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ACP 160(E)

IFF OPERATIONAL PROCEDURES

ACP 160(E)



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FOREWORD

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5. This ACP is to be maintained and amended in accordance with the provisions of ACP 198.

**THE COMBINED COMMUNICATIONS-ELECTRONICS BOARD
LETTER OF PROMULGATION
FOR ACP 160(E)**

1. The purpose of this Combined Communication Electronics Board (CCEB) Letter of Promulgation is to implement ACP 160(E) within the Armed Forces of the CCEB Nations. ACP 160(E) IFF Operational Procedures is an UNCLASSIFIED publication developed for Allied use and, under the direction of the CCEB Principals. It is promulgated for guidance, information, and use by the Armed Forces and other users of military communications facilities.
2. ACP 160(E) is effective on receipt for CCEB Nations and effective for NATO nations and Strategic Commands when promulgated by the NATO Military Committee (NAMILCOM). ACP 160(E) will supersede ACP 160(D), which shall be destroyed in accordance with national regulations.

EFFECTIVE STATUS

Publication	Effective for	Date	Authority
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3. All proposed amendments to the publication are to be forwarded to the national coordinating authorities of the CCEB or NAMILCOM.

For the CCEB Principals

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CHAPTER 1**GENERAL INSTRUCTIONS****PURPOSE**

101. The purpose of this document is to provide a foundation for establishing detailed Identification Friend or Foe (IFF) operational policies and procedures that reside in national, regional and allied supplements to this publication.

BASIC IFF FUNCTIONALITY AND NOMENCLATURES

102. The function of IFF systems is primarily to assist in the rapid and reliable identification of friendly aircraft, ships and platforms and to support the tracking and control of friendly aircraft.

103. IFF systems are normally used in conjunction with other means (e.g. flight plan correlation, voice authentication) to identify friendly platforms. The legacy IFF system is Mark XII which consists of five Modes: 1, 2, 3/A, C and 4. Mark XIIA is the designation for the system that adds Mode 5 to the Mark XII modes. The civil Mode S and Automatic Dependent Surveillance – Broadcast (ADS-B) capabilities are also included in much IFF equipment.

SECURITY CLASSIFICATION

104. The classification of IFF equipment and related technical information can be found in the NATO Identification Security Classification Guide and the DoD International AIMS¹ Program Security Classification Guide.

105. Information on IFF use (including doctrine and procedures) that could aid an adversary in deceiving, exploiting, or denying the system is classified SECRET.

106. Guidance concerning the non-tactical employment of IFF systems (for instance Air Traffic Control or Air/Sea Rescue when not in hostilities) is UNCLASSIFIED.

GENERAL INSTRUCTIONS FOR OPERATORS

107. All operators of IFF interrogation equipment must be highly skilled in the use of the different interrogation modes and in recognizing and interpreting IFF responses as displayed on their equipment. In particular, operators should be cognizant of the degree of security protection associated with each mode, the type of data (if any) that is conveyed by the different replies and reports, the significance of the Identification of Position (I/P) and Emergency responses, and the use of Lethal Interrogations.

¹ Air Traffic Control Radar Beacon System Identification Friend or Foe Mark XII / XII A System

CHAPTER 2

IFF SYSTEM DESCRIPTION

201. IFF is a cooperative system that includes challenge and reply techniques as well as position reporting in Mode 5. Replies and reports support the identification of targets as friends and may contain additional information for tracking and control functions. Challenges are transmitted on 1030 MHz by interrogators that are typically associated with surveillance or fire control radars; replies and reports are sent on 1090 MHz by transponders installed on friendly aircraft, ships and platforms. Replies to challenges are sent rapidly and automatically by transponders. Reports can be autonomously transmitted (squittered) by transponders at a low rate and sent in response to particular types of interrogations (triggered) at a higher rate. Each reply is associated with a particular challenge and is useful only to the interrogator that sent the challenge; each Mode 5 report can provide information to any compatible system that receives it.

IFF MODES

202. Different modes within IFF systems are used world-wide for different purposes. Technical details of the civil modes are contained in International Civil Aviation Organization (ICAO) Annex 10. Details of the military modes are described in documents of national, regional and allied organizations. Brief summaries of the modes are as follows:

Mode 1. In most Mark XII transponders, 32 reply codes are available. In Mark XIIA transponders and some Mark XII transponders, 4096 reply codes are available. Mode 1 codes are non-secure and are typically used to convey the aircraft's mission.

Mode 2. There are 4096 reply codes available. Mode 2 codes are non-secure, variably not aircrew selectable and are typically assigned by a command and control authority. (For Naval aircraft can represent aircraft's side number.).

Mode 3/A. The military Mode 3 and the civilian Mode A are identical (other than a minor difference in Emergency operation); therefore, this mode is generally referred to as Mode 3/A. There are 4096 reply codes available. Mode 3/A codes are non-secure and are typically employed by civil and military users for flight identification.

Mode C. Mode C replies are non-secure and convey barometrically-derived altitude data to civil and military users.

Mode S. Mode S is a civilian mode which operates using addressed interrogations. Each aircraft is assigned a unique address, though military platforms have the capability to change the address in use when operationally required. The Mode S system can transmit a variety of data depending on the level of Mode S capability implemented on a platform.

ADS-B. ADS-B is an enhanced feature of the Mode S system which provides for automatic self-reporting of a platform's location.

Elementary Mode S (ELS). ELS provides for responses to addressed interrogations with traditional data such as flight ID, altitude, Mode 3/A, transponder data link capability, and flight status.

Enhanced Mode S (EHS). EHS provides for responses to addressed interrogations with ELS data plus additional reply formats for eight Downlink Airborne Parameters (DAPs), such as magnetic heading, indicated airspeed and vertical rate.

Mode 4. Mode 4 provides for secure friend identification.

Mode 5. Mode 5 provides enhanced security, data capability and functionality relative to the Mark XII modes. Mode 5 Level 1 is based on the challenge and response technique while Mode 5 Level 2 adds reporting functionality. All data carried within Mode 5 messages is securely encrypted. In addition to the Mode 1, 2, 3/A and C codes, Mode 5 provides the capability to send National Origin (NO) information and a Platform Identification Number (PIN) in replies and reports. Reports also convey the platform's latitude, longitude and altitude based on the Global Navigation Satellite System (GNSS), along with a Figure of Merit (FOM) representing the accuracy of this position information.

IFF SYSTEMS

BASIC IFF MARK X	IFF MARK X (SIF)	IFF MARK X (A)
Mode 1	Mode 1 - 32 codes	Mode 1 - 32 codes
Mode 2	Mode 2 - 4096 codes	Mode 2 - 4096 codes
Mode 3	(not normally selectable in flight)	(not normally selectable in flight)
	Mode 3 - 64 codes	Mode 3 - 4096 codes
		SSR Mode C
IDENT (I/P)	IDENT (I/P)	IDENT (I/P)
EMERGENCY	EMERGENCY	EMERGENCY

IFF MARK XII	IFF MARK XII (S)	IFF MARK XII (A)
Mode 1 - 32 codes	Mode 1 - 32 codes	Mode 1 - 32 codes
Mode 2 - 4096 codes	Mode 2 - 4096 codes	Mode 2 - 4096 codes
(not normally selectable in flight)	(not normally selectable in flight)	(not normally selectable in flight)
Mode 3 - 4096 codes	Mode 3 - 4096 codes	Mode 3 - 4096 codes
Mode 4 - secure mode	Mode 4 - secure mode	Mode 4 - secure mode
SSR Mode C	SSR Mode C	Mode 5 - secure mode, PIN
IDENT (I/P)	SSR Mode S	SSR Mode C
EMERGENCY	DAPs (Downlinked Air Parameters)	
	IDENT (I/P)	
	EMERGENCY	IDENT (I/P)
		EMERGENCY
		LETHAL

Table 2-1

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ADDITIONAL IFF CAPABILITIES

203. Identification of Position. This function, also referred to as I/P or IDENT, enables a transponder operator to distinguish his or her replies from those of other platforms (if so requested), by causing a distinctive indication on the interrogator display. When selected, I/P replies are transmitted for approximately 18 seconds in response to interrogations in Modes 1, 2, 3/A, S and 5, for those modes which are enabled.

204. Emergency. When selected by a transponder platform, Emergency is transmitted in Modes 1, 2, 3/A, S, and 5. Emergency creates an indication on the interrogator operator's display. In most platforms, the Mode 3/A code transmitted by the transponder will automatically default to 7700. Some platforms will enable all modes when Emergency is selected, while others will transmit only in the currently selected modes.

205. Surface Transponders. Controls for ground and surface transponders are very similar to airborne transponders except that EMERGENCY, IDENT (I/P) and Mode C may be omitted.

206. Unmanned Aircraft. Some unmanned aircraft transmit an additional pulse (the X Bit) in their reply in Modes 1, 2, 3/A, and 5. Depending on the interrogating platform, an indication may be created on the interrogator operator's display.

207. Lethal Interrogation. Transponders in Standby generally do not reply to interrogations; however, Mode 5 provides an interrogation format that elicits replies from Mark XIIA transponders in Standby. These "lethal" interrogations are intended to be used only during the target engagement process, to provide friendly platforms that are trying to minimize their radio frequency emissions with a last opportunity for identification.

CHAPTER 3

COMMANDER'S RESPONSIBILITY

301. Commanders are responsible for ensuring that personnel under their command concerned with IFF operation are cognizant of these instructions and that they are fully disseminated, thoroughly understood, and properly employed.

302. Tests and analyses show that, in areas of high aircraft density and large numbers of interrogators, IFF systems can suffer significant performance degradation due to self-interference. Excessive interrogation can also cause interference to civil air traffic control systems, like Mode S and ADS-B, which use the same frequencies. Commanders will therefore ensure that operators under their command limit their interrogations to the minimum necessary for performing the functions described in paragraph 102, unless authorized to do otherwise by the appropriate Theatre or Area Commander.

303. Commanders will ensure IFF equipment is maintained in a manner to allow immediate operational use.

304. Commanders will ensure that exercises that employ IFF systems are coordinated in advance, with host nation, or host nations, IAW established policies and procedures.

305. Commanders are responsible for effecting operational control in a manner cognizant of the concomitant performance of Air Traffic Control functions.

306. Commanders are responsible for ensuring adherence to information on the tactical use of IFF equipment (including doctrine and procedures) contained in the appropriate ACP 160 supplement.

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