FOR RADAR BEACON OPERATIONS (J-BEACON)

23 APRIL 1993

A large body of joint doctrine (and its supporting tactics, techniques, and procedures) has been and is being developed by the US Armed Forces through the combined efforts of the Joint Staff, Services, and combatant commands. The following chart displays an overview of the development process for these publications.



All joint doctrine and tactics, techniques, and procedures are organized into a comprehensive hierarchy. Joint Pub 3-04.1 is located in the operations series of joint publications.



Joint Pub 1-01, "Joint Publication System," provides a detailed list of all joint publications. Joint pubs are also available on CD-ROM through the Joint Electronic Library (JEL). For information, contact: Joint Doctrine Division, J-7, 7000 Joint Staff Pentagon Washington, D. C. 20318-7000.

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CHAPTER I

OPERATIONAL CONCEPTS

1. Background

a. The use of portable ground RBs for tactical operations can improve the ability of radar-equipped aircraft and naval surface fire support (NSFS) ships to provide accurate fire support to friendly ground forces. RBs can be employed for air interdiction, air drop or assault, position updates, naval applications, amphibious operations, special operations (SO), and close air support (CAS).

b. An RB is a receiver-transmitter combination that sends out a coded signal when triggered by the proper type of radar pulse. This signal enables a properly equipped radar to determine range and bearing from the RB. However, some air-ground radar delivery systems, similarly referred to as "beacon," continuously transmit a signal without being interrogated by a radar. The procedures in this publication also apply to these beacons unless otherwise indicated.

c. Benefits from employing RBs are:

(1) Provide a reference that can enhance the accuracy of radar weapons deliveries.

(2) Allow radar-equipped aircraft and NSFS ships to attack targets in areas where radar-significant aim points are not available or accurate maps or charts are unavailable.

(3) Because some RBs emit coded responses, they may be positively identified by aircraft and NSFS ships. This gives planners the flexibility of having several closely situated targets each marked by an RB with a discrete code.

(4) RBs may be positioned by air, land, or sea delivery methods (also see limitations, subparagraph 1d below). Additional information on restrictions can be found in Chapter III.

(5) RBs can mark friendly positions during CAS or airdrop missions involving troops in contact with enemy forces. This capability is especially

important when adverse weather is a factor, at night, or when mission profile restricts communications.

d. Limitations of employing RBs are:

(1) RBs require extensive communications to ensure the aircrew or NSFS ships have current and accurate RB target data.

(2) RB operational constraints may limit the choice of aircraft attack headings.

(3) The threat could impact RB employment. Aircraft survivability factors may dictate air operations only where the surface-to-air threat is limited.

(4) RBs require active emissions that may compromise the security of airborne, ground, and naval forces using or interrogating them.

(5) There is no uniform system for beacon offset data. Some users rely on reference data in feet, others in meters; some use true headings, others use magnetic headings; some use offset data, others do not; some figure offsets from the target to the beacon, others do the reverse. System compatibility between specific beacons and radar interrogators is complex and may change rapidly with changes in radar hardware, software, or operational procedures. See Chapter III for additional information.

(6) There is no reliable method to predict actual coverage areas for beacon operations (normally expressed as the plot of ranges and associated altitudes) required for adequate interrogations and reply signal strength. Consequently, military planners should not rely on satisfactory beacon operations unless the beacon has been checked.

(7) Compatibility of beacons and interrogating platforms does not guarantee effective operations. Planners must not only determine that aircraft assigned to beacon missions are capable of interrogating a given beacon but also must verify that aircrews are trained in the mission. For example, all F-16s and F-15Es are beacon-capable, but few pilots are presently trained to use the beacon-systems mode in their aircraft.

e. Because of these limitations, beacons can be best used as confirmational references. Modern aircraft normally use visual pilotage, mapping radar, global positioning system (GPS), or the aircraft inertial navigation system (INS) as the primary reference for weapons delivery.

f. The ground element of the RB team is the RB operator. RB operators controlling aircraft or naval surface fire support may be attached to the following:

(1) Tactical air control party (TACP)--USAF.

(2) Air Mobility Command combat control team (CCT)--USAF.

(3) Air and naval gunfire liaison company (ANGLICO)--USMC.

(4) Fire support team (FIST)--USA.

(5) Firepower control team (FCT)--USMC.

(6) Special operations forces (SOF).

(7) Marine Corps force reconnaissance battalion, Marine division.

(8) Drop zone support team (DZST).

2. Applications

a. Air Interdiction. Preplanned air interdiction attacks can use previously emplaced RBs as radar-significant offset aim points. The air tasking order (ATO) will designate the position, operational status, and code of each RB. When changes in the RB status occur, a change to the ATO should be published.

b. Air Drop or Assault. Ground forces can deploy RBs for aerial delivery operations as agreed to by the combat control team, special tactics team, terminal control personnel, or the mission controlling agency. RBs provide airlift crews a positive way to locate, recognize, and align on landing zones or on drop zones for recovery, extraction, or airdrop missions. To accomplish airborne radar approaches and aerial delivery under adverse weather or night conditions, aircrews can use the RB as a terminal reference. When used along with other means of navigation, the RB can greatly aid in the visual or electronic acquisition of an objective area. However, using the RB as a primary means of delivery can reduce aerial delivery accuracy. The amount of degradation depends on the precision-ranging capability of the radar set, skill of the operators, and accurate placement of beacons.

NOTE: For air drop or assault operations in instrument meteorological conditions (IMC), Services and their commands may have restrictions on the use of RBs. Check with the airlift approval authority in the particular area of responsibility (AOR) for details. More accurate systems exist for performing aerial resupply missions in low visibility or darkness. C-130s equipped with the adverse weather aerial delivery system (AWADS) and aircraft equipped with enhanced station-keeping equipment (SKE) are examples. Consideration should be given to using these systems if they are available.

c. Position Update. Aircrews may use RBs placed along ingress routes to update aircraft positions. A position update reduces the need for navigation aids at or near the target and may increase radar or INS delivery accuracy.

d. Naval Applications. RBs can support naval surface fire support, which includes naval gunfire support (NGFS) and amphibious and other naval operations such as minesweeping, patrolling, or coast-watching activities. Either Navy or landing force LF elements can use and emplace RBs to support these operations. The accuracy of NGFS depends on the ability of the ship to fix its position. RBs can assist the ship in determining its position more accurately. Once the ship determines its location relative to the RB and target positions, navigation errors are minimal. RBs can also be used for ship-to-ship and air-to-ship operations. Such operations are beyond the scope of these JTTP.

e. Amphibious Operations. During amphibious operations, RB teams can deploy in any way that will support the LF scheme of maneuver. When maps and charts of the operational area are inaccurate, the following methods may prove useful:

(1) RBs may be emplaced during advance force or preassault operations or RB teams can carry them in during the assault and emplace them once ashore.

They may emplace RBs at either surveyed positions or accurately determined sites on the flanks of the landing beaches. Providing NSFS ships with a known point can increase the delivery accuracy of supporting fires.

(2) Although selection of initial RB locations or reference points occurs during the planning phase of the operation, after landing, artillery survey teams may designate new locations and improve the usefulness of reference points.

f. Special Operations. SO teams may use RBs to support joint actions in unconventional warfare, direct action, special reconnaissance, certain collateral SO activities, or the missions of conventional forces. Although basic operational concepts and principles of RB employment differ little from conventional operations, unique aspects of SO may dictate variations in operational employment such as limitations on RB transmit times.

g. Close Air Support. Deployed with ground combat elements, RBs may provide an accurate radar offset aim point for radar bombing of immediate or preplanned CAS targets. Service use of and proficiency in RB operations differ; therefore, Services will have specific priorities for the use of RBs as a primary delivery means for CAS operations. Factors to be considered include the complexity of operations and potential risks for friendly troops in contact. When requesting RB CAS missions, use the joint air request procedures. The agency directing CAS should ensure that RB and aircraft radar systems are compatible (verify this with higher authorities if necessary) and the threat to aircraft and ground troops is addressed. See Appendix A for RB and aircraft compatibility.

h. Air-to-Air Operations. RBs are used in aircraft to provide distance, bearing, and identification information to other aircraft during flight phases such as air refueling rendezvous operations. These types of operations are mentioned only for reference because they are beyond the scope of the JTTP in this publication.

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CHAPTER II

RESPONSIBILITIES

1. General. This chapter outlines basic responsibilities concerning RB management and Service-specific control and execution agencies. It is intended to give the user sufficient information to coordinate the use of ground RBs in a joint environment.

2. Joint Force

a. The Joint Force Air Component Commander (JFACC), if designated, may be tasked with the responsiblity for promulgating RB information at the joint force level and should then exercise overall coordination of beacon operations.

b. Frequency Management. Interoperability during joint forces operations requires frequency management at the strategic, operational, and tactical levels. US forces within the boundaries, airspace, or territorial waters of foreign countries have no independent authority to use frequencies during peacetime operations. US forces are subject to existing international agreements that have been coordinated by the US Department of State and theater commanders. The Chairman of the Joint Chiefs of Staff provides overall guidance on US joint military frequency engineering and management matters. He delegates this responsibility to the chairman of the Military Communications-Electronics Board.

3. Army

a. Forwards RB requests and requirements through the G3 (Army airspace command and control proponent) to the joint force commander's staff.

b. Coordinates for RB support through unit TACPs, FIST, ANGLICO, or SOF units. Determine if unit is proficient in operating assigned RBs and executing RB bombing procedures.

c. Coordinates requirements for relocating Air Force RBs, to include helicopter support, with the ASOC.

4. Navy

a. Naval Gunfire for Amphibious Operations

(1) Commander Amphibious Task Force (CATF). Responsible for determining the requirement for RBs.

(2) Commander Landing Force (CLF). Can be either an Army or Marine Corps officer. The CLF is responsible for the control, placement, operation, and maintenance of all RBs assigned to the LF. Because most Army units have no organic radar beacons, the Army may require RB support if designated the CLF.

(3) Naval Gunfire Liaison Officer. The senior ground combat element's FSCC Naval Gunfire Liaison Officer develops a naval gunfire RB plan, makes code assignments, and updates location of all RBs.

(4) RB Team. May be attached to a fire control party, a reconnaissance unit, or a SO unit. Preplanned RB locations are published in the ATO. If the RB location is not preplanned, the RB team will coordinate emplacement of the RB with the supporting arms coordination center (SACC). If C2 of supporting arms have been passed ashore, the RB team will coordinate with the FSCC. The RB teams will also advise support ships of the RB location when it is other than preplanned. For NGFS missions, the RB operator will use the division RB net.

b. Navy Tactical Air Control System (NTACS). The central agency under the NTACS is the tactical air control center (TACC). The TACC afloat is the primary control agency within an amphibious objective area from which all tactical air operations in support of the amphibious task force are supervised. Ground RB operations conducted by all aircraft (Navy, Marine, or other US and foreign Services) are coordinated at the TACC afloat until control is passed ashore to the CLF or the commander who has the capability to control such operations. This command element then becomes the control agency for air operations within the amphibious objective area.

c. Naval Gunfire For Other Than Amphibious Operations. On most occasions when naval gunfire is available, elements of the ANGLICO will be available for RB coordination. Units mentioned in subparagraph 4a above (except CATF or CLF) could also be contacted during coordination for RB use. If an RB control team or NGFS spotter is not available, a FIST or FCT may be available at the maneuver company level to call for and adjust naval gunfire.

5. Air Force

a. Air Operations Center (AOC). The AOC coordinates the allocation of Air Force RB assets and ensures allocated aircraft are compatible with deployed RBs. The AOC is the focal point for all joint force components concerning placement of RBs within the AOC assigned area of responsibility.

b. Air Support Operations Center (ASOC)

(1) Maintains operational control (OPCON) of tactical air force RBs.

(2) Directs the employment of RBs in its boundaries and maintains an up-to-date status list of deployed RBs.

(3) Makes code assignments for RBs and coordinates codes with adjacent ASOCs and the theater SO command operations center.

(4) Computes and publishes required RB bombing data for preplanned and immediate missions using the CAS beacon briefing format located at Appendix B.

c. Control and Reporting Center (CRC)

(1) Provides vector assistance to the RB attack aircraft, as required.

(2) Passes RB bombing data from the ASOC to RB attack aircraft, as requested. Information may be passed to the forward air control post for relay to RB attack aircraft.

d. Tactical Air Control Party (TACP)

(1) When requesting the RB mission, includes the target coordinates in latitude and longitude, the datum of the coordinates, and the recommended final run-in heading.

(2) Reports the RB location in latitude and longitude (with coordinate datum) and computes

bearing and range to the target. These computations serve as a safety cross-check for the ASOC and are to be used for actual missions only when the ASOC is unable to provide the data.

(3) Supplies forward air controller (FAC) or emergency tactical air control to control CAS missions.

(4) Prepares the RB CAS briefing according to the CAS RB briefing format (Appendix B).

(5) Uses standard radio calls (see Figure IV-1).

(6) Reports assigned RB status to the ASOC.

(7) As directed by the ASOC, conducts operational checks of RBs and ensures RBs are set on the assigned code and are turned off or on.

(8) Ensures that the beacon operator knows the RB bombing procedures in this publication and individual Service tactics manuals and the RB briefing format (Appendix B).

e. Air Mobility Element (AME) of the AOC

(1) Directs the allocation of RB to combat control teams for aerial delivery operations.

(2) Within designated boundaries, maintains OPCON of combat control forces and coordinates combat control team RB activity with associated ground Air Force units, such as TACP, ASOC, and AOC.

f. Theater Airlift Liaison Officer (TALO)

(1) Coordinates use of RBs for aerial delivery operations with appropriate ground and Air Force units and agencies.

(2) Assists maneuver units in forwarding specific aerial delivery mission RB requirements to higher echelons.

g. Combat Control Team (CCT)

(1) Employs RBs to support aerial delivery missions and reports location, status, code, and on or off status to the AOC.

(2) Coordinates with other Air Force and ground forces on RB use when CAS and aerial delivery operations are occurring simultaneously.

6. Marine Corps

a. Marine Air Ground Task Force (MAGTF). A MAGTF is a Marine Corps unit that is task organized and structured to accomplish specific missions. All MAGTFs have C2 elements that provide the air-ground team with its own C2 systems to coordinate RB support.

b. Tactical Air Command Center (TACC). Centralized command rests within the TACC, the senior agency within the Marine Air Command and Control System (MACCS). The TACC functions as the senior MAGTF air C2 agency. One of the functions of the TACC is management of all air assets, including RBs, within its assigned air space.

c. Direct Air Support Center (DASC). The MAGTF DASC (applies to Marine Expeditionary Force (MEF), Marine Expeditionary Brigade (MEB), and Marine Expeditionary Unit (MEU)) processes direct air support requests, coordinates with the senior fire support coordination center (FSCC) for integration of RB CAS aircraft with other supporting arms, and controls assigned aircraft. It also monitors location, status, and employment of RBs within the MAGTF's boundaries.

d. Air Officer (AO). The AO for the MAGTF ground combat element (GCE):

(1) Maintains location, status, and employment of RBs within the GCE boundaries.

(2) Coordinates OPCON of RBs.

(3) Advises DASC of any changes in the location, status, or employment of RBs.

e. MAGTF Tactical Air Control Party (TACP). The TACP:

(1) Operates and maintains RBs, when assigned.

(2) Provides the request, briefing, and terminal control information (if required) for RB missions.

(3) Uses RBs for NGFS missions when in range and line of sight of naval gunfire.

f. Wing, Group, or Squadron. A wing, group, or squadron will ensure RB-capable aircraft aircrews are knowledgeable of RB bombing procedures in this publication, individual Service tactics manuals, and the CAS beacon briefing format (Appendix B). The aircrew of RB capable aircraft must use standard radio calls and confirm the weapon system is in RB offset aim point mode not later than 1 minute before weapon release.

g. Naval Gunfire Ground Spotting Teams. These teams are made up of Navy or Marine Corps personnel assigned to the GCE who make the request and provide the briefing and fire adjustment for NGFS missions using RBs.

7. Special Operations

a. Theater Special Operations Command (SOC). The SOC under the command of the joint force special operations component commander (JFSOCC) functions as the primary operational-level headquarters for SO within the theater. The SOC Joint Operations Center (JOC) acts as the focal point for SOF RB operations.

b. Army Special Operations Forces (ARSOF). ARSOF units are proficient in operating assigned RBs and executing RB bombing procedures.

c. Navy Special Operations Forces (NAVSOF). Naval special warfare (NSW) sea-air-land teams (SEALs) can conduct clandestine RB operations ranging from crisis response in peacetime to operations in support of general war. Selected fleet, air, and NSW planners will study collected targets and develop a broad concept of operations. They will select both operational and supporting units, decide when the mission will be executed, and determine additional information required to complete planning.

d. Air Force Special Operations Forces (AFSOF). The Air Force special operations control center (AFSOCC) is the focal point for all AFSOF that may be utilizing RBs. Specially trained and equipped special tactics team (STT) forces provide support to both unconventional and conventional units during unilateral and joint operations. They provide positive control of the terminal or objective areas by diversified means. In support of SO air activities, STT forces may:

(1) Position RBs and operate target designation equipment.

(2) Act as a forward air guide.

(3) Control CAS operations (if FAC qualified).

(4) Operate and control drop zones, landing zones, recovery zones, and medical evacuation and forward refuel and/or rearm points.

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CHAPTER III

PLANNING CONSIDERATIONS

1. General. This chapter provides information on the capabilities and limitations of employing RBs. Planning should include considerations such as range, placement, electromagnetic energy, weather, enemy threat, and safety. Placement of RBs is significant, because transmission of radar energy to and from the RB is limited to line of sight (LOS). Shipborne radar is not normally constrained to the limited sweep angles of fighter aircraft radars but is more dependent on LOS considerations. Range is important, because factors such as aircraft radar capability, offset data, and aircraft altitude limit the RB employment range of an aircraft RB mission.

NOTE: When identifying position coordinates for joint operations, it is imperative to include the map datum that the location coordinates are based on. Operations conducted during Operation DESERT STORM showed that simple conversion to latitude and longitude is not sufficient. It may be referenced on several different datum bases (e.g., land-based versus sea-based datums).

2. Range

a. Aircraft Missions. Aircraft radar capability, RB-to-target offset data, and aircraft altitude limit the RB employment range for an aircraft RB mission. As a general rule, when aircraft ingress to the target at an altitude below 1,000 feet above ground level (AGL), the target should be within 5 nautical miles of the RB. Typically, the optimum altitudes for acquisition of the beacon is between 2,000 and 3,000 feet AGL; however, enemy threat intensity will frequently dictate lower attack profiles. Once the RB is acquired, run-in altitudes down to 100 feet AGL may be feasible. Aircraft ingressing at higher altitudes may be able to pick up RB signals from 35 to 50 miles, depending on beacon type, power output, and aircraft altitude (see Appendix A). Additional aircraft-to-beacon range may be attained at all altitudes by using the RB directional antenna. RB operators must align the antenna of a directional RB to the planned aircraft run-in course.

b. NGFS Missions. Shipboard radar is not normally constrained to the limited sweep angles of aircraft radars. This ability to "see" a full 360 degrees of horizon essentially removes constraints on RB-to-target employment range. However, the placement of a shipborne radar is much lower than that of an aircraft radar. Therefore, either the RB signal transmission range, or LOS, or both, limit the target coverage for an NGFS mission. NGFS is always limited to the maximum effective range of the ship's guns and may be less dependent on type of ammunition, fire control radars, or depth of near-shore waters.

3. Placement

a. Because transmission of radar energy to and from the RB is limited to LOS, placing the RB at the highest elevation available will increase the RB effective range. Foliage and any material that interrupts LOS will weaken the radar energy and cause a reduction or even elimination of the RB reply. A general rule to use is if the aircraft or NGFS ship can be seen from the RB antenna position, then the RB will be within the aircraft radar or NGFS ship LOS (Figure III-1). Using of directional antennas has an added benefit of increasing range and is more difficult for enemy forces to detect. Any object or atmospheric conditions between the RB and the aircraft or NGFS ship may block the RB signal output. RB operators who inadvertently stand in front of an operational RB may block the RB signal output and are susceptible to dangerous electromagnetic radiation.

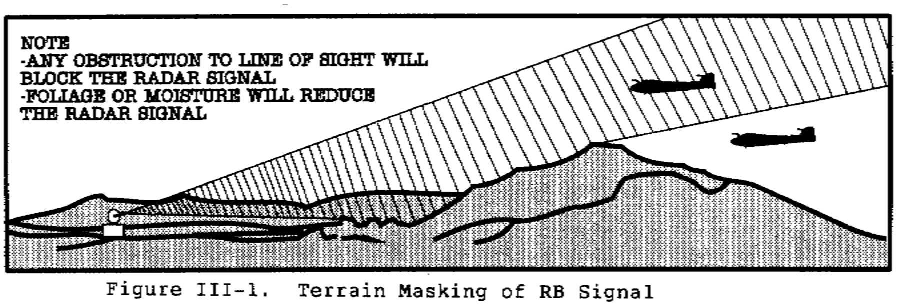


Figure III-1. Terrain Masking of RB Signal

b. Aircraft Run-In Headings

(1) Based on aircraft survivability, optimum RB reception, target acquisition, and location of friendly troops, the aircraft pilot may select the run-in heading with concurrence from the controlling agency. The contact and initial points along the run-in line should be prominent objects identifiable

from the air or radar-significant points (for night and/or adverse weather). Contact points should offer a reasonable opportunity for the RB operator to talk with the attacking aircraft.

(2) Safety of friendly forces is of prime importance when determining a run-in heading. A run-in parallel to friendly lines allows the most flexibility in bomb stick length and distance from friendly forces. However, other factors figure into run-in selection. For example, because of RB position relative to the attacking aircraft, a good run-in heading selected for a visual delivery on a certain target may be incompatible with the run-in heading required to attack the same target utilizing RB offset data.

(3) The aircraft attack axis, or attack heading, should be planned so that the beacon will remain within 45 degrees of the aircraft nose alignment until release. Actual limit depends on the sweep limits of the specific radar type. Because the actual release point (slant range from the target) depends on the type of delivery (dive, level, loft, etc.), release altitude, dive angle, airspeed, and type of ordnance, etc., release points can vary from 1000 feet to more than 3 miles in slant range. Therefore, the RB operator should plan an attack axis or heading that will ensure that the RB is within 45 degrees of aircraft nose as close as 1,000-feet slant range from target (see Figure III-2). If this criterion cannot be met, accuracy may be degraded and success of the delivery becomes less likely.

(4) RBs must be emplaced to ensure proper RB LOS to the aircraft. RB operators and aircrew should also plan to avoid overflight of troops. The ground commander will determine whether to continue or abort the pass if friendly forces are within risk estimate distances.

(5) Because the AC-130 gunship orbits its target, placement of the beacon along the axis of the run-in heading is not generally a consideration for gunship operations.

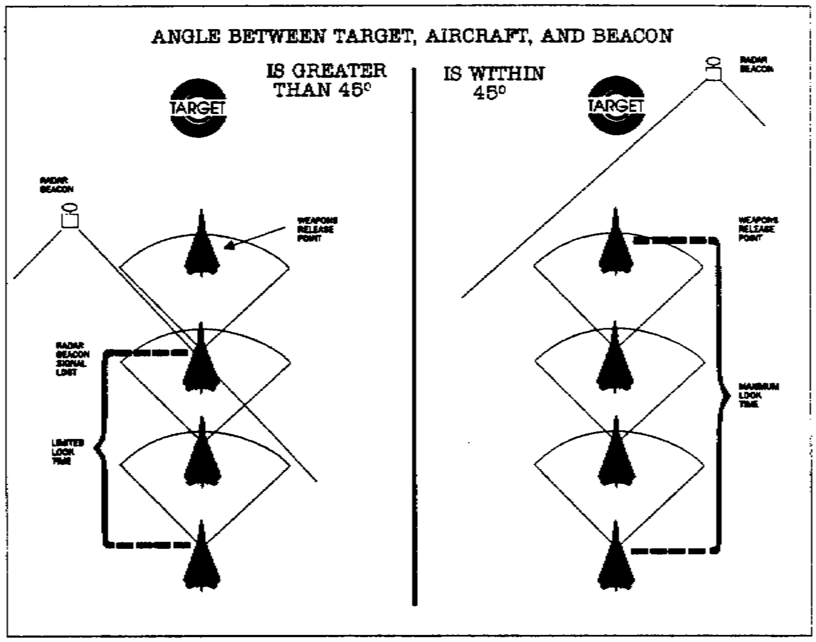


Figure III-2. Aircraft Attack Axis

Figure III-2. Aircraft Attack Axis

c. Theater Air Transport. For theater air transport operations, place the beacon:

(1) On the impact area or on a prebriefed set of offset coordinates when performing airdrops.

(2) On either side of the leading edge of the landing zone when performing air-land missions.

(3) Between the right release panels when performing extractions.

(4) On the recovery zone just before the item or person to be picked up.

NOTE: The tactical environment will frequently require modification of the standard placements

d. Aircraft Position Updates. For aircraft position updates, the RB should be within 10 nautical miles either side of the proposed ingress flight route. This allows sufficient time to update the aircraft position. The unit responsible for the placement of the RB must ensure LOS for the inbound aircraft because its placement can be critical to mission accomplishment. Because of accuracy errors, aircrews should not rely solely on air-dropped RBs for primary position updates.

4. Electromagnetic Environment Effects

a. Commanders must consider the electromagnetic environment in which the RB is placed. Any pulse type signals of sufficient power transmitted in the RB receiving frequency band can trigger most RBs. Like any radar system, the RB is susceptible to radar jamming and/or accidental interrogation. Interference will normally be most severe near the forward edge of the battle area.

b. Because RBs are vulnerable to enemy direction-finding equipment, RB on-times must be limited to increase survivability in a hostile area. Based on specific mission profiles and RB characteristics, premission coordination between supporting and supported units must firmly establish the RB on-times. To greatly reduce the possibility of detection and interference, RB operators should shield the RB in the direction of possible enemy detection equipment or use the directional antenna.

5. Weather. Weather is an important consideration when using RBs. Heavy precipitation between the aircraft or NGFS ship and the RB may attenuate the radar energy enough to prevent triggering the RB. To use RBs for operations during IMC, the RB selected must be compatible with adverse weather aircraft systems. For example, if the RB is to be the primary illuminator, airdrop operations may be prohibited unless the formation lead C-130 is equipped with an AWADS.

a. Atmospheric Conditions. Atmospheric pressure, temperature, and humidity may cause irregular bending or ducting of the radar energy needed to trigger the RB as well as the RB reply. Ducting may extend or reduce the trigger range and the RB detection range. These effects depend on terrain elevation, wind speed, time of day, and soil type, as well as temperature and humidity inversions. Trapping radar energy within a limited region of space near the earth's surface is usually rare at extreme northern or southern latitudes. However, trapping can occur 40 to 60 percent of the time in operational areas over water in the mid-latitudes and tropics. These conditions are more localized over land. Consult weather personnel for more details regarding this atmospheric phenomenon. Moisture on the RB can also affect the beacon's radio frequency energy path. Sealed unit RBs can operate in extremely moist conditions, salt air, or sea spray with little degradation.

b. Temperature Conditions. Cold weather adversely affects most electrical batteries. Therefore, RB operators must take special precautions before employing RBs in a cold weather environment. While employing the RBs in a man-portable mode, the RB operator should wrap the batteries in thermal insulating material to prolong battery output (consult operating manuals for specific details).

(1) Although cold does not damage the components of the actual RB (it may be transported or mounted in an exposed position), additional time is required for warm-up of the magnetron for the beacon to stabilize in frequency. If covert operations are desired during the warm-up period, the RB operator should shield the antenna to prevent spurious radar signals from triggering the RB.

(2) Hot weather does not significantly affect RB components; however, extremely hot weather may reduce battery life.

6. Air Threat Environment. The air threat environment is defined in terms of an assessment of the enemy's air defense capability against airborne friendly aircraft (sometimes referred to as low, medium, or high threat). The lack of interference in a low-threat environment makes it the most lucrative for flying RB missions. At the other extreme, a high-threat environment limits the use of RBs and requires extensive prior coordination and consideration of the tactics friendly aircraft employ. Employment of RBs in a high-threat environment should be made on a case-by-case basis.

7. Terrain. The terrain and its effects on radar transmission are also important for commanders and planners. They include:

a. Desert regions--desert absorbs energy of waves.

b. Polar regions--signal fading and blackouts of skywaves.

c. Jungle regions--vegetation absorbs energy of waves.

d. Mountain regions--produces poor conductivity and terrain obstacles hinder waves.

e. Urban areas--poor conductivity of paved surfaces and manmade obstacles hinder waves.

f. Water areas--absorbs and scatters waves.

8. Safety. When conducting RB missions, commanders and planners should consider the following:

a. Operational Considerations

(1) Coordination with other fire support assets.

(2) Aircrew training and proficiency in RB operations.

(3) Weapons effects.

(4) Location and offset data accuracy (range and bearing).

(5) Ingress and egress routes.

(6) Aircraft heading, altitude, airspeed, and configuration.

(7) Delivery tactics and techniques.

(8) Proximity of RB to target and objective.

(9) Target and RB elevations.

(10) Airspace control measures.

(11) Weather, both enroute and in the target area.

(12) Enemy threat.

(13) Location of friendly ground forces.

(14) RB security.

b. Equipment Operating Precautions (consult operating manuals for specific details)

(1) Dangerous voltages can exist in the RB units.

(2) Personnel could receive RF burns or other injuries if:

(a) Positioned within 1 foot of antennas when the unit is transmitting (see operating instructions for each specific device).

(b) Operating the RB if either the antenna or the waveguide switch is not installed.

(c) Battery is not vented properly.

CHAPTER IV

OFFSET AND DELIVERY PROCEDURES

1. General. To locate targets accurately, RB users must determine target range and bearing offsets from the RB and target elevation. Two methods most commonly used are discussed in this chapter. It is important for the planner and RB operator to note that aircraft use different measurement standards for offset data; NGFS ships prefer no offset data. A section on terminal, or final, control for aircraft is presented to introduce the RB operator or mission planner to aircraft data requirements. Procedures for C-130 and NGFS are also presented.

2. Offset Computation. Offset data consists of bearing (from the RB to the target), range (straight-line distance from the RB to the target), and elevation. Weapons delivery and air drops will be only as good as the accuracy of the offset data. Some methods of determining bearing, range, and elevations follow.

a. RB-to-Target Bearing. Chart legends normally describe how to determine true and/or magnetic bearing. It is important to apply the local magnetic variation, if required, to the measured bearing as depicted on the chart legend. Incorrectly adding or subtracting variation can result in significant delivery error (add west variation or subtract east variation to (from) true bearings to determine magnetic bearings). Once the bearing is determined, the compatible information (true or magnetic bearing) is provided to the weapons system supporting the mission.

b. RB-to-Target Range. RB-to-target range is determined in feet, nautical miles, or meters, depending on the RB aircraft or ship (see Appendix B). If the specified distance measurement cannot be determined, the RB operator should advise the aircraft or NGFS ship. Once the range is determined, the RB operator then provides the compatible information to the weapon system supporting the mission.

NOTE: To convert meters to feet, multiply using a factor of 3.28.

c. Elevation. The elevation of both the RB and the target are required. In all cases, measure elevations to the nearest foot above mean sea level (MSL).

d. Grid Method. Conditions may preclude attaining accurate beacon-to-target bearing and distance information. In these situations, replace the standard bearing and distance offset data with the grid location of the RB and target. Using the most accurate scale available (often 1:50,000-scale maps commonly used by ground forces), measure the location in universal transverse mercator (UTM) coordinates to at least eight places, and then convert them to latitude and longitude, if required. Coordinates should be measured to tenths or hundredths of a minute. If time and the tactical situation permit, the RB location may be determined by artillery survey team or a topographic engineer team. When available, GPS and the position location and reporting system provide an accurate means of positioning. USN, USAF, and USMC aircraft normally prefer coordinates in latitude and longitude; however, USN/USMC A-6E can use either the grid coordinate or range and bearing method.

NOTE: Crews of F-16, F-15E, and A-6E prefer coordinates expressed in degrees, minutes, and tenths of minutes vice degrees, minutes, and seconds.

Army aircraft and fire support units use UTM coordinates. Give target and RB elevation in feet above mean sea level. The CAS beacon briefing format (Appendix B, Section II) incorporates the information necessary to conduct the grid method of offset bombing.

3. Weapons Delivery Criteria

a. Beacon Offset Data. Offset data is used primarily by aircraft and not by NGFS.

(1) As discussed in Chapter III, data accuracy is critical in the effective employment of RBs. Planners should compute the required target offset data, understand different requirements for each type aircraft, and provide the proper data to the aircrew before takeoff. Passing this information to the aircraft while en route or in the target area is possible, but not desirable.

(2) When using the bearing and distance offset method, the aircrew requires the following (see Appendix B):

(a) RB to target bearing--true for F-111F, A6-E, and F-16.

NOTE: F-111A/E and F-15E require true bearing from target to RB.

(b) RB to target range--feet for A-6, F-111 and F-16. Nautical miles to the nearest tenth for F15E.

(c) RB elevation--feet MSL.

(d) Target elevation--feet MSL.

(e) RB code.

(f) RB delay--millisecond.

(g) Desired attack heading.

(3) When using the grid offset method, the minimum data are:

(a) RB grid. Provide UTM grid coordinates or latitude and longitude, as requested by aircrew.

(b) Target grid. Provide UTM grid coordinates or latitude and longitude as desired by aircrew.

(c) RB elevation (feet MSL).

(d) Target elevation (feet MSL).

(e) RB code.

b. Terminal Control

(1) General. Ideally, the RB team providing terminal control will be able to communicate with the aircrew and pass a complete target brief in accordance with CAS beacon briefing format (Appendix B). However, communications may be impossible during combat operations. Targets should only be attacked if the terminal controller, ground commander, and aircrew are certain that the attack will not inflict casualties on friendly forces. Aircrews must receive a positive clearance to attack at some point in their run. USMC aircraft will interpret the CAS beacon

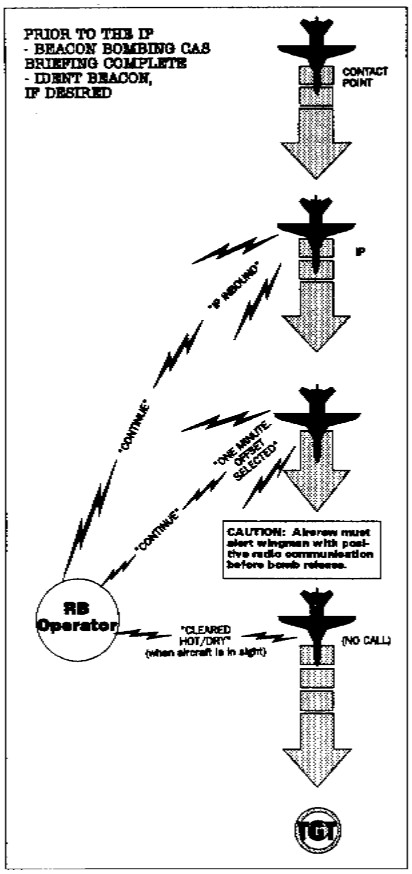
briefing as clearence to attack. Additionally, prearranged signals indicating attack abort could be indicated by a beacon code change or beacon shut down by the RB operator.

(2) Special Operations. Because of the nature of SO, terminal control may be limited or nonexistent. Because ground personnel may be required to position the RB without any direct radio contact with supporting elements, prior coordination is essential. In various situations, the communications system used may result in an inordinately long leadtime. Additionally, SO may require unconventional authentication procedures and immediate adjustments of fire and/or mission effects reporting may not be possible.

(3) Training Operations. During RB training operations, the pilot in command of each attacking aircraft must receive a "cleared hot" radio call from the terminal controller prior to releasing any weapons. Additional procedures for "no communication" practice attacks will need to be specified.

(a) To provide maximum RB training benefit and for safety purposes, the first training RB bombing run should be a dry run. This will allow the RB operator to visually check the attack heading and general drop area and enable the aircrew to check the aircraft systems before releasing any ordnance. In order for the RB operator to estimate bomb range, the aircrew can indicate the simulated release point that would have occurred had the run been live. After completing the dry run, environment permitting, drop a single bomb to check the accuracy of the offset information.

(b) For aircrew and terminal controller procedures, see Figure IV-1.



NOTES:

1/ The RB operator will make bombing corrections by adjusting the original RB offset data. Whengiving corrections, the RB operator uses the following: left or right or minus or plus in degrees and seconds, add or subtract range in feet or meters. When correcting RB-to-target bearing: left is minus, right is plus. For verification, the aircrew will read back each correction.

2/ RB operators must be knowledgeable of the type of aircraft they are controlling and the specific correction format required for that aircraft; i.e., feet vs. meters or left or right for RB to target vs. target to RB systems.

Figure IV-1. Terminal Control (Training)

4. Other Delivery Procedures

a. Airdrop. Aircrews using the RB as a terminal reference, with some restrictions, can successfully perform airdrop missions. However, this method is not normally practiced. The navigator receives the RB signal on the aircraft radar and provides headings for the pilots to fly to the release point. Using this airdrop method, airlift aircraft fly directly to the RB. Using offset procedures is also possible, but doing so would significantly degrade airdrop accuracy. For IMC operations:

(1) C-130 airdrops require aircraft equipped with either the AWADS, the self-contained navigation system used with a zone marker, or an RB.

(2) C-141 airdrops require an AN/TPN-27 (zone marker) or an RB.

(3) Formation airdrops require aircraft equipped with SKE.

b. AC-130 Gunship. The identification of friendly positions is the primary concern in any AC-130 gunship operation with ground troops. Beacon operations are ideal for this purpose, especially during adverse weather. Once the friendly position is identified, ground personnel provide RB offset range in meters and magnetic bearing to the target. The aircrew will move their airborne sensor to the defined area. If the target cannot be identified, the crew will fire a marking round, and ground personnel will correct the fire. The correction will be given in meters and cardinal direction from the round impact point. This allows the crew to update the offset information in the onboard computer. An alternate method would be to provide a new range and bearing from the RB site.

c. Naval Gunfire Support. The three naval gunfire control methods for radar beacons are ALPHA, ALPHA modified, and BRAVO. NGFS ships do not use offset data as their primary procedure (known as ALFA method). RBs are primarily used as a navigation aid for ships to determine their relative positions. Other procedures are available that express target location as offsets in bearing and range from the beacon to target. The NGFS ship selects the best method, considering ship position, target position, and whether the beacon position is known.

(1) ALPHA Method. Use when the exact location of the RB is known (ATO or RB team information). For this method, use the beacon simply as a relative navigation aid to determine ship's position. The target is the point of aim and is engaged as in a simple indirect fire mission. Express target data in UTM grid coordinates and include the map datum base.

(2) ALPHA Modified Method. May be used whether or not RB location is known. This method provides the advantage of speed and accuracy over the other methods. The target location is given in polar coordinates from the RB. To engage the target, the ship plots its own and the target's position, relative to the RB.

(3) BRAVO Method. May be used whether or not RB location is known. Express the target location in polar coordinates from the RB. RB location is the point of aim and offsets are introduced into the naval gunfire computer to lay the gun on target.

5. Communications

a. Following proper operational and communications security procedures is the primary defense against enemy meaconing attempts. Shielding the RB transmissions and using directional antennas will significantly hamper enemy attempts to gather the information needed to meacon the attacking aircraft away from the target. Aircraft-to-ground communications are also susceptible because standard radio calls and call signs are easy to exploit by the enemy. This is minimized because RBs are placed relatively close to target areas precluding pre-drop communication lead time of more than 1 minute.

b. Authentication. During RB missions use proper joint authentication procedures. Because Service authentication tables differ, each air, land, and sea element must obtain a joint authenticator through unit communications security custodians. RB training exercises should utilize appropriate joint training authenticators.

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APPENDIX A

RADAR BEACON CHARACTERISTICS AND COMPATIBILITY

This appendix outlines the characteristics of each radar beacon by type, assigns compatibility codes to each beacon type, and provides a quick reference to compatability comparisons.

Table A-1. Radar Bacon Characteristics

Table A-1. Radar Beacon Characteristics

TRANSPONDER	SIZE L	SIZE W	SIZE H	SIZE WT	XMTR POWER WATTS	BATTERY	QTY	WT (LB)	VOLTS	COMPATI-BILITY CODES	ANTENNA OMNI	ANTENNA DIR
PRD-7880	8.0	3.4	3.0	2.8	(CLAS)	K308A	1	(INC)	16	C	✓	
AN/PPN-18	11.2	4.5	5.2	10.0	500	BB-451	1	16	24-31	A	✓	
PPN-19	12.7	4.7	8.0	17.0	200	BA-5590	2	5	17-30	A	✓	✓
						or				B	✓	✓
						BA-590	2	6		F	✓	✓
										D(GAR-I)		✓
SST-122	11.2	4.4	3.1	6.0	600	BB-451	1	16	24-31	A		✓
ST-124 1/	8.0	4.2	2.5	4.5	300	BA-3515 or	1	5	22-33	D		✓
						BA-4386 or	2	6				
GAR-I						60-26511L	1	5				
SST-181XE	3.9	3.4	2.9	3.3	400	(OPT)			24-31	B	✓	✓
SST 201X	3.0	1.5	5.0	1.75	5	60-PO4902A001	1	1.25	7-25	B	✓	✓
TPN-23	5.5	5.5	21.2	24.0	200	(OPT)			16-29	A	✓	
										B	✓	
TPN-26	10.5	6.5	17.2	24.0	200	(OPT)			20-30	A	✓	
										B	✓	
TPN-27	21.0	8.0	12.0	30.0	1000	BB-451	1	16	22-31	E	✓	
TPN-27A	21.0	8.0	12.0	30.0	1000	BB-451	1	16	22-31	E	✓	
UPN-25	4.0	4.0	13.0	5.0	400	(OPT)			24-31	B	✓	
UPN-32	12.5	4.2	3.5	4.9	400	(OPT)			24-31	B	✓	
										F	✓	
UPN-34	4.9	6.9	11.5	7.5	500	BA-1509	1	(INC)	24-31	B	✓	

NOTES

1/ The SST-124 transponder has four code switches which can be turned off or on to any combination to provide 16 codes having one to four pulses with a variety of spacings.

KEY

(GAR-I) . . . . The Ground to Air Responder-Interrogator is a special cross band transponder that receives K-band and transmits on I-Band.

(CLAS) . . . . .Classified Information.

(INC) . . . . .Included in basic weight.

(OPT) . . . . .OPTIONAL - Often a BB-451 or two auto batteries (in series) are used. Any 24VDC, 1.5 Amp source will suffice.

WEIGHT . . . . . . .In pounds.

XMTR Power . . .Nominal transmitter output power.

Table A-2. Radar Beacon Compatibility Codes

Table A-2. Radar Beacon Compatibility Codes

AIRCRAFT CODES					
A	B	C	D	E	F
A-6	AC-130	AC-130	MC-130C	C-130	
A-7	B-1			C-141	
F-111	B-52				
MH-53	C-17				
	C-130				
	C-141				
	E-2				
	E-3				
	E-4				
	E-6				
	F-14				
	F-15				
	F-16				
	MH-53				
	MH-60				
	MC-130				
	V-22				

SHIPS CODE F
CRUISERS (CG/CGN)
Belknap Class (CG-26)
Josephus Daniels Class (CG-27 to CG-34)
Ticonderoga Class (CG-47 to CG-58)
Truxton Class (CGN-35)
California Class (CGN-36 to CGN-37)
Virginia Class (CGN-38 to CGN-41)
DESTROYERS (DD)
Spruance Class (DD-963 to DD-992 and DD-997)
DESTROYERS GUIDED MISSILE (DDG)
Farragut Class (DDG-37 to DDG-46)
Kidd Class (DDG-993 to DDG-996)
Arleigh Burke Class (DDG-51)
FRIGATES (FF)
Knox Class (FF-1097)
AMPHIBIOUS ASSAULT SHIPS (LHA)
Tarawa Class (LHA-1 to LHA5)
Wasp Class (LHD-1)

NOTE: THE FOLLOWING AIRCRAFT HAVE NO KNOWN GROUND RADAR BEACON CAPABILITY:
E-8 (JOINT STARS), F-117, C5B, HC-130 P/N, AND KC-130

Table A-3. Quick Reference Compatibility Comparisons

Table A-3. Quick Reference Compatibility Comparisons

	BEACON										
AIRCRAFT	AN/PPN-18 SST-122	AN/PPN-18A SST-122MOD	UPN-25 UPN-32 UPN-34	SST-181-XE	AN/TPN-23 AN/TPN-26	AN/TPN-23 AN/TPN-26 MODIFIED	AN/ TPN-27 TPN-27A	SST-201X MINI PONDER	SST-124 GAR-I	PRD-7880	AN/ PPN-19
A-6E	✓	✓			✓	✓					✓
A-7D		✓			✓						✓
AC-130H			✓	✓	✓	✓		✓		✓	✓
B-1B			✓	✓	✓	✓		✓			✓
B-52G,H			✓	✓	✓	✓		✓			✓
C-17			✓	✓ 1/				✓			✓ 1/
C-130E,H			✓	✓	✓	✓	✓	✓			✓
C-141B			✓	✓	✓	✓	✓	✓			✓
F-4E			✓	✓	✓	✓		✓			✓
F-15			✓	✓	✓	✓		✓			✓
F-16			✓	✓	✓			✓			✓
F-111A/E	✓	✓				✓					✓
F-111F		✓			✓						✓
MC-130E/H									✓		✓
MH-53J	✓										✓
MH-60G			✓	✓	✓	✓					✓
SHIPS 2/											✓

1/ NOT COMPATIBLE WITH ALL CODES
2/ ALL EXCEPT FOR THE ARLEIGH BURKE CLASS

APPENDIX B

SECTION I

CLOSE AIR SUPPORT BEACON BRIEF (GIVEN TO THE AIRCRAFT)

(Aircraft Call Sign) This is (your call sign) CAS Briefing as follows:

1. Initial Point (IP): "__________________________________."

2. Heading: "____________________." (magnetic)
   (IP to target (TGT)
   "offset_____________________________________."
   (left/right)

3. Distance (IP to TGT): "________________"(nautical miles).

4. Target Elevation: "___________________" (feet-MSL).

5. Target Description: "_________________________________."

6. Target Location: "_____________________________________"
   (LATitude & LONGitude or UTM or offsets or visual).

7. Type Mark: "_________________" Code: "________________"
   (WP, beacon, laser) (beacon, laser)

8. Location of Friendlies: "______________________________."

9. Egress: "____."

NOTE: For beacon bombing, insert line numbers from SECTION II, Appendix B, here.

Time on Target: "TOT _______________" or Time to Target (TTT):
"Stand by ________(min) plus __________(sec) hack."

Omit data not required. Line numbers are not transmitted. Units of measure are standard unless otherwise specified. (USMC aircraft will interpret transmission of this briefing as a clearance to attack.)

BASIS: FM 90-20/FMFRP 2-72/TACP 50-28/USAFEP 50-9/PACAFP 50-28, Multi-service Procedures for the Joint Application of Firepower (J-FIRE).

SECTION II

BEACON BOMBING CHART

Different aircraft require different information for beacon bombing. Select the appropriate line numbers. Transmit only after confirming aircraft type. Follow this information with remarks, TOT, or TTT. F-111 A/E requires lines 10 and 11. F-111 F requires lines 14, 15, and 16 plus either lines 10 and 11 or lines 12 and 13.

USN A-6 Line Numbers

10. "Bearing _________________________" (magnetic) or
(RB to TGT)
"Beacon Grid _____________________" (UTM grid).

11. "Range ______________________________" (meter) or
(RB to TGT)
Target Grid "_______________________."
(UTM grid)

12. "Beacon Elevation ______________________" (feet-MSL).

****

F-111 Line Numbers

10. "Bearing _____________________________________" (true)
(RB to TGT for F-111F) (TGT to RB for F-111A/E).

11. "Range ________________________________" (feet for F-111, NM to nearest tenth for F-15E).

12. "Beacon Grid _________________" (LATitude/LONGitude).

13. "Target Grid ____________________" (LATitude/LONGitude).

14. "Beacon Delay ____________________________"(milliseconds).

15. "Beacon elevation ________________________" (feet MSL).

16. "Target elevation _______________________" (feet MSL).

BASIS: FM 90-20/FMFRP 2-72/TACP 50-28/USAFEP 50-9/PACAFP 50-28, Multi-service Procedures for the Joint Application of Firepower (J-FIRE)

APPENDIX B

BEACON BOMBING CHART (Cont'd)

F-15E Line Numbers

10. "Bearing ____________________________________" (true).
(TGT to beacon)

11. "Range ____________________________________" (nautical miles to nearest tenth).

12. "Beacon Elevation _______________" (Feet-MSL).

13. "Target Elevation ________________"(Feet-MSL).

****

F-16 Line Numbers

10. "Bearing ____________________________________" (true).
(beacon to TGT)

11. "Range ______________________________________" (feet).
(beacon to TGT)

12. "Beacon Elevation _______________" (Feet-MSL).

13. "Target Elevation ________________"(Feet-MSL).

14. "Beacon Time Delay _________________" (Milliseconds).

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APPENDIX C

REFERENCES

Joint Publications

1. Joint Pub 1-02, "DOD Dictionary of Military and Associated Terms."

2. Joint Pub 3-05.3, "Joint Special Operations Operational Procedures."

3. Joint Pub 3-09, "Doctrine for Joint Fire Support."

Multi-Service Publications

4. FM 90-20/FMFRP 2-72/TACP 50-28/USAFEP 50-9/PACAFP 50-28, "Multi-Service Procedures for the Joint Application of Firepower."

5. JTC3AH 9000/DA PAM 25-7/OPNAV-P-942-1-86/AFP 102-2 Vol I/NAVMC 2800, "Joint User Handbook for Message Text Formats (JUH-MTF)."

Navy Publications

6. NSW TACMEMO 2080-5-89.

7. NWP 22-2, "Supporting Arms in Amphibious Operations."

Marine Publications

8. FMFM 1-7, "Support Arms in Amphibious Operations."

9. FMFM 5-3, "Assault Support."

10. FMFM 5-41, "Close Air Support and Close In Fire Support."

Air Force Publications

11. MCM 3-1, "Mission Employment Tactics."

12. MACR/AMCR 55 Series, "Airlift Operations."

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APPENDIX D

USERS EVALUATION REPORT
ON JOINT PUB 3-09.2

1. Users in the field are highly encouraged to directly submit comments on this pub. Please fill out and send in the following: Users' POC, unit address, and phone (DSN) number.

2. Content

a. Does the pub provide a conceptual framework for the topic?

b. Is the information provided accurate? What needs to be updated?

c. Is the information provided useful? If not, how can it be improved?

d. Is this pub consistent with other joint pubs?

e. Can this pub be better organized for the best understanding of the doctrine and/or JTTP? How?

3. Writing and Appearance

a. Where does the pub need some revision to make the writing clear and concise? What words would you use?

b. Are the charts and figures clear and understandable? How would you revise them?

4. Recommended urgent change(s) (if any).

5. Other

6. Please fold and mail comments to the Joint Doctrine Center (additional pages may be attached if desired) or FAX to DSN 564-3990 or COMM (804) 444-3990.

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(FOLD)

GLOSSARY

PART I--ACRONYMS AND ABBREVIATIONS

ACC	Air Combat Command
ACE	aviation combat element
AFR	Air Force regulation
AFSOCC	Air Force special operations control center
AFSOF	Air Force special operations force
AGL	above ground level
ALO	air liaison officer
AMC	Air Mobility Command
AME	Air Mobility Unit
ANGLICO	air and gunfire liaison company
AO	air officer
AOC	air operations center (USAF)
AOR	area of responsibility
ARSOF	Army special operations force
ASOC	air support operations center
ATO	air tasking order
AWADS	adverse weather aerial delivery system
C2	command and control
CAS	close air support
CATF	commander, amphibious task force
CCT	combat control team
CLF	commander, landing force
COCOM	combatant command authority
DASC	direct air support center
DZST	drop zone support team
ETAC	emergency tactical air control
EZ	extraction zone
FAC	forward air controller
FCT	fire power control team (USMC)
FIST	fire support team (Army)
FM	field manual
FMFM	Fleet Marine Force manual
FMFRP	Fleet Marine Force reference publication
FSCC	fire support coordination center
G3	operations officer
GCE	ground combat element
GPS	global positioning system
INS	inertial navigation system
IP	initial point
IGPS	global positioning system

INS	inertial navigation system
IP	initial point
IMC	instrument meteorological conditions
JFACC	joint force air component commander
JFSOCC	joint force special operations component commander
JTF	joint task force
JTTP	joint tactics, techniques, and procedures
JOC	Joint Operations Center
LF	landing force
LOS	line of sight
MACCS	Marine Air Command and Control System
MAGTF	Marine Air-Ground Task Force
MEB	Marine Expeditionary Brigade
MEF	Marine Expeditionary Force
MEU	Marine Expeditionary Unit
MSL	mean sea level
NAVSOF	Navy special operations force
NGFS	naval gunfire support
NSFS	naval surface fire support
NSW	naval special warfare
NTACS	Navy tactical air control system
OPCON	operational control
RABFAC	radar beacon forward air controller
RB	radar beacon
RF	radio frequency
SACC	supporting arms coordination center
SEAL	sea-air-land team
SKE	station keeping equipment
SO	special operations
SOC	special operations command
SOF	special operations forces
STT	special tactics team
TACC	tactical air command center (USMC); tactical air control center (USN); tanker/airlift control center (USAF)
TACP	tactical air control party
TALO	theater airlift liaison officer
TGT	target
TOT	time on target
TRADOC	United States Army Training and Doctrine Command

TTT	time to target
USAF	US Air Force
USAFE	US Air Forces Europe
USAFEP	US Air Forces Europe pamphlet
USMC	US Marine Corps
USN	US Navy
UTM	universal transverse mercator

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PART II--TERMS AND DEFINITIONS

adverse weather. Weather in which military operations are generally restricted or impeded. (Joint Pub 1-02)

adverse weather aerial delivery system.* The precise delivery of personnel, equipment, and supplies during adverse weather, using a self-contained aircraft instrumentation system without artificial ground assistance, or the use of ground navigational aids. This system may be used with or without radar beacons. Capability exists on a limited number of C-l30 aircraft. Also called AWADS.

airdrop. The unloading of personnel or materiel from aircraft in flight. (Joint Pub 1-02)

Air Force special operations control center.* An Air Force operations center where detailed planning, coordination, and tasking for airborne phases of special operations occur.

air interdiction. Air operations conducted to destroy, neutralize, or delay the enemy's military potential before it can be brought to bear effectively against freindly forces at such distance from friendly forces that detailed integration of each air mission with the fire and movement of friendly is not required. (Joint Pub 1-02)

air liaison officer. An officer (aviator/pilot) attached to a ground unit who functions as the primary advisor to the ground commander on air operation matters. (Joint Pub 1-02)

assault airland.* Theater airlift aircraft operating into small airfields or landing zones.

attack heading. 1. The interceptor heading during the attack phase that will achieve the desired track-crossing angle. 2. The assigned magnetic compass heading to be flown by aircraft during the delivery phase of an air strike. (Joint Pub 1-02).

authenticate. A challenge given by voice or electrical means to attest to the authenticity of a message or transmission. (Joint Pub 1-02)

beacon. A light or electronic source which emits a distinctive or characteristic signal used for the determination of bearings, courses, or location. (Joint Pub 1-02) bearing. The horizontal angle at a given point measured clockwise from a specific datum to a second point. (Joint Pub 1-02)

bombing run. In air bombing, that part of the flight that begins, normally from an initial point, with the approach to the target, includes target acquisition, and ends normally at the weapon release point. (Joint Pub 1-02)

close air support. Air action 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. (Joint Pub 1-02)

combat control team. A team of Air Force personnel organized, trained, and equipped to establish and operate navigational or terminal guidance aids, communications, and aircraft control facilities within the objective area of an airborne operation. (Joint Pub 1-02)

contact point. l. In land warfare, a point on the terrain, easily identifiable, where two or more units are required to make contact. 2. In air operations, the position at which a mission leader makes radio contact with an air control agency. (Joint Pub 1-02)

control and reporting center. An element of the US Air Force tactical air control system, subordinate to the tactical air control center, from which radar control and warning orpeartions are conducted within its area of responsibility. (Joint Pub 1-02)

correction. 1. In fire control, any change in firing data to bring the mean point of impact or burst closer to the target. 2. A communication proword to indicate that an error in data has been announced and that corrected data will follow. (Joint Pub 1-02)

datum.* (Mapping) A reference element, such as a line or plane, by reference to which the other elements are determined. The point of origin and orientation on the ellipsoid for a specific set of survey control.

direct air support center. A subordinate operational component of a tactical air control system designed for control and direction of close air support and other tactical air support operations, and normally collocated with fire-support coordination elements. (Joint Pub 1-02) drop zone. A specific area upon which airborne troops, equipment, or supplies are airdropped. (Joint Pub 1-02)

dummy run. Any simulated firing practice, particularly a dive bombing approach made without release of a bomb. Same as "dry run." (Joint Pub 1-02)

extraction zone. A specified drop zone used for the delivery of supplies and/or equipment by means of an extraction technique from an aircraft flying very close to the ground. (Joint Pub 1-02)

fire support coordination center. A single location in which are centralized communications facilities and personnel incident to the coordination of all forms of fire support. (Joint Pub 1-02)

flight. l. In Navy and Marine Corps usage, a specified group of aircraft usually engaged in a common mission. 2. The basic tactical unit in the Air Force, consisting of four or more aircraft in two or more elements. 3. A single aircraft airborne on a nonoperational mission. (Joint Pub 1-02)

forward air controller. An officer (aviator/pilot) member of the tactical air control party who, from a forward ground or airborne position, controls aircraft in close air support of ground troops. (Joint Pub 1-02)

forward air control post. A highly mobile US Air Force tactical air control system radar facility subordinate to the control and reporting center and/or post used to extend radar coverage and control in the forward combat area. (Joint Pub 1-02)

initial point. 1. The first point at which a moving target is located on a plotting board. 2. A well-defined point, easily distinguishable visually and/or electronically, used as a starting point for the bomb run to the target. 3. airborne--A point close to the landing area where serials (troop carrier air formations) make final alterations in course to pass over individual drop or landing zones. 4. helicopter--An air control point in the vicinity of the landing zone from which individual flights of helicopters are directed to their prescribed landing sites. 5. Any designated place at which a column or element thereof is formed by the successive arrival of its various subdivisions and comes under the control of the commander ordering the move. (Joint Pub 1-02) landing zone. Any specified zone used for the landing of aircraft. (Joint Pub 1-02)

mark. 1. In artillery and naval gunfire support: a. to call for fire on a specified location in order to orient the observer/spotter or to indicate targets; b. to report the instant of optimum light on the target produced by illumination shells. 2. In naval operations, to use a maritime unit to maintain an immediate offensive or obstructive capability against a specified target. (Joint Pub 1-02)

meaconing. A system of receiving radio beacon signals and rebroadcasting them on the same frequency to confuse navigation. The meaconing stations cause inaccurate bearings to be obtained by aircraft or ground stations. (Joint Pub 1-02)

naval gunfire support.** Fire provided by Navy surface gun systems in support of a unit or units tasked with achieving the commander's objectives. A subset of naval surface fire support. Also called NGFS.

naval surface fire support. Fire provided by Navy surface gun, missile, and electronic warfare systems in support of a unit or units tasked with achieving the commander's objectives. Also called NSFS. (Identified in Joint Pub 3-02, Final Draft, as a proposed term and definition for Joint Pub 1-02.)

offset bombing. Any bombing procedure which employs a reference or aiming point other than the actual target. (Joint Pub 1-02)

point of impact. 1. The point on the drop zone where the first parachutist or air dropped cargo item lands or is expected to land. 2. The point at which a projectile, bomb, or re-entry vehicle impacts or is expected to impact.(Joint Pub 1-02)

point target. 1. A target of such small dimension that it requires the accurate placement of ordnance in order to neutralize or destroy it. 2. nuclear--A target in which the ratio of radius of damage to target radius is equal to or greater than 5. (Joint Pub 1-02)

radar beacon. A receiver-transmitter combination which sends out a coded signal when triggered by the proper type of pulse, enabling determination of range and bearing information by the interrogating station or aircraft. (Joint Pub 1-02) recovery zone. A designated geographic area from which special operations forces can be exfiltrated by air, boat, or other means. Also called RZ. (Identified in Joint Pub 3-05.5, as a proposed term and definition for Joint Pub 1-02.)

self-contained navigation system.* An integrated navigation and radio control system which provides the crew with three independent navigation solutions. Also called SCNS.

shore fire control party. A specially trained unit for control of naval gunfire in support of troops ashore, consisting of a spotting team to adjust fire and a naval gunfire liaison team to perform liaison functions for the supported battalion commander. (Joint Pub 1-02)

special tactics team. An Air Force team composed primarily of special operations combat control and pararescue personnel. The task of the team is to support joint special operations air and ground/maritime missions by selecting, surveying, and establishing assault zones; providing assault zone terminal guidance and air traffic control; conducting direct action and personnel recovery missions; providing medical care and evacuation; and coordinating, planning, and conducting air, ground, and naval fire support operations.
(Identified in Joint Pub 3-05, Test Pub, as a proposed term and definition for Joint Pub 1-02.)

spot. 1. To determine by observation, deviations of ordnance from the target for the purpose of supplying necessary information for the adjustment of fire. 2. To place in a proper location. (Joint Pub 1-02)

supporting arms coordination center. A single location on board an amphibious command ship in which all communication facilities incident to the coordination of fire support of the artillery, air, and naval gunfire are centralized. This is the naval counterpart to the fire support coordination center utilized by the landing force. (Joint Pub 1-02)

suppression of enemy air defenses. That activity which neutralizes, destroys or temporarily degrades enemy air defenses in a specific area by physical attack and/or electronic warfare. (Joint Pub 1-02)

tactical air command center. The principal United States Marine Corps air operation installation from which aircraft and air warning functions of tactical air operations are directed. It is the senior agency of the Marine Corps Air Command and Control System from which the Marine Corps tactical air commander can direct and control tactical air operations and coordinate such air operations with other Services. (Joint Pub 1-02)

tactical air control center. The principal air operations installation (land or ship based) from which all aircraft and air warning functions of tactical air operations are controlled. (Joint Pub 1-02)

tactical air control party. A subordinate operational component of a tactical air control system designed to provide air liaison to land forces and for the control of aircraft. (Joint Pub 1-02)

theater airlift liaison officer.* Air Mobility Command airlift representative assigned to an Army unit to advise the Army commander, staff, and senior air liaison officer on the capabilities, limitations, and use of AMC airlift resources.

time on target. l. Time at which aircraft are scheduled to attack/photograph the target. 2. The actual time at which aircraft attack/photograph the target. 3. The time at which a nuclear detonation is planned at a specified desired ground zero. (Joint Pub 1-02)

wing. l. An Air Force unit normally composed of one primary mission group and the necessary supporting organizations, i.e., organizations designed to render supply, maintenance, hospitalization, and other services required by the primary mission groups. Primary mission groups may be functional, such as combat, training, transport, or service. 2. A fleet air wing is the basic organizational and administrative unit for naval-, land-, and tender-based aviation. Such wings are mobile units to which are assigned aircraft squadrons and tenders for administrative organization control. 3. A balanced Marine Corps task organization of aircraft groups/squadrons together with appropriate command, air control, administrative, service, and maintenance units. A standard Marine Corps aircraft wing contains the aviation elements normally required for the air support of a Marine division. 4. A flank unit; that part of a military force to the right or left of the main body. (Joint Pub 1-02) zone marker.* A portable, self-contained, ground-based radar set that operates in conjunction with airborne-enhanced station-keeping equipped aircraft. It serves as a groundbased marker used to guide aircraft up to 20 miles to a drop zone for precise air delivery of cargo and personnel.

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* This term and definition are applicable only in the context of this pub and connot be referenced outside this publication.

** Upon approval of this publication, this term and definition will be included in Joint Pub 1-02.

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