NATO STANDARD

ATP-91

IDENTIFICATION OF LAND FORCES ON THE BATTLEFIELD AND IN AN AREA OF OPERATION

Edition A Version 1

MARCH 2015

NORTH ATLANTIC TREATY ORGANIZATION

ALLIED TACTICAL PUBLICATION

Published by the
NATO STANDARDIZATION OFFICE (NSO)

INTENTIONALLY BLANK

NORTH ATLANTIC TREATY ORGANIZATION (NATO)

NATO STANDARDIZATION OFFICE (NSO)

NATO LETTER OF PROMULGATION

2 March 2015

1. The enclosed Allied Tactical Publication ATP-91, Edition A, Version 1, IDENTIFICATION OF LAND FORCES ON THE BATTLEFIELD AND IN AN AREA OF OPERATION, which has been approved by the nations in the MCLSB, is promulgated herewith. The agreement of nations to use this publication is recorded in STANAG 2129.

2. ATP-91, Edition A, Version 1, is effective upon receipt.

4. This publication shall be handled in accordance with C-M(2002)60.

Edvardas MAŽEIKIS
Major General, LTUAF
Director, NATO Standardization Office

INTENTIONALLY BLANK

RESERVED FOR NATIONAL LETTER OF PROMULGATION

INTENTIONALLY BLANK

RECORD OF RESERVATIONS

CHAPTER	RECORD OF RESERVATION BY NATIONS
Note: The reservations listed on this page include only those that were recorded at time of promulgation and may not be complete. Refer to the NATO Standardization Document Database for the complete list of existing reservations.	

INTENTIONALLY BLANK

RECORD OF SPECIFIC RESERVATIONS

[nation]	[detail of reservation]
Note: The reservations listed on this page include only those that were recorded at time of promulgation and may not be complete. Refer to the NATO Standardization Document Database for the complete list of existing reservations.	

INTENTIONALLY BLANK

TABLE OF CONTENTS

INTENTIONALLY BLANK

CHAPTER 1 IDENTIFICATION OF LAND FORCES

1.1. GENERAL

1.1.1. Aim

The aim of this publication is to standardize the procedures and combat identification (CID) devices to be used by NATO forces to enable them to identify each other as friendly on the battlefield and in an area of operation.

1.1.2. Agreement

Participating nations agree that NATO forces are to use the procedures described in this publication, and employ combat identification capabilities that meet the minimum standard as detailed in Chapter 3 to this publication.

1.1.3. Related Documents

The following documents should be studied in conjunction with this STANAG and publication:

a. STANAG 2020 - OPERATIONAL SITUATION REPORTS

b. ATP-3.2.2 - COMMAND AND CONTROL OF ALLIED LAND FORCES

c. AJP 3.2 - ALLIED JOINT DOCTRINE FOR LAND OPERATIONS

d. ATP 3.3.2.1 - TACTICS, TECHNIQUES AND PROCEDURES FOR CLOSE AIR SUPPORT AND AIR INTERDICTION

e. AAP-06(2014) - NATO GLOSSARY OF TERMS AND DEFINITIONS (ENGLISH AND FRENCH)

1.2. DEFINITIONS

The following terms and definitions are used for the purposes of this document and combat identification:

a. Combat identification. The use of identification measures to reduce friendly fire and increase the operational effectiveness of forces and weapon systems. [AAP-06];

b. Identification. The process of attaining an accurate characterization of a detected entity by any act or means so that high confidence real-time decisions, including weapons engagement, can be made. [AAP-06];

c. Target identification. This term is not defined within AAP-06; however, it is a commonly used term that can be deemed to be synonymous with identification. The purpose of target identification is to identify an entity in the battlespace as friendly, enemy, neutral or non-combatant.

d. Battlespace. The environment, factors and conditions that must be understood to apply combat power, protect a force or complete a mission successfully.
Note: It includes the land, maritime, air and space environments; the enemy and friendly forces present therein; facilities; terrestrial and space weather; health hazards; terrain; the electromagnetic spectrum; and the information environment in the joint operations area and other areas of interest. [AAP-06];

e. Battlespace awareness.
Preferred term: situational awareness. [AAP-06];

f. Situational awareness. The knowledge of the elements in the battlespace necessary to make well-informed decisions. [AAP-06].

1.3. REQUIREMENT AND METHODS FOR THE IDENTIFICATION OF LAND FORCES

1.3.1 General

The problems of recognising forces on the battlefield or in an area of operations will be overcome by a combination of control procedures, battlespace awareness, technical means and effective training. Because difficulties in recognising forces increase with greater distances, complex terrain and reduced visibility, the principle means of preventing misidentification and fratricide, especially above the unit level, will be through effective command and control measures. The aim of combat identification is to build upon doctrine, training, and rules of engagement by optimizing battlespace awareness and identification techniques, capabilities and devices to increase combat effectiveness and, as a result, limit fratricide incidents.

1.3.2 Identification of Friendly Forces

1. Friendly land forces identify themselves on the battlefield by establishing liaison (in accordance with ATP-3.2.2) and by the use of the following control methods and procedures:

a. Battlespace Responsibilities. Command and control measures will often be exercised through the use of organizational lines. These include:

(1) Forward Line of Own Troops (FLOT);

(2) fire support coordination measures;

(3) airspace coordination measures;

(4) phase lines; and,

(5) boundaries, sectors and areas.

b. Manual and Automatic Challenge and Reply Systems. These types of systems require an interrogator, i.e. the person or entity issuing the challenge, and the responder, i.e. the person(s) or entity replying, whose response would indicate affiliation as either friendly or unknown. Challenge and reply systems include the following methods:

(1) Non-Verbal. Non-verbal methods of challenging and replying include:

(a) use of coloured smoke, lights, pyrotechnics, panels or other signals;

(b) electronic methods, including radio calls on stipulated frequencies; and,

(c) electro-optical methods, including lasers.

.

(2) Verbal. The method of challenging to be used by guards and sentries is at Chapter 2.

c. Training. The successful use of the combat identification capabilities described in this standard is predicated on relevant training by users and operators. Recognition training has been determined to be a key area in regard to improving combat identification. Training systems, methods and standards vary within the NATO nations but there is consensus that this training is important for effective military operations. Essential to identification is the sharing of vehicle, equipment and soldier characteristics amongst NATO forces. Nations employ various identification and vehicle recognition methods to inform pre-deployment training. The sharing of operation-specific information should occur during force generation and throughout the conduct of the operation. The foundation for in-theatre training is derived from the minimum combat identification standard employed on operations, as designated by the appropriate commander.

d. Battlespace Management Systems. Battlespace awareness, or situational awareness, has been recognized as a key element in the effective employment of forces on the battlefield. Critical to fratricide avoidance is knowledge of friendly force locations and activities. Various methods are employed to plot required battlespace information, ranging from hand-drawn to automated and networked computer-based systems. Consideration must be given to the time difference between receipt of the information and the plotting and display of it. As progress is made towards a truly networked battlespace awareness system, the risks associated with lapsed information will diminish. Any changes to existing fire or manoeuvre control measures to support automated systems should keep the intent of this doctrine in consideration.

2. Identification Features and Signals. Identification of friendly forces may be established and recognition effected through a number of means. The effectiveness of these means is directly related to the training commanders and soldiers receive prior to operations. These means include the following:

a. Appearance of Personnel and Equipment. Appearance is enhanced through the silhouette, colour, markings, lay-out and general visual effect of elements conforming to prescribed arrangements.

b. Behaviour. Direction and manner of movement, speed, use of armament, orientation of armament and type of formation will assist in the recognition of friendly forces. Identification or recognition by behaviour requires a good tactical knowledge of the current situation. This will include knowledge of the movement plan of friendly forces.

c. Time. The age of the information can aid in assessing risk associated with making decisions that may impact upon friendly forces; the younger the information, the more likely it is that the information is more accurate, while the converse is true and accuracy of location must be considered in conjunction with other factors. Determining whether forces have crossed a designated position at a specified time will assist in identification.

d. Sound. The distinct audio characteristics of certain weapons and equipment will aid in recognition and identification.

e. Electronic Emissions. Electronic systems can in some instances recognize or identify electronic emissions as being friendly (especially radar equipment).

f. Infrared (IR) Spectrum. Recognition and identification can be aided by the exploitation of near, mid and far IR radiation. Image intensifying devices (e.g. night vision goggles) exploit Near-IR radiation, but are

only able to operate during darkness. Thermal imagery devices exploit Mid- and Far-IR radiation and are able to operate both day and night. Examples of combat identification capabilities and devices that exploit the IR spectrum can be found at Chapter 3.

g. Signals. Prescribed recognition signals will assist in the identification of friendly forces. This will include the use of:

(1) Any type of signal used in accordance with a prescribed plan or key; and

(2) The correct use of the challenge and reply (Chapter 2).

h. Position. The knowledge of the location of friendly forces or elements in reference to clearly recognised terrain features and the limits of prescribed operating areas for specific friendly elements will assist in fratricide avoidance. Fire support co-ordination measures (e.g. fire support coordination line (FSCL)) and artificial landmarks can be used for the recognition and identification of ground elements. Ground elements are responsible for the display of artificial ground landmarks for recognition and identification by air elements, after coordination of time and place with air commanders. Recognition of a unit designated by position and track may be determined by its coincidence, or the coincidence of its radar plot with:

(1) A position received by a situation report (SITREP);

(2) The reported position of a unit designated as friendly or hostile by a competent authority; and

(3) Knowledge of friendly and enemy tactical boundaries and positions.

i. Ground/Air Marking Panels. Fluorescent marking panels may be used, subject to limitations imposed by topography or possible enemy identification. Where such panels are used, they should be oriented to provide maximum visibility for the friendly attacking air forces/crews or for transiting ground forces. See Chapter 3.

3. Limitations. Recognition and identification signals have certain limitations that are linked to human factors and technology failure. These limitations include:

a. Friendly personnel may not, in all instances, know the current reply to a challenge.

b. Recognition signaling equipment may fail.

c. Identification devices require a degree of maintenance and cleanliness to ensure visibility and recognition.

d. The failure to give a correct reply to a challenge (be it visual, verbal or electronic) must not be taken as proof of enemy character. Neutral or non-combatant elements on the battlefield, such as civilians or representatives of a non-governmental organization (NGO), will not be equipped with recognition devices and will not know passwords or other signals. As well, the reply may not be known to some friendly troops.

e. Signals may become known to the enemy and identification devices imitated by the enemy. Such devices and signals are therefore to be regarded as evidence but never as proof of friendly character.

f. Some methods are not effective by day, or by night, or in conditions of poor visibility. It is important to understand the limitations of combat identification capabilities and devices and provide alternative means to mitigate these limitations.

4. Additional Considerations. Other procedures and considerations to aid in the identification of friendly forces are as follows:

a. To lessen the risk of compromise, challenges and replies must be changed periodically and only distributed on a need-to-know basis. Challenges and replies and their alternates are usually issued on a daily basis through the chain of command.

b. Challenges and replies should not be used forward of the Forward Edge of the Battle Area (FEBA) except in special circumstances (e.g. link-up with an airborne bridgehead).

c. Alternate challenges and replies and identification configurations will be implemented in the event of their actual or suspected compromise.

d. Commanders order the employment and configuration of specific identification capabilities or devices through standing operating procedures (SOP) or unique direction within orders. Regular review of the directed employment and configuration is necessary to ensure relevancy and mitigate the risk of compromise to non-friendly forces.

e. The use of passive or active identification devices operating in the infrared spectrum must be considered in light of enemy force capabilities. Use of such items may very well allow enemy forces to more easily detect our own friendly troops utilising similar enemy IR systems.

f. Identification devices should be protected from disclosure to the enemy until the latest possible time to maintain security for their use.

g. The addition of add-on armour, rocket initiator cages or personal kit to the exterior of a vehicle will alter its recognition features and possibly cover any recognition devices. Commanders must be aware of this and issue direction as appropriate.

h. Red or white smoke should not be used, as these colours are not suitable for identifying friendly forces.

i. Red lights or pyrotechnics should not be used as this colour is not suitable for the intended purpose.

j. Potential enemy use of CID devices should be a requirement for intelligence. Awareness of enemy use of CID devices will aid in directing action to mitigate this risk.

5. Exchange of Information on Identification and Recognition. Positive recognition of friendly forces operating on the battlefield must be based on the exact knowledge of uniforms, equipment and vehicles used by such forces. This of course should be a focus of continuous recognition training at all levels within NATO nations. Training will have to be refined prior to the commencement of coalition operations, so that those friendly and enemy signature equipments to be encountered on the battlefield can be studied in greater detail.

6. Command Responsibility. All commanders have the responsibility to ensure that personnel under their operational command are trained in the recognition of both friendly and enemy forces likely to be met on the battlefield.

7. Orders. To ensure that combat identification issues are addressed in orders, a sub-paragraph should be placed under “Coordinating Instructions” of the “Execution” paragraph and be titled “Combat Identification Measures”.

8. Command Direction. Commanders are responsible for prescribing the challenges and replies, and the configurations of identification capabilities or devices to be used in both operations and training. Commanders are responsible for ensuring compliance with recognition direction issued by superior commanders in coalition operations. Identification configurations and verbal and non-verbal challenges are decided upon at the highest applicable level of command and notified in advance to subordinate formations and units. Neighbouring and higher formations are also to be informed of challenge and reply protocols.

1.4. IMPLEMENTATION OF THIS PUBLICATION

This publication is implemented when the necessary orders/instructions putting the procedures detailed in this doctrine into effect have been issued to the forces concerned. Furthermore, this publication is implemented when the forces concerned have received the equipment covered in this doctrine and are ready to use it.

CHAPTER 2 CHALLENGING BY GUARDS AND SENTRIES

2.1. DEFINITIONS

The following terms and definitions are used within this chapter:

a. Challenge. Any process carried out by one unit or person with the object of ascertaining the friendly or hostile character or identity of another. [AAP-06)

b. Reply. An answer to a challenge. [AAP-06]

c. Password. Often a combination of two or more words, letters or numbers that is used during a challenge. A part of the password is used in the challenge and another portion of the password is used in the reply. The definition in AAP-06 is different, however this is the commonly understood application of password in the context of this publication.

2.2. METHOD

1. Challenging by voice is most commonly used to identify unknown persons approaching a position. It is based on a password, which normally changes at least once a day at a specified time, and which is common within national formations, or within specified command groupings, or areas.

2. The words used to form a password must be easily pronounceable. The combination selected should not have an obvious connection from which, given the challenge, the reply could be guessed.

3. The password is decided upon at the highest applicable level of command and notified in advance to subordinate formations and units. Neighbouring and higher formations are also to be informed.

4. When forces of two or more nations are in the same formation or area of operations, great care is necessary to ensure that the password chosen is pronounceable by the nationalities concerned. In these circumstances two or more letters of the NATO phonetic alphabet must be used. For the sake of clarity both challenge and reply may be given twice.

2.3. PROCEDURE

1. No challenge should be made until the challenger is ready to take offensive action.

2. The following procedure is to be used.

	Action by Sentry	Action by Challenged Person or Group
Step 1	Alert immediate commander of the approach of a person/group. Cover person/group with weapon.	
Step 2	Order person/group to stop. (Eg, "HALT HANDS UP") Ensure order can be heard, but do not allow person/group to approach so close that the sentry position can be rushed.	Halt, and indicate that you are not a threat (eg, raise hands).
Step 3	Order, by voice or sign, one person to approach (eg, "ADVANCE ONE")	One person (or group leader) advances towards the sentry position.
Step 4	Allow the unknown person to approach close enough for visual identification, or to give the challenge in a quiet voice, and then order him/her to stop (eg. "HALT").	Halt.
Step 5	Quietly give the challenge, if the person's identity is unknown.	Give the reply.
Step 6	Call forward the remainder of the group, either as individuals – "ADVANCE ONE" – or altogether – "ADVANCE", as the situation or orders dictate.	Second person, or the remainder of the group, advances to be identified by the sentry, assisted by the initial person, who stays with the sentry until all have passed.

2.4. FIRING BY SENTRIES

The circumstances under which a sentry is to be instructed to fire on persons or groups failing to heed a challenge are left to national authorities and must, necessarily, vary depending upon the particular situation and the rules of engagement being applied.

CHAPTER 3 STANDARDS, TECHNIQUES AND PROCEDURES FOR THE USE OF COMBAT IDENTIFICATION CAPABILITIES AND DEVICES

3.1. PREFACE

Combat identification (CID) devices are used in conjunction with appropriate acquisition and identification procedures for identification of friendly forces. They are a supplement to aid in identification of friendly forces on the battlefield or in an area of operation in order to reduce the risk of fratricide. Because of their potential for compromise, CID devices should be employed or activated only for a specified and fixed period of time. The appropriate level of command will issue time guidelines/limitations for use of these devices. This chapter describes current CID capabilities and specific devices, and their employment.

3.2. DEFINITIONS

The following terms and definitions are used within this chapter:

a. Active. /…/ Active is an adjective applied to actions or equipments which emit energy capable of being detected. [AAP-06]

b. Passive. /…/ Passive is an adjective applied to actions or equipments which emit no energy capable of being detected. [AAP-06]

3.3. CID CAPABILITIES

1. The available CID devices provide a variety of means that are used in conjunction with line of sight sensors to provide a high confidence of the identification of friendly forces. It is the combination of device and sensor that identifies the CID capability; however, a particular device can be observable using different types of sensors.

2. Visual. Visual devices are characterised by being observable using one's vision, thus the sensor is the human eye. These devices include passive orange coloured panels attached to the top of vehicles for air to ground daylight identification, active coloured chemical lights used at night, national flags and vehicle markings. Certain countries have adopted coloured national flags which are both visible under normal illumination and near-infrared illumination at night. Vehicle markings comprise alphanumeric and symbolic markings that are used to identify units; these markings can also be made from near-infrared reflective materials.

3. Infrared (IR). CID capabilities that exploit the IR spectrum are normally categorized according to infrared bands or wavelengths, specifically Near-IR

(0.7-1.0 micron), Mid-IR (approximately 3-5 micron) and Far-IR (approximately 8-12 micron). IR can be used to describe the device and the sensor.

a. Near-IR. Near-IR is only observable during darkness using image intensifying (II) sensors (e.g. night vision goggles (NVG)). A Near-IR device can be active or passive. Examples of an active Near-IR device are beacons or chemical IR lights. Passive devices are normally reflective tapes, patches and flags, which can be highlighted using laser aiming devices or laser illuminators to enhance visibility with an II sensor.

b. Mid- and Far- IR. The Mid- and Far-IR bands are more commonly referred to as thermal bands observable by thermal imagery (TI) sensors during both day and night. Thermal CID devices are active emitters or materials of low emissivity designed to produce contrasting hot or cold spots which provide a characteristic alteration to the signature of the entity. Thermal CID devices include active tools such as thermal beacons and passive tools such as thermal panels mounted on vehicles or carried by dismounted personnel.

6. Query and Response. Query and response CID capabilities require an interrogator (shooter) to emit a radio frequency (RF) signal to elicit a response from the transponder (target) thus identifying the entity as friendly or unknown. This capability can be advantageous in that the assignment of affiliation can be automatically reflected within a compatible battlespace, or situational, awareness system. The technologies associated with this capability continue to be developed and are not described in detail within this document. However, for understanding, the following are examples of query and response technologies under development:

a. Battlefield Target Identification Devices (BTID). The BTID is a millimeter wave interrogator/transponder system, compliant with STANAG 4579. It is primarily for use on ground vehicles and mounted weapon systems. BTID waveform also provides for a Digital Data Link (DDL) and Data Exchange Mode (DEM) capability to create a local situational awareness network amongst BTID-equipped platforms.

b. Radio Based Combat Identification (RBCI). The basis of RBCI capability is a global positioning system (GPS) receiver-equipped, software definable, SINCGARS ASIP (Single Channel Ground and Airborne Radio System, Advanced System Improvement Program) compatible radio. RBCI exchanges GPS location information to provide clearance for fires, either indirect or air-to-surface. Radio Based Situational Awareness (RBSA) utilizes the beaconing functionality in the SINCGARS ASIP radios, mounted or man-portable, that allows the radio to broadcast its position based on time increment, distance moved, or when the radio is keyed.

c. Reverse Identification Friend or Foe (IFF) (Mode S/5). Mode S/5 is an IFF waveform that enables secure, cooperative identification of friendly ground assets from the air. Reverse IFF exploits the current IFF protocol, Mark XII, as defined in STANAG 4193.

3.4. MINIMUM OPERATIONAL CID STANDARD

1. The minimum operational standard for CID comprises the use of visual and infrared capabilities. The minimum operational standard recognizes that coalition soldiers and equipment should exhibit a recognizable signature to other coalition systems in the visual, Near-IR, Mid-IR and Far-IR spectrum.

2. This minimum standard does not imply that a particular CID device must be used, and implies that a nation can select the most appropriate and cost-effective solution and that this selected compliant device will be accepted by the coalition partners.

3.5. CID DEVICES

The sections that follow describe available CID devices, including means of employment, limitations and considerations when utilizing each particular device.

3.5.1. Combat Identification Panel (CIP)

1. Concept. The CIP is a Mid- and Far-IR device that is affixed to vehicles, equipment and installations, producing a contrasting cold spot within the target's signature that is identifiable using TI sensors. The sensor operator (e.g. the gunner) can use this contrast to help determine if the target is friendly or unknown; lack of contrast does not positively identify a target as enemy, but does tell the sensor operator that it has not been positively identified as friendly.

2. Description. The CIP is a board or rigid surface, approximately 0.6m x 0.8m, that operates as a thermal mirror by reflecting the contrasting cooler temperature from the sky. A CIP may be a flat panel or a series of narrow, louvered panels arranged like Venetian blinds. It can be made of any durable material, have a low thermal emissivity on one side, and is designed to be reversed or masked. A CIP is normally affixed to vehicles but can also be affixed to other equipment and platforms.

3. Mounting and Attachment of a CIP.

a. Colour. Ideally, a CIP should be painted or taped to match the colour surface of the host platform to aid in visual camouflage; the reverse side of a CIP should similarly be painted.

b. Visibility. Vehicles should have from four to ten panels positioned to make them visible from all three-dimensional aspects.

c. Reflecting Angle. Each CIP must be placed to ensure cooler radiation from the sky is reflected while providing sufficient surface to be recognised at maximum engagement ranges for TI sensors. A CIP will normally only present a distinct cold spot if sufficient angle is used to allow for effective reflection, and sufficient surface area is presented for TI recognition. To be most effective, the panels must be at an angle of 20-30 degrees from the vertical (see Figure 1).

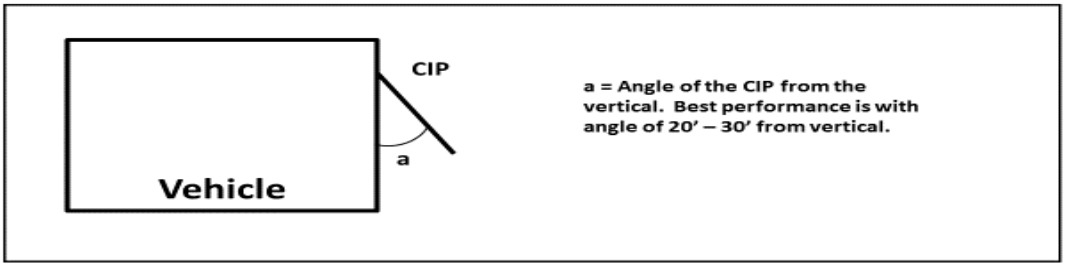

Figure 1: Mounting Angle of a Combat Indentification Panel (CIP)

d. Qualities. A CIP's construction requires durability, uniformity and simplicity, as the loss of a mounted CIP will cause uncertainty in determining friendly affiliation. Durability is most important. Uniformity of placement ensures confidence in identification and uniformity of shape facilitates maintenance and transferability. Simplicity in mounting also reduces maintenance and system costs.

e. Mounting Modes. The most effective mounting system is a metal frame that allows the CIP to be reversed, within the frame, or masked. A masked or reversed CIP is in non-operational mode. The mounting frame can be affixed with brackets or hook and loop fasteners.

4. CIP Identification

a. Range Limitations. CIP performance is dependent on the quality of the thermal sensor and the size (exposed surface area) of the panel. A CIP will be less effective beyond 2,500 metres, especially for vehicles on the move. Use of a CIP at ranges greater than 1,500 metres is complicated by the fact that thermal sight reticules can obscure the cold image. Even at ranges less than 1,500 metres it may be difficult to identify the CIP when performing a direct laying of the sight on the

target. Switching polarity of the thermal imager between “white hot” and “black hot” will improve probability of positive identification of a CIP when acquiring and engaging targets. The cold contrast of the CIP image to the hot vehicle is much clearer when using the "black hot" polarity.

b. Identification Training. If quickly and positively identified, a CIP will assist weapons crews in their decision to stop an engagement of a friendly vehicle. The addition of CIP, therefore, should be incorporated into the TI recognition training already in use. When arriving in theatre, rehearsals should be conducted to confirm CIP performance before initiating operations. Training should also incorporate identifying likely positioning of CIPs on platforms; thereby, assisting a shooter in his target interrogation procedure. This should include "white hot” and "black hot" recognition prior to engaging. Libraries for thermal threat profiles can also be developed and utilised in training.

5. CIP Considerations

a. General. Use of CIPs should not be the sole target identification criteria, as they can become damaged, degraded due to dust/dirt, or lost from vehicles. Additionally, non-combatant forces on the battlefield will not utilise such recognition devices. A CIP should be seen as only one factor contributing to positive identification of an entity.

b. Degradation. CIP performance can be degraded under certain circumstances. Contrast between a CIP and the vehicle or platform can be reduced by the effects of low overcast cloud cover, battlefield obscurants, overhead foliage cover or accumulated dust/dirt on a CIP’s surface. Terrain features, trees and other vegetation, proper defilade firing positions and other obstacles will break up the image of any vehicle and make them more difficult to identify.

c. Security. The use of particular CIP configurations will not maintain security for long periods of time. The enemy will be able to replicate such configurations with relative ease and speed. Emphasis should, therefore, be placed on the use of CIPs as late in the operation as safety allows.

d. Deception. A CIP is very open to deception by an enemy as they can be mimicked either voluntarily or involuntarily. In either case, thermal or visual recognition of the entity, based on all recognition features and its actions, should be the deciding factor in the engagement decision.

(1) Voluntary Imitation. In this case, the enemy intentionally copies the panels in order to exploit or undermine their effectiveness.

The counter-measure is to turn friendly force panels to non-operational mode.

(2) Involuntary Imitation. In this case, features on the entity create a cold spot image similar to that of a CIP. This effect has been observed on some vehicles with features such as windshields, toolboxes, stowage bins, and track guards. To counter this, training on thermal signature recognition, with special emphasis on utilising cues from the entire target image, not just CIPs, is required.

e. Maintenance. The simplicity of the design makes it relatively easy to maintain. A CIP must be kept clean in order to maintain its reflective nature. A CIP should be replaced if vegetation, high winds, or other battlefield effects cause the panel to be damaged or lost.

6. Pre-Combat Inspection. Inspecting mounted CIPs should be a priority item when conducting pre-combat inspections and preventive maintenance checks and services. A CIP inspection requires the following basic steps:

a. mount all CIPs in the proper positions;

b. check for damage or loose mounts;

c. replace or repair all loose, damaged, or missing CIPs;

d. clear all dust, mud, sand, snow, or other concealing elements from a CIP. A soft cloth, free from oils, grease, or fuels, should be used for cleaning;

e. if thermal tape is used, ensure that it is still adhering to the backing material; and

f. ensure that each CIP is visible through a thermal imager.

3.5.2 Thermal Identification Panel (TIP)

1. Concept. A TIP is a flexible thermal panel that exploits the Mid- and Far-IR spectrum so that it is observable using TI sensors. A TIP is typically employed to provide air-to-ground identification. When viewed through a TI sensor, a TIP appears as a contrasting cold spot on the hot target image (see Figure 2). Some TIP variations offer day-time visible markers (bright orange) on the reverse side; Note: Some orange marker panels appear similar to a TIP; however, they have no thermal properties. The user must know if a particular panel actually has thermal properties.

Figure 2: Thermal Identification Panel (TIP) as seen through a thermal sight.

2. Description.

a. A TIP is a cloth thermal panel, normally 1.3m x 1.3m in size, covered on at least one side with thermal reflective material. To provide dual-purpose identification, certain TIP variants have international orange coloured material on the reverse side; other variants provide a camouflage colour. Figure 3 provides examples of a TIP.

Figure 3: Examples of Thermal Identification

b. A smaller TIP can be used by dismounted soldiers. This type consists of 30cm x 30cm panels that can be attached to the soldier's equipment (i.e. backpack or other load carrying equipment) or laid on the ground in groups of panels. A TIP can be secured by using attached grommets.

3. Employment of a TIP. To be effective for air-to-ground identification, a TIP may be tented in the middle to achieve optimal air-to-ground angular reflection. The

dismounted soldier version should be as rigid as possible and angled to achieve optimal reflection.

4. TIP Identification. Aircraft with a thermal imaging capability see a TIP as a distinctive cold spot on a hot target area, visible at distances of three to five km, depending upon environmental conditions and exposed surface.

5. Considerations. The considerations of degradation, security, deception, maintenance and inspection highlighted for a CIP equally apply to a TIP. A TIP can be employed day or night and in all climatic conditions. A TIP can also be employed as the primary CID device for vehicles not equipped with CIPs. If constructed as such, the international orange side of a TIP may be used for visual recognition during daylight, non-thermal operations. Before use in operations, standardized use of colours needs to be addressed as part of the commander's overall combat identification plan.

3.5.3 Thermal Identification Beacon (TIB)

1. Concept. A TIB is an active, flashing beacon that operates in the Mid- and/or Far-IR bands. A TIB aids in the identification of vehicles by adding a regularly flashing hot / cold spot to the thermal signature of the vehicle. TIBs are generally unaffected by weather, relatively easy to install and easily recognised with a minimum of training. As an active means of identification subject to inclusion in emission control (EMCON) orders, use of TIBs must comply with directed control procedures.

Figure 4: Example of a Thermal Identification Beacon

2. Description. A TIB contains an emitter platform that has a radiating thermal element and a parabolic reflector; the reflector rotates around the element and focuses the radiated energy in a concentrated unidirectional beam that flashes across the viewing TI sensor. A plated steel wire cage surrounding the rotating thermal element prevents physical damage. Attached to this cage is a plastic film to provide environmental protection. Other TIB components include a base assembly unit, a TIB control box (TCB) and a vehicle-specific installation kit. The TCB powers

the TIB using the vehicle's internal electrical power supply and indicates the operating status of the beacon.

3. TIB Mounting. A TIB is mounted on, and powered by, the host vehicle. Changes to the vehicle caused by the mounting of a TIB are slight. It does not alter the vehicle's image characteristics in any other way, visually or in the IR spectrum. Consequently, it does not impede other recognition practices nor significantly increase the host vehicle's detectable signature.

4. TIB Operation. A TIB works by heating an element using the vehicle's rotating traffic beacon mount and power supply. The TIB is a line replaceable unit that has an appearance and mechanical design based upon the Amber Road Traffic Beacon designed to fit most vehicles. Electrical and mechanical connection to a TIB is via the base assembly unit using a standard DIN 14620 Form A socket which is compatible with the existing Amber Traffic Beacon. A TIB should be issued with an integration kit that will ensure it can be adapted to the widest variety of vehicles and fitted by vehicle crews.

5. TIB Identification.

a. Range. Prevailing visibility conditions and the effectiveness of the TI sensor used to view it limit the operational range of a TIB. Test results have given a typical recognition distance of not less than 1500m and not greater than 4000m. Horizontal visibility is 360º normal to the vertical axis. Vertical visibility is from - 10º to +30º normal to the horizontal axis.

b. Sensor Viewing. A TIB will display flashing pixels on the potential target when viewed through a TI sensor. The flash appears as an alternating hot and cold spot represented by pixels changing between white and black.

6. TIB Considerations.

a. General. A TIB is not a complete CID device; it is an aid that should be used to reinforce or prompt existing recognition procedures. When a potential target is acquired, the presence of a TIB provides an additional prompt to hold engagement until a positive identification is made. Often, the presence of a TIB will be the first indication that an entity is indeed a friendly vehicle; however, the absence of a TIB signature does not indicate a hostile vehicle. Use of TIBs has utility for non-military vehicles such as aid convoys or other authorised personnel. TIBs may also be used as an aid to movement control, especially for convoys. In situations that allow use of an active device, and in circumstances of reduced visibility, a TIB could be employed as a replacement or supplement to CIPs.

b. Degradation. Thick mist, dust, battlefield obscurants and foliage can degrade TI sensors. Trials have shown that a TIB has greater penetration through rapid blooming obscurants (e.g. smoke) than residual thermal signatures. Strong winds, which can cause the element to cool rapidly, may degrade range detection performance.

c. Security. A TIB is an active CID device that can be seen with equal ease by any friend or adversary equipped with a TI sensor. Its use must be evaluated against its vulnerability to enemy detection and the enemy's thermal detection capability. Orders should specify conditions and methods of use. A TIB may have to be partially shrouded in the enemy direction to afford protection from enemy observation.

d. Deception. A TIB is a relatively inconspicuous device and its function is not immediately apparent. Nonetheless, should the function of TIBs become known, unauthorised persons could use a captured TIB because there is no method of encryption. Effects of capture could range from a mere nuisance to a serious risk against friendly forces depending on the number captured. To imitate TIBs in any quantity would require modern engineering and production facilities.

e. Maintenance. A TIB is susceptible to physical damage and should be removed and safely stowed when not in use. It should be kept as clean and dry as possible.

3.5.4. Near Infrared Emitters

1. Concept. Electronic or chemical Near-IR emitters operate using active Near IR energy which can only be viewed through image intensifying (II) sensors and are, therefore, only effective during night-time. Near-IR emitters may be pulsed or steady, directional or omnidirectional; a pulsed emitter is commonly referred to as a strobe. Examples of Near-IR emitters include disposable chemical lights (a.k.a. chem-lights or glow-sticks), the Phoenix Beacon (Figure 5) and the BUDD Light (Figure 6).

Figure 5: Phoenix

Figure 6: BUDD Light

2. Description.

a. Near-IR Lights/Strobes. Near-IR Lights are compact devices using a 9-volt or “AA” battery power source; both the light and its power source can be held in the palm of the hand. The pulse emitted is similar to a strobe light. The size of the light makes it convenient for fixed sites, vehicle identification and for use by ground personnel. For directional strobes, the pulse is best seen when pointing the beam directly at the II sensor. Omnidirectional strobes can be shielded to make them directional and prevent an enemy with II sensor capability from detecting the emission. This also applies to directional strobes to make the emission more precise. Shields can be made from cans or tape.

b. Near-IR Chem-Light. Similar to the traditional fluorescent chem-light, the Near-IR chem-light emits a steady/constant Near-IR light. They can be used in the same ways as Near-IR strobes, except their range is limited and they are omnidirectional unless physically blocked. The average life of a Near-IR chem¬light is three hours.

3. Identification and Employment. Near-IR emitters can be used to mark fixed sites, ground troops, and vehicles. They are best used as specific marking or signalling devices from one ground position to another specific position, ground or air. They may be used in patterns to indicate unit identification, used to mark obstacles or breach sites, or turned on/off to signal accomplishment of a task such as crossing a phase line. They are also useful for the marking of pickup, drop, or landing zones. For air-to-ground identification, a Near-IR emitter can be used for marking friendly platforms, dismounted soldiers, no fire areas, targets, target reference points and kill zone limits / arcs / boundaries.

4. Considerations.

a. Directional characteristics make it possible to limit observation by an enemy, but they also limit the reliability for target identification unless multiple lights are mounted that can be seen from all aspects.

b. It is possible for observers to misinterpret a Near-IR strobe emission as a muzzle flash. To mitigate this, use of a strobe is to be considered in light of the current tactical activity and should not be the sole source for identifying friendly forces or targets for engagement. Consideration should be given to using a strobe away from friendly forces and ongoing tactical engagements.

c. The frequency of the strobe flash should be coordinated as a control measure to enhance security.

d. Near-IR emitter output is limited by battery life or chemical reaction.

e. II sensors, unlike thermal imagers, are relatively inexpensive and available in quantity. It is best to assume, in the absence of firm intelligence, that enemy forces possess II sensors; therefore, an enemy equipped with II sensors can detect Near-IR emitters as easily as can friendly troops. Use should be controlled and limited to critical times such as after forces have crossed the line of departure.

f. Caution must be used when employing Near-IR emitters in dense foliage, smoke, fog, or battlefield obscurants because, like car headlights in fog, a halo of reflected IR light may develop around the source.

3.5.5. Near Infrared Reflective Paint or Tape

1. Concept. Near-IR reflective paint or tape can be useful in identifying friendly vehicles on the ground, either passively or through illumination by an active Near-IR source. Different symbols or characters can be painted or temporarily taped onto the sides of a vehicle. These paint / tape schemes can be observed through II sensors. Depending on the difference in colour between the vehicle and the applied reflective tape/paint, the symbols or characters also aid in visual identification.

2. Identification. For illustrative purposes, Figure 7 depicts a tank with a Near-IR horizontal painted chevron symbol above the track wheels. Typically, a tape scheme will utilize strips of tape 45-50 cm long and 7.5 cm wide, thus restricting the visibility of tape schemes to within 500 m. In Figure 7, note that the rectangles on the two faces of the turret are hook and loop fasteners to which a CIP may be mounted.

Figure 7: Example of Near-IR Paint

3. Considerations. Use of reflective tape or paint applied directly to the vehicle prevents them from being turned off, thereby restricting a commander's options for selectively utilizing them. Paint/tape schemes should be changed periodically to reduce compromise. Standardisation of symbols and characters is directed by the appropriate commander.

3.5.6. Near Infrared Reflective Material

1. Concept. Near-IR reflective material is a passive CID device intended for identifying vehicles and individual soldiers. This material can be used to identify friendly forces through visual means and passive use of an II sensor; however, it is best observed using an active Near-IR source to illuminate the material ensuring easier identification via an II sensor (Figure 8). This material can be attached to vehicles or an individual soldier's uniform and/or equipment. To be most effective, it should be mounted in various locations so that illumination from any direction will afford identification.

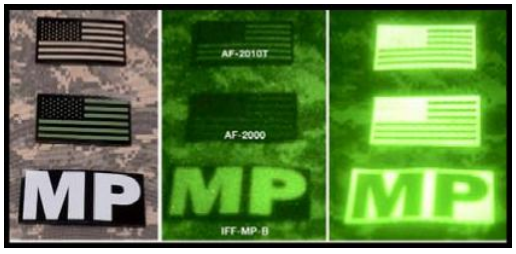

Figure 8: Near-IR Flags and Patches as viewed with (left to right): the naked eye; passive II sensor; and, an II sensor with active Near-IR illumination.

2. Employment and Identification. Near-IR reflective material is generally provided as patches or markers, of various sizes, employed in unique patterns/schemes that are applied directly to vehicles or individual soldier's uniforms or equipment, or temporarily using hook and loop fasteners. The patterns/schemes used are in accordance with direction from the appropriate commander. Certain nations have used this reflective material in national flag patches as a means of

varying the application and therefore reduce the vulnerability of the reflective device to spoofing. Various examples of and uses for these Near-IR reflective materials are shown in Figure 9.

Figure 9: Examples of Near-IR Patches/Markers and National Flags

3. Considerations. When employed on individual soldiers, ensure that all soldiers have Near-IR bands and patches mounted on outer uniform garments, helmets and equipment in standard locations specified in current orders or established SOP. Similarly, when used on vehicles, ensure that markers are applied to the outside fixed components of the vehicle so that normal operation and activity will not remove the reflective markers. Pre-combat inspections should include a check using an II sensor and a Near-IR illuminator to confirm effectiveness. Ensure that the markers are visible in prescribed locations, not obscured by load bearing equipment or camouflage. Keep the Near-IR reflective materials free of dust, dirt and mud as much as possible. As with other CID devices that work within the Near-IR spectrum, the wide-spread availability of II sensors throughout the world will need to be considered before employing these particular CID devices.

3.5.7. Vehicle Marking System

A vehicle marking system consists of a standardised set of combinations of numbers and/or symbols that provide visual discrimination between vehicles in a unit. Markings are standard size and may be placed on CIP or other similar mounting surfaces. To ensure visibility, markings will be in a colour of material that contrasts in colour with the background. This marking system would normally be coordinated as an operation or theatre-specific control measures.

3.5.8. Guidance for the Employment of CID Devices

Table 1 provides guidance for the tactical employment of the various CID devices previously described.

FACTOR	SITUATION	EMPLOYMENT GUIDANCE
MISSION	Attacking, Advancing, or Forward Passage of Lines	CIP: Mount on front, sides and rear. Remove or reverse the front mounts once passage of lines is completed or across the line of departure. TIP: On for required air-to-ground identification. TIB: On, front arc shielded.
	Defending or Rearward Passage of Lines	CIP: Mount on sides and areas facing friendly forces. TIP: Use for required air-to-ground identification. TIB: On, front arc shielded.
ENEMY FORCES	Few using Near-IR sensors	Use Near-IR emitters with caution.
	Most using Near-IR sensors	Do not use Near-IR emitters
	Few using Thermal sensors	CIP: Mount on the rear only. Remove or reverse the mounts on the front, sides and areas facing the enemy. TIP: Use for required air-to-ground identification. TIB: On for specific purposes only, (e.g. convoy drills, air-to-ground identification); front and/or side arcs shielded as necessary.
	Most using Thermal sensors	Do not use CIP or TIB, or do so with caution. TIP: Use for required air-to-ground identification.
	Capable of mounting Mid- or Far-IR CID devices.	Do not use CIP, TIP, or TIB.
	Assumed to be capable of mounting Mid- or Far-IR CID devices.	Do not use CIP, TIP or TIB, or do so with caution.
FRIENDLY FORCES	Joint / Combined / Multi-National Force	Appropriate commander establishes a minimum operational standard for CID devices, directed in orders or SOP. Coordinate use of CID devices. Rehearse with CID devices.

FACTOR	SITUATION	EMPLOYMENT GUIDANCE
WEATHER (WARM – HOT)	Clear, Dry	TIB, CIP, TIP and Near-IR emitter performance is good.
	Clear, Humid	CIP, TIP and TIB performance is good, (use white hot thermal polarity). Near-IR emitters may produce a halo effect.
	Cloudy, Humid, Wet	TIB performance is good. CIP and TIP performance is significantly degraded. Near-IR emitters may produce a halo effect.
WEATHER (COOL – COLD)	Clear, Dry	TIB, CIP, TIP and Near-IR emitter performance is good.
	Clear, Humid	CIP, TIP and TIB performance is good. Near-IR emitters may produce a halo effect.
	Cloudy, Humid, Wet	CIP, TIP and TIB performance is good. Near-IR emitters may produce a halo effect.
	Wet, Windy	TIB performance may be degraded due to wind, recommend shielding from wind. CIP and TIP performance is good. Near-IR emitters may produce a halo effect.
TIME	Day	Use TIB, CIP, TIP and Vehicle Marking System
	Night	Use TIB, CIP, TIP and passive and active Near-IR devices.

Table 1: Guidance for Tactical Employment of CID Devices

3.6. RELATIVE EFFECTIVENESS OF VARIOUS IDENTIFICATION METHODS AND DEVICES

1. Table 2 provides information regarding the relative effectiveness of devices or methods used for identification purposes. Note that the device or method described may not have been detailed previously within this document, nor is there an expectation of use by agreeing nations. Rather, the methods or devices detail those that friendly forces could employ or encounter during the conduct of operations.

2. Within Table 2:

   a. the column DAY / NIGHT refers to the time of day when the method or device is intended for use: D for daylight hours; N for periods of darkness;

   b. the column SENSOR refers to the type of sensor that can detect the method or device: Visual for human vision; II for image intensifying sensor; TI for thermal imagery sensor; All for all previously mentioned sensors; or Unique for a unique, specific sensor; and

   c. the columns MARKS FRIENDLY and MARKS TARGET refer to the performance of the method or device in marking a friendly force location or a target for engagement.

METHOD/DEVICE	DAY/NIGHT	SENSOR	MARKS FRIENDLY	MARKS TARGET	REMARKS
Smoke	D	Visual	Good	Good	Easily identifiable. May compromise friendly positions, obscure target, or warn of fire support employment. Placement may be difficult due to structures.
Smoke (Near-IR)	D	Visual	Good	Good	Easily identifiable. May compromise friendly position, obscure target, or warn of fire support employment. Placement may be difficult due to structures.
	N	II	Good	Good	
Illumination, Ground Burst	D / N	All	N/A	Good	Easily identifiable. May washout II sensors.
Signal Mirror	D	Visual	Good	N/A	Avoids compromise of friendly location. Dependent on weather and available light, and may be lost in reflections from other reflective surfaces (e.g. windshields, water).
Spot Light	N	Visual, II	Good	Marginal	Highly visible to all. Compromises friendly positions and may warn of fire support employment. Effectiveness is dependent upon urban lighting.
Near-IR Spot Light	N	II	Good	Marginal	Less likely to compromise than overt spot light. Effectiveness dependent upon degree of urban lighting.

METHOD/DEVICE	DAY/NIGHT	SENSOR	MARKS FRIENDLY	MARKS TARGET	REMARKS
Near-IR Laser Pointer (Below 0.4 Watts)	N	II	Good	Marginal	Effectiveness dependent upon degree of urban lighting.
Near-IR Laser Pointer (Above 0.4 Watts)	N	II	Good	Good	Less affected by ambient light and weather conditions.
Visible Laser Pointer	N	Visual, II	Good	Marginal	Highly visible to all. Risk of compromise is high. Effectiveness dependant upon degree of urban lighting.
Laser Designator/Target Marker	D / N	Unique	N/A	Good	Highly effective with precision guided munitions. Very restrictive laser acquisition cone and requires line of sight to target. May require coordination of laser codes
Tracer	D / N	All	N/A	Marginal	May compromise position. May be difficult to distinguish mark from other fire. During daylight use, it may be more effective to kick up dust surrounding target.
Near-IR Beacon	N	II	Good	N/A	Effectiveness dependent upon degree of urban lighting. Coded strobes aid in identification.

METHOD/DEVICE	DAY/NIGHT	SENSOR	MARKS FRIENDLY	MARKS TARGET	REMARKS
Electronic Beacon	D / N	Unique	Excellent	Good	Ideal friendly marking device for some fixed wing aircraft. Least impeded by urban terrain. Can be used as a target reference point for target identification. Coordination with aircrews essential to ensure equipment and training compatibility
Flare	D / N	All	Good	N/A	Easily identified by aircrew.
Near-IR Flare	N	II	Good	N/A	Easily identified by aircrew.
Near-IR Reflective Material	N	II	Good	N/A	See Chapter 3 above for detailed employment considerations.
Combat Identification Panel (CIP)	D / N	TI	Good	N/A	See Chapter 3 above for detailed employment considerations.
Thermal Identification Panel (TIP)	D / N	TI	Good	N/A	See Chapter 3 above for detailed employment considerations.
Chem-Light	N	Visual, II	Marginal	N/A	Provides distinct colour signature. May be obscured by structures. Effectiveness dependent upon degree of urban lighting.
Near-IR Chem-Light	N	II	Marginal	N/A	See Chapter 3 above for detailed employment considerations.

Table 2: Relative Effectiveness of Various Identification Methods and Devices

INTENTIONALLY BLANK

INTENTIONALLY BLANK

ATP-91(A)(1)