NAMIBIAN CIVIL AVIATION AUTHORITY

Advisory Pamphlet (AP)

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COMMUNICATION REQUIREMENTS FOR SEARCH AND RESCUE

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COMMUNICATION REQUIREMENTS FOR SEARCH AND RESCUE

1. PURPOSE

This Advisory Pamphlet (AP) provides information on search and rescue communication. It provides information on the basic functions and operating capabilities of communication systems to enable the provision of search and rescue services in accordance with NAMCARs, Part 179.

2. BACKGROUND

(a) The NAM-CARs Parts 179 requires that SAR personnel, survivors, RCCs and RSCs, SAR facilities, and many others must have the means to send and receive information regarding search and rescue operations.

(b) NAM-CARs Part 179 further requires the SAR coordinating agency to establish essential communications elements needed for the purpose of receiving distress alerts and the performance of the SAR mission functions. The SAR coordinating agency must in addition ensure the use of appropriate alerting equipment by those who may need SAR service.

(c) Below are the extracts from the Civil Aviation Regulations Part 179 – Search and Rescue, to which this Advisory Pamphlet apply.

3. EXTRACTS FROM NAM-CARS, PART 179 – SEARCH AND RESCUE

179.02.5 Search and rescue communication

(1) The SAR coordinating agency must ensure that the rescue coordination centre (RCC) and as necessary the rescue sub-centres (RSCs) have means of rapid and reliable two-way communications with the relevant units, centres and agencies involved in SAR operations.

(2) The communication systems and procedures for RCC and the RSCs shall be established in accordance with standards prescribed in Document NAM-CATS-SAR.

4. EXTRACTS FROM DOCUMENT NAM-CATS-SAR

179.02.5 Search and rescue communication

(1) A SAR coordinating agency must establish communication systems and procedures to ensure that the Rescue Coordination Centre and each of the Rescue Coordination Sub-Centres listed in the service provider's manual can provide the services for which they are intended.

(2) The communication systems and procedures must be able to handle the volume and nature of the information being communicated so that no information is delayed to the extent that the information becomes out-of-date or affects the ability of the provider to respond effectively and in a timely manner.

COMMUNICATION REQUIREMENTS FOR SEARCH AND RESCUE

1. Introduction

1.1 Good communications is essential for promptly providing the RCC with alerting information to permit the RCC to dispatch search and rescue units (SRUs) and other resources to search areas without delay and to maintain two-way contact with the persons in distress.

1.2 The SAR organization should be alerted to an actual or potential distress situation directly or by means of alerting posts. Alerting posts include any facility involved in receiving information about an apparent distress situation and relaying it to an RCC or RSC such as air traffic services (ATS) units or coast radio

stations (CRSs). The ability of an RCC or RSC to act quickly and effectively when an emergency occurs depends largely on the information forwarded to it by alerting posts. It is essential that communications between an alerting post and the RCC, RSC or local SRU are by fast and reliable means.

1.3 The information collected by alerting posts and other reporting sources must be forwarded immediately to the RCC or RSC, which decides on the type of response. The RCC or RSC may have the communications capability itself or may rely upon other facilities to forward alerts and to carry out SAR response communications.

1.2 SAR personnel, survivors, RCCs and RSCs, SAR facilities, and many others must have the means to send and receive information. The SAR coordinating agency must therefore:

(a) ensure that essential communications elements are provided to receive distress alerts and perform the SAR mission; and

(b) promote use of appropriate alerting equipment by those who may need SAR service.

1.3 Necessary communications for SAR may include telephones, radios operating on international distress frequencies, long-range terrestrial and satellite systems, and other equipment, depending upon geography, the capabilities of mobile facilities within that area, and other factors affecting the ability of persons to contact each other.

2. Basic functions and operating requirements of SAR communication systems

2.1 Communications support distress alerting, co-ordination, and locating systems should allow:

(a) alerting posts to receive information about an apparent distress situation and relay it to an RCC or RSC.

(b) receipt of alerts from equipment used by persons in distress and survivors to help SAR units respond and conduct a rescue;

(c) exchange of information with persons in distress;

(d) exchange of information among the SAR mission coordinator (SMC), on scene coordinator (OSC) and SAR units (SRUs) to enable the SAR system to respond and conduct its mission; and

(e) Search and rescue units to be dispatched to the vicinity of the distress and to home on signals from equipment used by survivors.

2.2 General operating requirements for SAR communications include the following.

(a) *Timely delivery of alerts*. Fast delivery of alert messages to the RCC is crucial for response to a distress alert and for successful rescues. Alerts from aeronautical or maritime communications equipment must be passed to the RCC directly and quickly.

(b) *Complete and easy to understand alerts*:

(i) Information in all pre-formatted data alert message fields must be complete, accurate and easy to understand;

(ii) Alerts with coded or missing data, wrong aircraft or vessel identities or positions, false alerts, etc., are detrimental to lifesaving. RCCs are obligated to consider every alert it receives to be related to a real distress, and to promptly respond to it;

(iii) Systems intended for distress alerting must be sufficiently reliable to only generate alerts in real distress situations, and the alert must not require any special time, effort or training on the part of the RCC to interpret;

(iv) Communications data to support SAR must be consistent, complete, and if possible, delivered along with or shortly after the associated alert. Information on emergency contacts on land is often critical; and

(v) Equipment for distress alerting must be registered from when it is installed.

(c) *Minimum number of false alerts*: False alerts are any alerts received by the SAR system which indicate an actual or potential distress situation when no such situation actually exists. Some causes of false alerts include equipment malfunctions, interference, testing, and inadvertent human error. A false alert transmitted deliberately is called a hoax. As more alerting equipment transmits automatic pre-formatted data messages, there will be a tendency for the

numbers of false alerts to increase. If counter-measures are not developed, this will place increasing strain on the SAR system, bring increasing risk to SAR personnel, and harm the credibility of alerting systems needed to inform the SAR system when help is needed. It is essential that SAR personnel treat every distress alert as genuine until they know differently.

(d) *Capability to contact units in distress*. If the vessel or aircraft sending an alert is still operational, an RCC must be able to contact it directly or via an appropriate communications facility on the same equipment it used to contact the RCC (except for ELT and EPIRB alerts). This contact is needed for acknowledgement and subsequent two-way communications to obtain information to support SAR planning and operations. If an alert is received either via satellite services or ATS from an ELT or EPIRB, the survivors may have lost all other means of alerting.

(e) *Common Language*. The language to be used for SAR is English. The RCC must always have personnel on watch who are able to speak, read, and write the English language to enable timely and effective communications with aircraft, vessels and other RCCs. Where a language barrier exists with other neighbouring States during SAR operations, it will be necessary to have a person at the RCC or on call to provide translation.

2.3 Publications which can be used to overcome language barriers and circumstances among vessels, aircraft, survivors, and SAR personnel include: the International Code of Signals and the Standard Marine Navigational Vocabulary. These documents should be included in RCC libraries and be understood by the staff, who should be able to recognize coded messages based on these references. Ships should carry these documents and search and rescue units should carry the Code.

2.4 While tools like the Code and Vocabulary exist, they are not intended to be used for verbal communications among SAR personnel and others who must be able to speak English.

3. Important factors for SAR communication

3.1 The important factors to be considered in SAR communication include:

(a) ***Priority, reliability and availability:***

(i) To reduce delays and improve the value of communications, systems must be improved on an end-to-end basis. All sea, land, air and space segments must be examined to eliminate weak links, delays and deterioration of quality.

(ii) Distress messages should always have priority, i.e., be processed before all other communications.

(iii) Because of the time-critical nature of SAR services, communications must work well at all times.

(iv) Besides work well, the equipment, must also be available to all parties involved at all times.

(b) ***Interoperability***. Communications must be able to take place reliably and quickly between units in distress and the SAR system, and between components of the SAR system, nationally and internationally. Civil vessel and aircraft must have basic alerting equipment which will be effective for the area in which they operate. The SAR coordinating agency must ensure:

(i) availability of land-based infrastructure to receive, process and route distress alerts quickly to the appropriate place in the SAR system;

(ii) availability of communications databases to support alerts which are data rather than voice.

(iii) that systems which are not directly interoperable with each other are interlinked through indirect arrangements; and

(iv) that all those involved with the SAR operations are provided with communications procedures, frequencies and equipment sufficiently compatible to carry out their duties;

(c) ***Identification***. All radio transmission sources must be identifiable.

(d) ***Geography***. Geography should be considered in setting up a communications system. Terrain, distances and other geographic factors can limit the types of equipment or methods which will be effective.

(e) ***International coordination.*** Co-ordination of modern communications on a regional or even global basis is important with the use of long-range and satellite communications.

(f) ***Available technology.*** Technological advances, like the Internet and low earth orbit satellites can be used. Persons in distress may use any means available to call for help. Systems such as cellular telephones, low-power mobile satellite equipment, paging systems, amateur radios, and portable computers are examples of available technologies for communication.

(SAR personnel must however be aware of capabilities and limitations of the various modern means of communications being developed which could be used for distress alerting and SAR).

3.2 Mobile equipment

3.2.1 Mobile equipment are used by persons in distress and SAR facilities for distress communications. Distress communications must be used when immediate assistance is required by persons, aircraft, or marine craft in distress, which may include medical assistance. Distress calls must be given absolute priority over all other transmissions; anyone receiving a distress call must immediately cease any transmissions which may interfere with the call and listen on the frequency used for the call.

Equipment Used by Persons in Distress

3.2.2 Persons in distress may use any available means of communication for distress alerting. However, some vessels and aircraft are subject to international carriage requirements for distress communication:

(a) Civil aircraft operating over ocean areas and remote land areas, and other aircraft, are required to carry an emergency locator transmitter (ELT). Designated SAR aircraft shall be able to home on ELT 121.5 MHz signals for locating a distress scene and survivors.

(b) Ships and some other craft at sea are required to carry emergency position-indicating radio beacons (EPIRBs) capable of transmitting signals to indicate that a distress exists and to facilitate location of survivors during a SAR operation.

(c) Some ships may carry radios for use in survival craft capable of transmitting and receiving on the frequency 2182 kHz (radiotelephony). Some vessels may also carry portable survival craft VHF transceivers.

3.2.4 Where alerts are received with missing or inaccurate position information, location information may be obtained from direction-finding or homing devices, if available, to locate distressed persons and allow the SRUs to be dispatched to the immediate vicinity of the distress.

3.2.4 Position information received with an ELT or EPIRB alert, as might be provided with the navigation capabilities of an integrated Global Navigation Satellite System (GNSS) such as the Global Positioning System (GPS), should not be considered an adequate substitute for locating signals. GPS positions are often sufficient, but without comparably precise navigation equipment aboard search facilities, or in situations involving low visibility, direction finding or homing are essential.

Search and rescue units

3.2.5 Equipment provided to be carried aboard designated SRUs must be able to support co-ordination and locating functions.

3.2.6 Suitable means should be provided within an SRR to determine positions for SAR operations, especially over land and in coastal areas. These may include surveillance systems for aircraft and vessel traffic services systems, and DF stations. If there is any way to confirm the position reported in an alert, it would be prudent to do so, especially with initial EPIRB and ELT alerts via COSPAS-SARSAT which provide both a true and an image position.

3.2.7 Lines of position (LOPs) can be obtained from direction-finding (DF) equipment within range of radio or other compatible signals. Two or more LOPs can be used to estimate the position of an aircraft or vessel. DF equipment can be effective on land or installed aboard search and rescue units (SRUs).

3.2.8 Satellite systems with three dimensional capability and high accuracy, used for navigation e.g., GPS or GLONASS, may be used for navigation and for finding the search targets.

3.2.9 Designated SAR aircraft should be able to communicate on common maritime frequencies. Also, since most aeronautical and maritime survival craft equipment operates on 121.5 MHz AM, SAR and military aircraft should be able to use this frequency for voice communications.

3.2.10 SAR authorities may provide SRUs with:

(a) ability to operate on the frequencies 3023 kHz, 4125 kHz, 5680 kHz, 121.5 MHz, 123.1 MHz, and 2182 kHz;

(b) search and rescue radar transponder (SART)-compatible 9 GHz radars;

(c) disposable droppable radios operating on 123.1 MHz AM which can be dropped for survivors to use to communicate with SAR aircraft on-scene; and

(d) capability to actuate one of the radiotelephone alarms aboard vessels in the vicinity to help establish communications with them more directly

3.3 Land-based infrastructure

3.3.1 The reliability and availability of the communication network which supports distress communication must be considered on an end-to-end basis. Land-based infrastructure shall include:

(a) Alerting posts: These include;
(i) coast radio stations,
(ii) COSPAS-SARSAT local user terminals and mission control centres(MCCs)
(iii) Inmarsat land earth stations (LESs) (also known as maritime coast earth stations (CESs) and aeronautical ground earth stations (GESs));
(iv) air traffic services (ATS) units; and
(v) vessels, aircraft, or other persons or facilities which may receive and relay alerts.

(b) SAR communication networks; e.g. radio frequencies, AFTN, ATN

(c) SAR data providers; e.g. the authority maintaining ELT/EPIRB database

(d) Global Maritime Distress and Safety System (GMDSS). Where shore-based communication facilities to support ships carrying GMDSS are provided, the SAR managers must ensure that this information is included in the SAR plan and that the RCCs, communications facilities, ships and training institutes have a copy of the Plan.

(e) Ship reporting systems for SAR. Ship reporting systems are communication intensive and may be important to successful rescue of persons from aircraft to marine crafts in remote ocean areas. The SAR coordinating agency must, where practicable:

(i) either directly or via their State's maritime safety authorities, recruit or require such ships to participate in their SAR operations.

(ii) arrange for messages regarding SAR to be relayed free of charge to ships, and support any appropriate measures to enable such reports to be submitted with improved accuracy and ease; and

(iii) take advantage of ship reporting systems, where they exist, in arranging rescues by ships at sea. This requires communications needed to retrieve reporting system data, and to contact ships from the system's plot.

3.4 Supplemental capabilities

3.4.1 Supplemental communication systems that may be provided include:

(a) Instant replay recording equipment;
(b) Telephone equipment such as answering machines, voicemail, call forwarding, automatic speed dialing, etc.;
(c) Equipment that enable caller identification for incoming calls;
(d) Two- or three-digit emergency landlines or cellular telephones.

3.5 MEDICO Communications

Commercial and Government radio stations may be used to provide free medical message service to ships. Messages requesting medical advice are normally delivered only to hospitals or other facilities based on prior arrangements. These incoming or outgoing messages should be prefixed with ''DH MEDICO'. Inmarsat provides service access codes (SACs) for medical advice and medical assistance.

3.6 Radio call signs for aircraft involved in SAR operations

3.5.1 During search and rescue missions and exercises the following prefix call signs be used before the ordinary radio call sign or as a specific mission call sign:

''RESCUE'' - for all airborne units involved in a rescue mission

''AIR CO-ORDINATOR'' - for the aircraft co-ordinator (ACO)

''SAREX'' - for all airborne units involved in international/national exercises

4. SAR co-ordination

4.1 Communications among SAR facilities will depend on local agreements and the organization of the SAR services in the SRR and on the equipment available. Communications with mobile facilities may be handled directly by the RCC or RSC or via capable associated alerting posts. Communications with alerting posts or other elements of the SAR system, including international communications among RCCs, should be reliable and, ideally, either be dedicated or preserve message priority or pre-emptive handling. RCCs normally assign a SAR Mission Co-ordinator (SMC) to handle a SAR incident. The SMC may specify pre-planned communications channels for co-ordination with the OSC and for communications among facilities on-scene.

4.2 Communications to and from RCCs and RSCs should be as timely and reliable as possible and sufficient to handle the total diversity and volume of needs for the worst potential scenarios. Specific details are provided in the International Aeronautical and Maritime Search and Rescue Manual for Mission Co-ordination.

4.3 On-scene channels are used between SRUs and the OSC. The SMC must specify an on-scene communications channel for use by all SRUs based on the equipment carried by the SRUs. If an on-scene radio frequency is required for communications between air and surface facilities involved in a SAR operation, distress and on-scene frequencies may be used. Designated SAR aircraft operating in maritime areas must be equipped with a frequency for communicating with vessels during SAR operations.

4.4 Voluntary fitting of air band radio equipment, should be encourage especially on marine SAR units and government vessels, but also on the International Convention for the Safety of Life at Sea (SOLAS) ships operating in areas where working with aircraft not fitted with maritime band radio equipment is known to be a possibility.

4.5 SAR co-ordinators must consider the need for communications between aircraft and surface units within their SAR Regions, and ensure that this need can be met even for aircraft that cannot communicate directly on maritime frequencies. Typically, the RCC should be able to provide a communication link between the aircraft and surface units with their own equipment or by making other arrangements. SAR and government vessels should be encouraged to fit equipment to be able to communicate directly on aeronautical frequencies. Passenger ships subject to the SOLAS Convention are required to have this capability.