



Volume I
**ORGANIZATION
AND MANAGEMENT**

2008 Edition

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IAMSAR MANUAL

International Aeronautical and Maritime Search and Rescue Manual



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**INTERNATIONAL AERONAUTICAL AND
MARITIME SEARCH AND RESCUE MANUAL**

Volume I

ORGANIZATION AND MANAGEMENT

2008 Edition

**incorporating 2001, 2002, 2003, 2004,
2005, 2006 and 2007 amendments**



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Foreword

The primary purpose of the three volumes of the *International Aeronautical and Maritime Search and Rescue Manual* (IAMSAR Manual) is to assist States in meeting their own search and rescue (SAR) needs, and the obligations they accepted under the Convention on International Civil Aviation, the International Convention on Maritime Search and Rescue and the International Convention for the Safety of Life at Sea (SOLAS). These volumes provide guidelines for a common aviation and maritime approach to organizing and providing SAR services. States are encouraged to develop and improve their SAR services, co-operate with neighbouring States and to consider their SAR services to be part of a global system.

Each volume of the IAMSAR Manual is written with specific SAR system duties in mind, and can be used as a stand-alone document, or, in conjunction with the other two Manuals, as a means to attain a full view of the SAR system.

The *Organization and Management* volume (volume I) discusses the global SAR system concept, establishment and improvement of national and regional SAR systems and co-operation with neighbouring States to provide effective and economical SAR services;

The *Mission Co-ordination* volume (volume II) assists personnel who plan and co-ordinate SAR operations and exercises; and

The *Mobile Facilities* volume (volume III) is intended to be carried aboard rescue units, aircraft, and vessels to help with performance of a search, rescue, or on-scene co-ordinator function and with aspects of SAR that pertain to their own emergencies.

Organization and Management Manual

Chapter 1 presents an overview of the SAR concept, including what is involved in providing SAR services, and why such services are required and beneficial. The SAR system is examined from a global, regional and national perspective.

Chapter 2 introduces some of the key components of the SAR system. These include communications, rescue co-ordination centres and sub-centres, operational and support facilities and the on-scene co-ordinator.

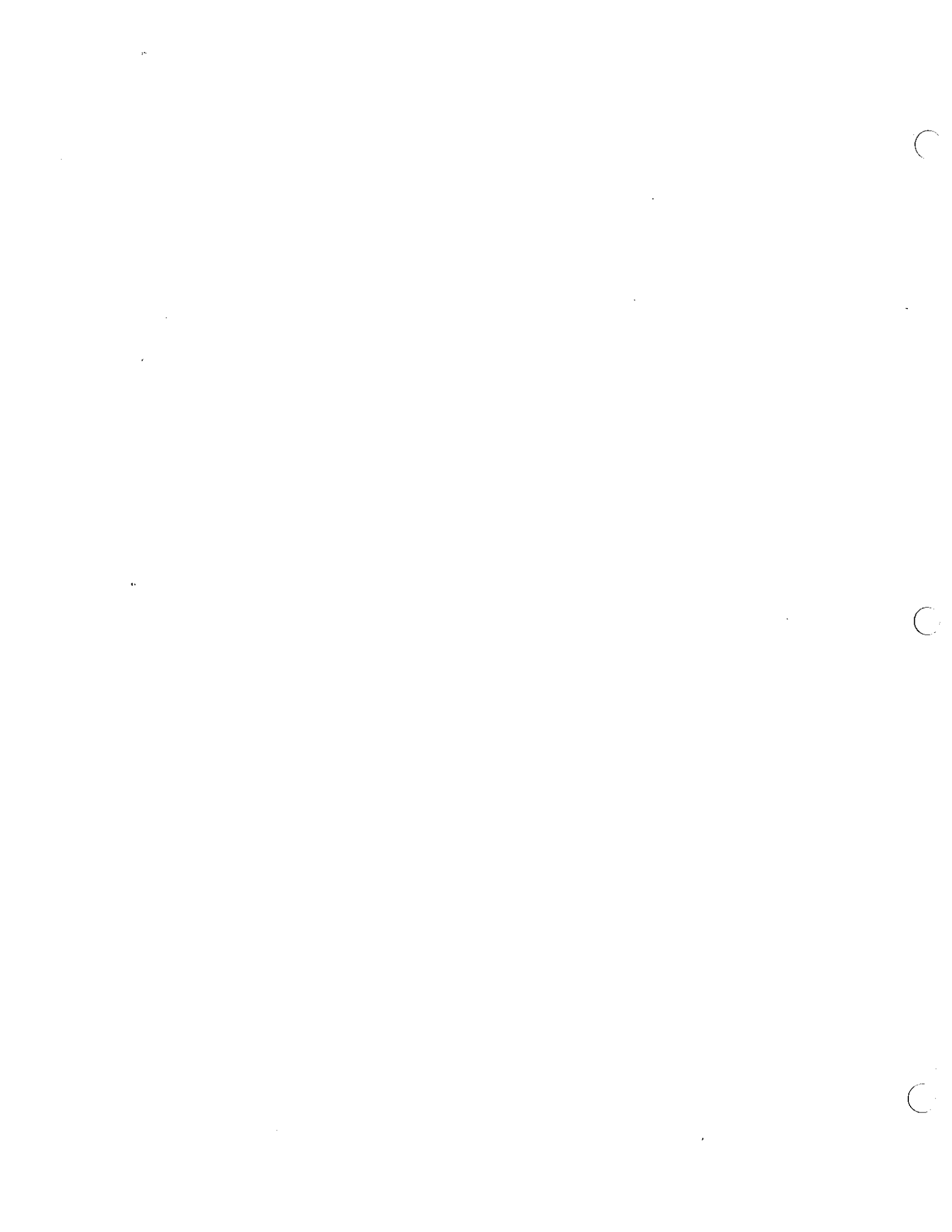
Chapter 3 considers the use of training, qualification, and certification processes to develop professionally competent SAR personnel. A number of aspects of training and of exercises used for training, are examined in detail.

Chapter 4 describes the communications needs of the SAR organization for reception of distress alerts and for supporting effective co-ordination among the various components of the SAR system.

Chapter 5 provides an overall management perspective of the SAR system.

Chapter 6 discusses the necessary factors and recommends some techniques for creating an organizational environment that fosters improvement of services.

This Manual is published jointly by the International Civil Aviation Organization and the International Maritime Organization. It has been updated from earlier editions by including the amendments that were adopted by the seventy-fourth session of the IMO Maritime Safety Committee in June 2001 (which entered into force on 1 July 2002), by the seventy-fifth session in May 2002 (which entered into force on 1 July 2003), by the seventy-seventh session in June 2003 (which entered into force on 1 July 2004), by the seventy-eighth session in May 2004 (which entered into force on 1 July 2005), by the eightieth session in May 2005 (which entered into force on 1 June 2006), by the eighty-first session in May 2006 (which entered into force on 1 June 2007) and by the eighty-third session in October 2007 (which apply as from 1 June 2008).



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Abbreviations and Acronyms

A/C	aircraft	ICAO	International Civil Aviation Organization
ACC	area control centre	IFR	instrument flight rules
ACO	aircraft co-ordinator	ILS	instrument landing system
AES	aeronautical earth station	IMC	instrument meteorological conditions
AFN	aeronautical fixed network	IMO	International Maritime Organization
AFTN	aeronautical fixed telecommunications network	IMSO	International Mobile Satellite Organization
AIP	Aeronautical Information Publication	Inmarsat	Satellite communication service provider for the GMDSS
AIS	aeronautical information services	INS	inertial navigation system
AM	amplitude modulation	ITU	International Telecommunication Union
AMS	aeronautical mobile service	JRCC	joint (aeronautical and maritime) rescue co-ordination centre
AMS(R)S	aeronautical mobile satellite (route) service	kHz	kilohertz
AMSS	aeronautical mobile satellite service	LES	land earth station
Amver	automated mutual-assistance vessel rescue	LUT	local user terminal
ANC	Air Navigation Commission	MCC	mission control centre
ARCC	aeronautical rescue co-ordination centre	MF	medium frequency
ARSC	aeronautical rescue sub-centre	MHz	megahertz
ATC	air traffic control	MMSI	maritime mobile service identity
ATN	aeronautical telecommunications network	MRCC	maritime rescue co-ordination centre
ATS	air traffic services	MRO	mass rescue operation
CES	coast earth station	MRSC	maritime rescue sub-centre
Cospas	Space System for Search of Vessels in Distress	MRU	mountain rescue unit
CRS	coast radio station	MSI	maritime safety information
C/S	call sign	NBDP	narrow-band direct printing
CW	continuous wave	NM	nautical mile
DF	direction finding	NOTAM	notice to airmen
DME	distance measuring equipment	OSC	on-scene co-ordinator
DRU	desert rescue unit	OSV	offshore supply vessel
DSC	digital selective calling	PLB	personal locator beacon
ELT	emergency locator transmitter	PRU	parachute rescue unit
EPIRB	emergency position-indicating radio beacon	R&D	research and development
FIC	flight information centre	RANP	regional air navigation plan
FIR	flight information region	RCC	rescue co-ordination centre
FM	frequency modulation	RF	radio frequency
GES	ground earth station	RSC	rescue sub-centre
GHz	gigahertz	RTG	radio telegraphy
GLONASS	Global Orbiting Navigation Satellite System	SAR	search and rescue
GMDSS	Global Maritime Distress and Safety System	Sarsat	Search and Rescue Satellite-Aided Tracking
GNSS	Global Navigation Satellite Systems	SART	search and rescue radar transponder
GPS	global positioning system	SC	SAR co-ordinator
HF	high frequency		

Abbreviations and Acronyms

SCC	SAR Co-ordinating Committee	TLX	telex
SDP	SAR data provider	UHF	ultra-high frequency
SES	ship earth station	UIR	upper flight information region
SITREP	situation report	USAR	urban search and rescue
SMC	SAR mission co-ordinator	UTC	co-ordinated universal time
SOLAS	International Convention for the Safety of Life at Sea	VFR	visual flight rules
SPOC	SAR point of contact	VHF	very-high frequency
SRR	search and rescue region	VMC	visual meteorological conditions
SRS	search and rescue sub-region	VOR	VHF omnidirectional radio range
SRU	search and rescue unit	WMO	World Meteorological Organization

Glossary

Aircraft co-ordinator (ACO)	A person or team who co-ordinates the involvement of multiple aircraft in SAR operations in support of the SAR mission co-ordinator and on-scene co-ordinator.
Alert phase	A situation wherein apprehension exists as to the safety of an aircraft or marine vessel and of the persons on board.
Alerting post	Any facility intended to serve as an intermediary between a person reporting an emergency and a rescue co-ordination centre or rescue sub-centre.
Amver	A world-wide ship reporting system for search and rescue.
Area control centre (ACC)	An air traffic control facility primarily responsible for providing ATC services to IFR aircraft in controlled areas under its jurisdiction.
Captain	Master of a ship or pilot-in-command of an aircraft, commanding officer of a warship or an operator of any other vessel.
Coast earth station (CES)	Maritime name for an Inmarsat shore-based station linking ship earth stations with terrestrial communications networks.
Cospas-Sarsat system	A satellite system designed to detect distress beacons transmitting on the frequencies 121.5 MHz and 406 MHz.
Craft	Any air or sea-surface vehicle, or submersible of any kind or size.
Digital Selective Calling (DSC)	A technique using digital codes which enables a radio station to establish contact with, and transfer information to, another station or group of stations.
Direction finding (DF)	Homing on signals to pinpoint a position.
Distress alerting	The reporting of a distress incident to a unit which can provide or co-ordinate assistance.
Distress phase	A situation wherein there is reasonable certainty that a vessel or other craft, including an aircraft or a person, is threatened by grave and imminent danger and requires immediate assistance.
Ditching	The forced landing of an aircraft on water.
Emergency locator transmitter (ELT)	Aeronautical radio distress beacon for alerting and transmitting homing signals.
Emergency phase	A generic term meaning, as the case may be, uncertainty phase, alert phase or distress phase.
Emergency position-indicating radio beacon (EPIRB)	A device, usually carried aboard maritime craft, that transmits a signal that alerts search and rescue authorities and enables rescue units to locate the scene of the distress.
Flight information centre (FIC)	A unit established to provide flight information and alerting services.
General communications	Operational and public correspondence, traffic other than distress, urgency and safety messages, transmitted or received by radio.

Global Maritime Distress and Safety System (GMDSS)	A global communications service based upon automated systems, both satellite-based and terrestrial, to provide distress alerting and promulgation of maritime safety information for mariners.
Global positioning system (GPS)	A specific satellite-based system used in conjunction with mobile equipment to determine the precise position of the mobile equipment.
Inmarsat	A system of geostationary satellites for world-wide mobile communications services and which support the Global Maritime Distress and Safety System and other emergency communications systems.
Joint rescue co-ordination centre (JRCC)	A rescue co-ordination centre responsible for both aeronautical and maritime search and rescue incidents.
Local user terminal (LUT)	An earth receiving station that receives beacon signals relayed by Cospas-Sarsat satellites, processes them to determine the location of the beacons and forwards the signals.
Mass rescue operation (MRO)	Search and rescue services characterized by the need for immediate response to large numbers of persons in distress, such that the capabilities normally available to search and rescue authorities are inadequate.
Mission control centre (MCC)	Part of the Cospas-Sarsat system that accepts alert messages from the local user terminal(s) and other mission control centres to distribute to the appropriate rescue co-ordination centres or other search and rescue points of contact.
NAVAREA	One of 16 areas into which the world's oceans are divided by the International Maritime Organization for dissemination of navigation and meteorological warnings.
NAVTEX	The system for the broadcast and automatic reception of maritime safety information by means of narrow-band direct-printing telegraphy.
On-scene co-ordinator (OSC)	A person designated to co-ordinate search and rescue operations within a specified area.
Personal locator beacon (PLB)	Personal radio distress beacon for alerting and transmitting homing signals.
Pilot-in-command	The pilot responsible for the operation and safety of the aircraft during flight time.
Rescue	An operation to retrieve persons in distress, provide for their initial medical or other needs and deliver them to a place of safety.
Rescue co-ordination centre (RCC)	A unit responsible for promoting efficient organization of search and rescue services and for co-ordinating the conduct of search and rescue operations within a search and rescue region. <i>Note:</i> The term <i>RCC</i> will be used within this Manual to apply to either aeronautical or maritime centres; <i>ARCC</i> or <i>MRCC</i> will be used as the context warrants.
Rescue sub-centre (RSC)	A unit subordinate to a rescue co-ordination centre established to complement the latter according to particular provisions of the responsible authorities. <i>Note:</i> The term <i>RSC</i> will be used within this Manual except where it applies only to aeronautical or maritime; <i>ARSC</i> or <i>MRSC</i> will then be used.

SafetyNET	A service of Inmarsat enhanced group call (EGC) system specifically designed for promulgation of maritime safety information (MSI) as a part of the Global Maritime Distress and Safety System (GMDSS).
Search	An operation, normally co-ordinated by a rescue co-ordination centre or rescue sub-centre, using available personnel and facilities to locate persons in distress.
Search and rescue co-ordinating communications	Communications necessary for the co-ordination of facilities participating in a search and rescue operation.
Search and rescue co-ordinator (SC)	One or more persons or agencies within an Administration with overall responsibility for establishing and providing SAR services and ensuring that planning for those services is properly co-ordinated.
Search and rescue data provider (SDP)	A source for a rescue co-ordination centre to contact to obtain data to support search and rescue operations, including emergency information from communications equipment registration databases, ship reporting systems and environmental data systems (e.g., weather or sea current).
Search and rescue facility	Any mobile resource, including designated search and rescue units, used to conduct search and rescue operations.
Search and rescue mission co-ordinator (SMC)	The official temporarily assigned to co-ordinate response to an actual or apparent distress situation.
Search and rescue plan	A general term used to describe documents which exist at all levels of the national and international search and rescue structure to describe goals, arrangements and procedures which support the provision of search and rescue services.
Search and rescue point of contact (SPOC)	Rescue co-ordination centres and other established and recognized national points of contact which can accept responsibility to receive Cospas-Sarsat alert data to enable the rescue of persons in distress.
Search and rescue region (SRR)	An area of defined dimensions, associated with a rescue co-ordination centre, within which search and rescue services are provided.
Search and rescue service	The performance of distress monitoring, communication, co-ordination and search and rescue functions, including provision of medical advice, initial medical assistance, or medical evacuation, through the use of public and private resources, including co-operating aircraft, vessels and other craft and installations.
Search and rescue sub-region (SRS)	A specified area within a search and rescue region associated with a rescue sub-centre.
Search and rescue unit (SRU)	A unit composed of trained personnel and provided with equipment suitable for the expeditious conduct of search and rescue operations.
Search object	A ship, aircraft, or other craft missing or in distress or survivors or related search objects or evidence for which a search is being conducted.
Uncertainty phase	A situation wherein doubt exists as to the safety of an aircraft or a marine vessel, and of the persons on board.

Glossary

Unnecessary SAR alert (UN SAR) A message sent by an RCC to the appropriate authorities as a follow-up when the SAR system is unnecessarily activated by a false alert.

Vessel A maritime craft.

General System Concept

1.1 Establishing Services

- 1.1.1** Every State recognizes the great importance of saving lives and the need to be directly involved in rendering aeronautical and maritime search and rescue (SAR) services to persons in distress. This Manual provides a manager's perspective on supporting SAR services under the framework of SAR initiatives sponsored by the International Civil Aviation Organization (ICAO) and the International Maritime Organization (IMO), two agencies of the United Nations devoted to aeronautical and maritime transportation safety, respectively.
- 1.1.2** With a focus on the humanitarian nature of their work, member States of ICAO and IMO co-operate to develop and sponsor vital standards and recommendations, to provide other types of assistance to States to help prevent and cope with distress situations and to facilitate international co-operation and co-ordination on a daily basis.
- 1.1.3** ICAO and IMO jointly developed this Manual to foster co-operation between themselves, between neighbouring States, and between aeronautical and maritime authorities. The goal of the Manual is to assist State authorities to economically establish effective SAR services, to promote harmonization of aeronautical and maritime SAR services, and to ensure that persons in distress will be assisted without regard to their locations, nationality, or circumstances. State authorities are encouraged to promote, where possible, harmonization of aeronautical and maritime SAR services.
- 1.1.4** This Manual will assist those responsible for establishing, managing, and supporting SAR services to understand the:
- functions and importance of SAR services;
 - relationships between global, regional, and national aspects of SAR;
 - components and support infrastructure essential for SAR;
 - training needed to co-ordinate, conduct, and support SAR operations;
 - communications functions and requirements for SAR; and
 - basic principles of managing and improving SAR services to ensure success.
- 1.1.5** This Volume is one of three developed by ICAO and IMO as the *International Aeronautical and Maritime Search and Rescue Manual*. The others are the *International Search and Rescue Manual for Mission Co-ordination* and the *International Search and Rescue Manual for Mobile Facilities*. This volume attempts to ensure that managers understand the basic concepts and principles involved in SAR, and to provide practical information and guidance to help managers establish and support SAR services.

1.2 Benefits of Services

- 1.2.1** Besides reduction of loss of life and suffering by providing rescue services, a State's concern and involvement with SAR may offer other advantages, such as the following.
- (a) A safer and more secure environment for aviation and maritime related industries, commerce, recreation, and travel. Increased safety may promote use and enjoyment of aviation and maritime environments, tourism and economic development. This is especially true when the SAR system is associated with programmes aimed at preventing or reducing the effects of mishaps, sometimes referred to as "Preventive SAR."
 - (b) Availability of SAR resources often provides the initial response and relief capabilities critical to saving lives in early stages of natural and man-made disasters. Therefore, SAR services are sometimes made an integral part of any local, national or regional emergency management system.

- (c) Well performed SAR operations can provide positive publicity about situations which may otherwise be viewed negatively. However, the opposite is also true; a poor response or ineffective response to a major accident or disaster can also result in world-wide publicity and adversely affect sensitive industries such as tourism and transportation.
- (d) SAR provides an excellent means for promoting co-operation and communication among States and between organizations at local, national, and international levels, because it is a relatively non-controversial and humanitarian mission. Co-operation in this area can lead to co-operation in other areas as well and can be used as a leadership tool for promoting good working relationships.
- (e) The value of property which can be saved in association with SAR activities can be high and provide additional justification for SAR services.

1.3 Legal Basis for Services

1.3.1 As Party to the International Convention for the Safety of Life at Sea (SOLAS), the International Convention on Maritime Search and Rescue, or the Convention on International Civil Aviation, a Party undertakes to provide certain aeronautical and/or maritime SAR co-ordination and services. Reference to Search and Rescue is also contained in the UN Convention on Law of the Sea, 1982. This Convention includes a general statement at Article 98, paragraph 2, dealing with search and rescue:

Every coastal State shall promote the establishment, operation and maintenance of an adequate and effective search and rescue service regarding safety on and over the water and, where circumstances so require, by way of mutual regional arrangements, co-operate with neighbouring States for this purpose.

The international community expects these commitments to be fulfilled by all State parties.

1.3.2 These services can be provided by States individually establishing effective national SAR organizations, or by establishing a SAR organization jointly with one or more other States. The role of agreements and plans in establishing SAR services will be discussed throughout this Manual.

1.3.3 Appendix M provides an overview of the relevant articles, annexes and chapters of the International Convention on Maritime Search and Rescue and the Convention on International Civil Aviation.

1.3.4 Every State should have in place statutes and related provisions that establish a legal foundation for establishing a SAR organization and its resources, policies, and procedures.

1.3.5 SAR managers should seek legal advice on how domestic and international laws pertain to SAR policies and procedures.

1.3.6 State legislative provisions should be aligned with accepted principles of international law, and may serve purposes such as:

- recognizing the SAR function as a State responsibility;
- implementing IMO and ICAO requirements and standards;
- designating SAR agencies and their general responsibilities; and
- defining the jurisdiction and legal authority of the RCC in accordance with relevant standards of ICAO and IMO.

1.3.7 Legislation may also be used to promote sound design, construction, maintenance and operation of aircraft, vessels and other craft.

1.3.8 International law addresses concerns for saving lives and concerns for sovereignty. Neighbouring States should seek practical means to balance these concerns for situations where entry of foreign SAR facilities into territorial waters or territory may be necessary or appropriate.

1.3.9 Sample legislation is provided in appendix A.

1.4 Basic System Functions

1.4.1 Any SAR system should be structured to perform the following functions effectively:

- receive, acknowledge, and relay notifications of distress;
- co-ordinate SAR response; and
- conduct SAR operations.

- 1.4.2** Chapter 2 discusses the primary SAR system components available or necessary to carry out the above functions and chapter 4 elaborates on the communications component. Portions of chapters 2 and 5 review the staffing required to perform basic SAR system functions and their needs, and chapter 3 discusses how SAR personnel can achieve an effective level of professionalism in their work.
- 1.4.3** SAR services include not only finding persons in distress and removing them from danger, but also providing for initial medical or other needs and delivering survivors to a place of safety.
- 1.5 System Management and Support**
- 1.5.1** The SAR system cannot be organized and effective without management and support. Chapters 5 and 6 attempt to ensure that SAR system managers understand:
- the fundamentals of the system they are managing;
 - their own basic responsibilities and functions;
 - key types of SAR plans and planning processes; and
 - how to begin with available resources and economically improve the system.
- 1.5.2** To ensure success, the involved parties must be committed to providing the best possible SAR services with available resources. This commitment should also be reflected in national legislation designating agencies responsible for SAR.
- 1.5.3** Agencies or persons may be designated as *SAR Co-ordinators (SCs)*, and given oversight responsibilities within the national SAR organization. Besides SCs, others will be involved in managing and supporting various aspects of the SAR organization and system. "SC" is simply an optional designation which may be used to highlight the fact that co-ordination is important at the management level, in addition to the co-ordination centre and on-scene levels, of the SAR system.
- 1.5.4** States can assign SAR responsibilities as they choose. For illustration, some States assign SCs from departments or ministries responsible for maritime or aeronautical safety or for implementation of the Conventions of IMO or ICAO. Alternatives may include assigning the Minister of Transport who often has overall responsibility for both aeronautical and maritime safety or assigning SCs for each of these areas. When States co-operate to form a regional SAR system, each State may wish to assign an SC to oversee its portion of the system. States with several organizations involved in providing SAR services may have several entities doing what could be referred to as SC functions.
- 1.5.5** SCs seldom control all of the resources available for SAR operations. Therefore, they may arrange agreements with military and other agencies or organizations for use of resources.
- 1.5.6** Close co-operation between various civilian and military organizations is essential. One way to handle this is through National SAR Co-ordinating Committees which is further discussed in chapter 6. Legislation could provide for use of military and other public resources to support SAR.
- 1.5.7** Resources will be needed to gather performance data and review, analyze and recommend improvements in the SAR system and its operation. But even before a new system is started, a needs and capabilities analysis should be conducted. Chapters 5 and 6 will help with these efforts.
- 1.5.8** Commitments of various agencies and States to support the SAR system are often documented in a variety of plans, agreements, memoranda of understanding, etc., which evolve over time in a hierarchical fashion at the local, national and regional levels. Such instruments are discussed in detail in various other places in this Manual. Great care should be exercised in drafting such documents, so that they support SAR rather than unrelated concerns and remain consistent with higher level instruments and with international law.
- 1.5.9** Almost every State can satisfy its SAR needs cost-effectively by using all available resources, not just dedicated or specially designated resources; typical sources are discussed in chapter 2. Government, industry and general population sources tend to desire to support the SAR organization, but SAR managers need to take the initiative to make arrangements for them to do so. With a few exceptions, SAR resources are multi-mission facilities, that is, they perform SAR functions in addition to other missions.
- 1.5.10** Advanced planning, training, and some specialized equipment can often economically improve the quality of SAR services performed by alternative existing resources. This may reduce or eliminate the need for specially designated SAR units (SRUs) for some States.

- 1.5.11 When necessary, a rescue co-ordination centre (RCC) with an associated search and rescue region (SRR), and perhaps a rescue sub-centre (RSC) with one or more associated search and rescue sub-regions (SRSs), should be established. All RCCs and RSCs must satisfy certain minimum requirements. Provision of these and other facilities for SAR is discussed further in chapter 2.
- 1.5.12 The general levels and functions of the SAR system are shown in Figure 1-1.

General Levels	General Functions
SAR Co-ordination	Management
SAR Mission Co-ordination	Mission Planning
On-scene Co-ordination	Operational Oversight

Figure 1-1 – Co-ordination structure

1.6 The Global Concept

- 1.6.1 Understanding national SAR efforts as an integral part of a world-wide SAR system affects the overall approach a State will take to establish, provide and improve SAR services. Briefly, the goal of ICAO and IMO is to provide an effective world-wide system, so that wherever people sail or fly, SAR services will be available if needed.
- 1.6.2 In most areas of the world, *the fastest, most effective and practical way to achieve this goal is to develop regional systems associated with each ocean area and continent.* This differs from the approach whereby every State independently establishes a complete stand-alone SAR system with geographic areas of responsibility acceptable to their neighbouring States, the collection of which will comprise the global system. However, the regional approach does require the States associated with an ocean or land area to collaborate and co-operate to develop and operate the regional system.
- 1.6.3 A basic, practical, and humanitarian characteristic of the global aspect of SAR is that it eliminates the need for each State to provide SAR services for its own citizens wherever they travel world-wide. Instead, the globe is divided into SRRs, each with associated SAR services which assist anyone in distress within the SRR without regard to nationality or circumstances.

1.7 National and Regional Systems

- 1.7.1 SAR systems can be established on a national or regional level, or both. Either way, the process involves establishment of one or more SRRs, along with capabilities to receive alerts, and to co-ordinate and conduct SAR services within each SRR via an RCC. Each SRR needs an RCC, but each State does not necessarily need an SRR if one RCC can be supported by and serve more than one State. This is especially true in ocean areas. In such cases, each State may establish an RSC. Chapter 2 will further discuss the establishment of SRRs.
- 1.7.2 A regional approach can reduce cost and improve distribution of distress alerts, coverage and services. For example, it is usually less operationally complex, and more economical and effective, for States within a region to share the use and support of long-range terrestrial and satellite communications facilities and communications registration databases to support SAR. States can sometimes support each other with SRUs to reduce the total number of units needed for adequate coverage and readiness. Training and other types of resources can be shared to everyone's benefit. Nevertheless, participation in a regional system may not be the best approach for every State.
- 1.7.3 Establishment of national or regional SAR systems is typically based on development of multilateral national or regional plans, agreements, etc. (further discussed in other portions of this volume), to suit the desires and needs of the States involved. These documents may discuss establishment of RSCs, equivalent arrangements in lieu of establishing SRRs, etc., but usually provide for:
- effective use of all available resources for SAR;
 - delineation of SRRs;
 - description of relationships between the parties;

- discussion of how higher level conventions, plans, agreements, etc., will be implemented and supported.

1.7.4 The basic requirements for developing an effective SAR system include:

- legislative establishment of the SAR service(s);
- arrangements for use of all available resources, and provision of others if necessary;
- establishing geographic areas of responsibility with associated RCCs and RSCs;
- staffing, training, and other personnel support to manage and operate the system;
- adequate and functioning communications capabilities; and
- agreements, plans and related documents, to achieve goals and define working relationships.

1.8 SAR and the 1949 Geneva Conventions and their Additional Protocols

1.8.1 In times of armed conflict, SAR services will normally continue to be provided in accordance with the Second Geneva Convention of 1949 (Geneva Convention for the Amelioration of the Condition of Wounded, Sick and Shipwrecked Members of Armed Forces at Sea, of 12 August 1949) and Additional Protocol I to the Conventions.

- (a) The SAR services recognized by their Administrations are afforded protection for their humanitarian missions so far as operational requirements permit. Such protection applies to coastal rescue craft, their personnel and fixed coastal SAR installations, including RCCs and RSCs as far as these centres are located in coastal areas and are used exclusively to co-ordinate search and rescue operations. SAR personnel should be informed about their Administration's status regarding, and views on, implementation of the Second Geneva Convention and its Additional Protocol I.
- (b) Chapter XIV of the International Code of Signals illustrates the different means of identification which shall be used to provide effective protection for rescue craft.
- (c) The above-mentioned coastal installations should, in time of armed conflict, display the distinctive emblem (red cross or red crescent), according to regulations issued by their competent authorities.
- (d) It is recommended that Parties to a conflict notify the other Parties with the name, description and locations (or area of activity) of their above-mentioned rescue craft and coastal installations in the area they are located.

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Chapter 2

System Components

2.1 SAR as a System

2.1.1 The SAR system, like any other system, has individual components that must work together to provide the overall service. Development of a SAR system typically involves establishment of one or more SRRs, along with capabilities to receive alerts and to co-ordinate and provide SAR services within each SRR. Each SRR is associated with an RCC. For aeronautical purposes, SRRs often coincide with flight information regions (FIRs). The goal of ICAO and IMO conventions relating to SAR is to establish a global SAR system. Operationally, the global SAR system relies upon States to establish their national SAR systems and then integrate provision of their services with other States for world-wide coverage.

2.1.2 Every SRR has unique transportation, climate, topography and physical characteristics. These factors create a different set of problems for SAR operations in each SRR. Such factors influence the choice and composition of the services, facilities, equipment and staffing required by each SAR service. The primary system components are:

- communications throughout the SRR and with external SAR services;
- an RCC for the co-ordination of SAR services;
- if necessary, one or more RSCs to support an RCC within its SRR;
- SAR facilities, including SRUs with specialized equipment and trained personnel, as well as other resources which can be used to conduct SAR operations;
- on-scene co-ordinator (OSC) assigned, as necessary, for co-ordinating the on-scene activities of all participating facilities; and
- support facilities that provide services in support of SAR operations.

2.2 Communications

2.2.1 Good communications are essential. They should promptly provide the RCC with alerting information permitting the RCC to dispatch SRUs and other resources to search areas without delay and to maintain two-way contact with the persons in distress. Chapter 4 summarizes the general communications capability and equipment the RCC should have. The SAR organization is alerted to an actual or potential distress situation directly or by means of alerting posts. Alerting posts are facilities that relay distress alerts to RCCs or RSCs. The information collected by alerting posts and other reporting sources should 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. Figure 2-1 outlines the general SAR communications system.

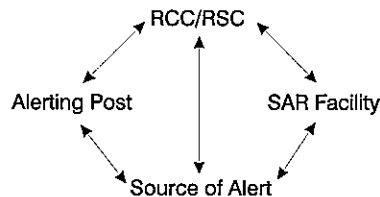


Figure 2-1 – General SAR system communications

- 2.2.2** The main functions of a SAR communications system are:
- receipt of alerts from equipment used by persons in distress;
 - exchange of information with persons in distress, and among the SAR mission co-ordinator (SMC), OSC and SAR facilities for co-ordination of responses to SAR incidents; and
 - direction finding (DF) and homing which allow SRUs to be dispatched to the vicinity of the distress and to home on signals from equipment used by survivors

Alerting Posts

2.2.3 Alerting posts include any facility involved in receiving information about an apparent distress situation and relaying it to an RCC or RSC. They include facilities such as air traffic services (ATS) units or coast radio stations (CRSs). Communications may or may not be the primary purpose for the alerting post, but the post must be able to forward the distress information to the RCC. Chapter 4 discusses alerting posts in more detail.

2.2.4 The ability of an RCC to act quickly and effectively when an emergency occurs depends largely on the information forwarded to it by alerting posts. If alerting posts are used, the RCC or RSC should ensure that the alerting post is well qualified to carry out its responsibilities. It is essential that communications between an alerting post and the RCC, RSC or local SRU are by fast and reliable means. Such channels should be checked regularly and could be established by voice or data communications via direct or public telephone, radiotelephone, radiotelegraph or other means. Ideally, data alerts should be automatically routed to the responsible RCC or RSC over communication links which help preserve the distress priority.

Locating

2.2.5 Locating capabilities enable the responding SAR facilities to minimize the search time and to get to the actual position of distress for rescue. There are basic international requirements for the types of equipment that must be carried by ships and aircraft.

- (a) Most civil aircraft operating over ocean areas and remote land areas, and many other aircraft, are required to carry an emergency locator transmitter (ELT). Designated SAR aircraft must be able to home onto ELT 121.5 MHz signals from ELTs used for locating a distress scene and survivors.
- (b) Ships and some other craft are required to carry emergency position-indicating radio beacons (EPIRBs) capable of transmitting signals. The purpose of the EPIRB signals is to indicate that a distress exists and to facilitate the location of survivors in SAR operations. Merchant vessels and survival craft have additional requirements which are discussed in chapter 4.

2.2.6 Having a very precise search object position is useful but does not eliminate the need for SRU homing capabilities. This is especially true if the SRU does not have precise navigation equipment or if operations take place at night or in other low-visibility conditions.

2.2.7 Due to the importance of position information for SAR operations, various suitable means should be provided within an SRR to determine positions. These may include DF stations, surveillance systems for aircraft and vessel traffic service systems. 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.

SAR Co-ordination

2.2.8 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.

2.2.9 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*.

2.2.10 SAR personnel should have national authority for their RCCs and RSCs to directly respond to requests for assistance from craft in distress, or from other RCCs or RSCs. Except in rare cases, related communications for such requests should be routed directly to the RCC or RSC rather than via diplomatic channels.

On-Scene

2.2.11 On-scene channels are used between SRUs and the OSC. The SMC should 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 should be equipped with a frequency for communicating with vessels during SAR operations.

2.2.12 Administrations should encourage voluntary fitting of air band radio equipment, especially on marine SAR units and government vessels, but also on SOLAS ships operating in areas where working with aircraft not fitted with maritime band radio equipment is known to be a possibility.

2.2.13 SAR co-ordinators should consider the possible 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.

2.3 Rescue Co-ordination Centres

2.3.1 The RCC is an operational facility responsible for promoting efficient organization of SAR services and for co-ordinating the conduct of SAR operations within an SRR. An RCC co-ordinates, but does not necessarily provide, SAR facilities throughout the internationally recognized SRR described in either the Regional Air Navigation Plans (RANPs) of ICAO or the Global SAR Plan of IMO. Aeronautical SAR responsibility may be met by means of an aeronautical RCC (ARCC). Coastal States with the added responsibility for maritime SAR incidents can meet this with a maritime RCC (MRCC). When practicable, States should consider combining their SAR resources into a joint RCC (JRCC), responsible for both aeronautical and maritime SAR incidents or co-locating their maritime and aeronautical RCCs.

Note: The term RCC will be used within this Manual to apply to either aeronautical or maritime centres; ARCC or MRCC will be used as the context warrants.

2.3.2 SAR managers should ensure that the RCC is familiar with the capabilities of all of the facilities available for SAR in its SRR. Collectively, these facilities are the means by which the RCC conducts its operations. Some of these facilities will be immediately suitable for use; others may have to be enhanced by changing organizational relationships or supplying extra equipment and training. If the facilities available in certain parts of an SRR cannot provide adequate assistance, arrangements should be made to provide additional facilities.

2.3.3 Co-operative arrangements among States could make it unnecessary for some States to have an RCC. RSCs (discussed later in this chapter) may be established under an RCC of the State concerned, under an RCC operated by another State or under an RCC operated by more than one State.

2.3.4 JRCCs can be established at minimal cost by combining aeronautical and maritime RCCs. Staffing would be determined by the responsible agencies and could include joint staffing by more than one agency. This co-operation could help in developing better capabilities and plans to assist both aircraft and ships in distress. Benefits include:

- fewer facilities to establish or maintain;
- reduced cost;
- less complexity for alerting posts in forwarding distress alerts; and
- better co-ordination and sharing of SAR expertise.

A coastal State may have a MRCC but not be able to be provided with an ARCC. In such a case, the SAR manager should arrange a suitable organizational relationship to provide the MRCC with aeronautical advice. Advice may be available from aeronautical facilities close to hand, such as an aerodrome tower, an ARCC, a flight information centre (FIC), or an area control centre (ACC).

2.3.5 Properly established, the JRCC may improve SAR service performance in most areas. The RCC chief operates the JRCC so that neither the aeronautical nor maritime community receives special attention at the expense of the other.

Purpose and Requirements

2.3.6 ICAO's Annex 12 and the International Convention on Maritime Search and Rescue require that SAR providers establish an RCC for each SRR. The following sections detail some minimum requirements for these centres. More information on specific RCC and RSC requirements is provided in the *International Aeronautical and Maritime Search and Rescue Manual for Mission Co-ordination*.

2.3.7 The RCC must have certain basic capabilities before it is recognized as having responsibility for an SRR by listing in the ICAO RANP or the IMO Global SAR Plan. Additional or improved capabilities may be added as ability and resources permit. A fully capable RCC may be viewed as having two sets of capabilities, "required" and "desired." Figure 2-2 outlines these capabilities.

Required	Desired
24-hour availability Trained persons Persons with a working knowledge of the English language Charts which apply to the SRR (aeronautical, nautical, topographic and hydrographic) Means of plotting Ability to receive distress alerts, e.g., from MCCs, CESs, etc. Immediate communications with: associated ATS units associated RSCs DF and position-fixing stations associated CRSs Rapid and reliable communications with: Parent agencies of SRUs adjacent RCCs designated meteorological offices employed SRUs alerting posts Plans of operation	Wall chart depicting SRR, SRSs, and neighbouring SRRs, SAR resources Computer resources Databases

Figure 2-2 - Capabilities of a fully capable RCC

Facilities and Equipment

2.3.8 An RCC should be located where it can effectively perform its functions within its SRR. The RCC may use accommodations at an existing suitable facility. Often agencies responsible for communications, defence, law enforcement, air and marine services or other primary missions have an operations centre which can be readily adapted for use also as an RCC. These centres, while not dedicated only to SAR, may act as RCCs in addition to their other functions as long as the centres and their staff meet the SAR requirements. Co-ordination skills used for other purposes are similar to those used to manage a SAR mission. This arrangement makes use of existing equipment and trained, experienced staff. However, additional personnel or space may be needed depending on the expected number and complexity of SAR operations. Also, the RCC may be located close to a well-equipped centre such as a flight information centre (FIC) or area control

centre (ACC) so that additional communications facilities can be kept to a minimum. In addition to communications facilities and general office equipment, a desk, plotting space, charts showing the RCC's area of responsibility and adjacent areas and filing space are needed. Use of various technologies may improve the RCC performance and affect the staffing and training requirements.

- 2.3.9** When a JRCC cannot be established, ARCCs and MRCCs may still be able to provide mutual communications and staff support. Direct and close co-operation among RCCs should also minimize costs, enhance co-ordination and ensure the efficient use of resources.
- 2.3.10** The equipment of an RCC will be determined by the expected demands to be made on the RCC, and the extent of functions it should perform.
- (a) *Communications.* Communications needs can sometimes be met by ATS channels, public services, or installation of an Inmarsat earth station. Reliable dedicated lines which can preserve message priority are preferred. In addition to telephone lines with published numbers, one telephone line should have an unlisted, confidential number to ensure the availability of one out-going line in situations where there are many incoming telephone calls. Use of the ICAO Aeronautical Fixed Telecommunications Network (AFTN) or digital Aeronautical Fixed Network (AFN) can meet some communications needs and preserve message priority. All voice equipment, including telephones, should be attached to a multi-channel tape recorder, preferably with a time recording. This allows the RCC to review verbal information. Arrangements can be made with the public telephone administration to ensure that calls from originators who do not wish to cover the charges are passed without delay to the RCC on a collect or pre-paid reply basis. Such arrangements should be widely publicized to encourage outside sources to provide information on missing or distressed craft. Chapter 4 summarizes the communications capability and equipment the RCC and RSC should have.
 - (b) *Information.* Ready access to operational information will help the SMC take immediate and appropriate action in an emergency. Much of this information derives from the RCC plan of operations and SAR databases. Use of large-scale wall charts showing assigned SRRs and locations of resources along with a SAR facility status board or computer file reflecting the current status of all SAR facilities, telephone numbers, and other useful information, is practical. The chart or map should also show areas adjacent to the SRR. The map could display, by means of coloured pins or other symbols, information of interest.
 - (c) *Plotting facilities.* The RCC and RSC should have a stock of maritime and aeronautical maps and charts, plotting equipment, and other information necessary for their use.
 - (d) *Publications and supplies.* The publications and supplies to be available at the RCC will vary, but should include:
 - SAR publications of ICAO, IMO, the national and neighbouring SAR authorities;
 - relevant State documents, e.g., Air Navigation Regulations and Notices to Mariners and, if considered necessary, those of adjacent States;
 - communications publications;
 - aeronautical information publications (AIPs);
 - indexes of names, addresses, telephone and facsimile numbers; and
 - relevant checklists and forms.

Staffing

- 2.3.11** RCCs perform administrative and operational duties. Administrative duties, including planning, co-operation with providers of facilities, exercises and case studies, are concerned with maintaining the RCC in a continuous state of preparedness. In areas of low SAR activity the administrative duties are of high importance since they are the best way to keep the staff in readiness for SAR cases. The administrative duties should be shared so that more than one person is capable of performing these duties. Effective administrative actions help to ensure proficient SAR operations. SAR operations are the responsibility of the SMC and this responsibility may be met by the RCC chief or by other properly trained staff of the RCC. Personnel from services or organizations providing facilities can be used as part of the RCC team if they are duly trained and qualified. They will normally serve in support of expert functions such as firefighting, or air or marine safety. The RCC must be prepared to undertake and continue operational duties 24 hours per day. This level of readiness requires that multiple persons be trained and qualified to assume SMC duties.
- (a) *RCC Chief.* The RCC chief may be a person who also performs other functions. Whenever an RCC is established in conjunction with an ATS unit or similar operations centre, responsibilities for the RCC are

often placed on the chief of that facility. In such instances, another person should be appointed to handle day-to-day management of the RCC. The RCC chief must make appropriate preparations, plans, and arrangements as well as oversee, if not delegated, the daily operations of the RCC, to ensure that when an incident occurs the SAR operation can be promptly performed.

- (b) **RCC Staff.** The RCC staff consists of personnel who are trained and capable of planning and co-ordinating SAR operations. If the RCC staff has duties besides SAR, the additional functions should be considered when determining the staffing needs. The number of personnel required will vary with local requirements, traffic density, seasonal conditions, meteorological conditions and other SRR conditions. An RCC must be in a constant state of operational readiness. Where the RCC does not maintain continuous staffing, or only has one trained and capable RCC person on duty, provision must be made for stand-by RCC staff to be mobilized rapidly.
- (c) **SAR Mission Co-ordinator.** An SMC should be designated for each specific SAR operation, and adequate numbers of personnel qualified to perform the SMC function must be readily available on a 24-hour basis. This is a temporary function which may be performed by the RCC chief or a designated SAR duty officer, assisted by as many staff as may be required. A SAR operation may continue over a prolonged period of time. The SMC is in charge of a SAR operation until a rescue has been effected or until it has become apparent that further efforts would be of no avail. The RCC plan of operations should give the SMC the freedom to employ any facility, to request additional ones and to accept or reject any suggestions made during the operation. The SMC is responsible for planning the search and co-ordinating the transit of SRUs to the scene. SCs are not normally involved in the conduct of the SAR operation. (Duties of the SMC are discussed further in the *International Aeronautical and Maritime Search and Rescue Manual for Mission Co-ordination*.) The number of persons to be available for assignment as SMC will depend on:
 - possible need to co-ordinate operations from a location other than the RCC, e.g., from available communications facilities;
 - expected frequency of SAR incidents, including the possibility of more than one incident occurring simultaneously;
 - size of the area and prevailing conditions (e.g., climate or topography); and
 - need to allow for vacation, training courses, illness, relief and travel.

Training, Qualification, and Certification

2.3.12 Training and experience are crucial to proper SAR response.

- (a) RCC chiefs, SMCs, and RCC staff need specific training in watchstanding, co-ordination of assorted resources, search planning, and rescue planning. SAR managers have the responsibility to ensure that the overall training programme is effective. It will normally be the responsibility of the RCC chief to ensure that all SAR service personnel reach and maintain the required level of competence.
- (b) Training in itself can provide only basic knowledge and skills. Qualification and certification processes are used to ensure that sufficient experience, maturity and judgement are gained. During a qualification process, the individual must, by demonstration of abilities, show mental and physical competence to perform as part of a team. Certification is official recognition by the organization that it trusts the individual to use those abilities. Chapter 3 provides additional information on these and related topics.

Plans of Operation

2.3.13 Each RCC is responsible for preparing comprehensive plans for the conduct of SAR in its SRR and for co-ordinated actions within adjacent SRRs. These plans must cover the whole SRR and be based on agreements between the SAR service and the providers of facilities or other support for SAR operations. Plans are intended to be valuable aids for time-critical search planning and SAR co-ordination processes. Each RCC and RSC should develop plans that:

- meet the requirements of applicable international SAR manuals;
- cover all the emergency scenarios likely to occur within the SRR;
- are reviewed and updated regularly; and
- are in a convenient form for quick and easy use.

2.3.14 The plans of operation set out the details for the conduct of SAR at operational levels. The *International Aeronautical and Maritime Search and Rescue Manual for Mission Co-ordination* contains an outline of plans of operation.

Search and Rescue Regions

2.3.15 An SRR is an area of defined dimensions associated with an RCC within which SAR services are provided. ICAO RANPs depict aeronautical SRRs for most of the world. States have agreed to accept SAR responsibility for an area which is composed of one or more aeronautical SRRs. Maritime SRRs are published in the IMO SAR Plan, and could be similar, or different, to aeronautical SRRs. The purpose of having an SRR is to clearly define who has primary responsibility for co-ordinating responses to distress situations in every area of the world and to enable rapid distribution of distress alerts to the proper RCC. A State may have separate aeronautical and maritime SRRs, or separate SRRs in different ocean/sea areas; otherwise, a single SRR (with SRSs, if necessary) will usually suffice.

- (a) *Factors Affecting SRR Size and Shape.* When establishing or amending an SRR, States should try to create the most efficient system possible, bearing in mind that each SRR is part of a global system. Leading factors to consider should include:
- size and shape of the area of responsibility;
 - air and shipping traffic density and pattern;
 - availability, distribution, readiness and mobility of SAR resources;
 - reliability of the communications network, and
 - which State is fully capable, qualified, and willing to assume responsibility.
- (b) Aeronautical SRRs often are aligned with FIRs for specific reasons.
- The ATS unit providing flight information service for an FIR is the central point for collecting and forwarding information about aircraft emergencies and co-ordinates SAR aircraft and other air traffic operating within the FIR.
 - Simplified notification, co-ordination and liaison between the RCC and the ATS unit.
 - Savings often result from sharing RCC and ATS staff, facilities, and communications networks.
- (c) Upper flight information regions (UIRs) sometimes exist above a system of FIRs. UIRs generally are NOT used to define aeronautical SRRs for three reasons.
- Searches are generally conducted at low altitudes and must be co-ordinated with other traffic in the FIR.
 - ATS communications facilities useful for SAR, particularly air-ground facilities, are adapted to the FIR rather than to the UIR.
 - Territorial divisions of authority for local agencies used in SAR operations generally correspond to those of the FIRs.
- (d) Experience shows that in most areas there are operational advantages in harmonizing aeronautical and maritime SRRs. Doing so minimizes confusion over which authority is to be alerted when a distress situation arises at and over a specific geographic position. In order to enhance the efficiency of SAR services, neighbouring States should seek to agree on the limits of their SRRs which could enhance co-ordination and avoid duplication of efforts. To make them easier to use, SRR limits should, if possible, be straight lines running north to south or east to west between well-defined geographic points. Such regions should be contiguous and as far as practicable not overlap.
- (e) The delimitation of SRRs is not related to and shall not prejudice the delimitation of any boundary between States. An SRR is established solely to ensure that primary responsibility for co-ordinating SAR services for that geographic area is assumed by some State. SRR limits should not be viewed as barriers to assisting persons in distress. Any facility within a SAR organization should respond to all distress situations whenever and wherever it is capable of doing so. In this respect, co-operation between States, their RCCs and their SAR services should be as close as possible.
- (f) An SRR is established by agreement among States. States should propose establishing or amending SRR limits when this would result in the provision of more efficient or effective SAR services. The States concerned should agree among themselves, formally or informally, on the lines separating their SRRs

and then inform IMO or the applicable ICAO regional office, depending on whether the SRRs are maritime or aeronautical. After due process, the information will then be published in the IMO SAR plan or the applicable ICAO RANP. Sometimes SRR limits can be tentatively decided at an IMO SAR workshop or an ICAO regional air navigation meeting, subject to later approval.

2.4 Rescue Sub-Centres

2.4.1 There may be situations where an RCC is not able to exercise direct and effective control over SAR facilities in an area within its SRR. The establishment of an RSC with its SRS may be appropriate. Examples of such situations include:

- where the communications facilities in a portion of an SRR are not adequate for close co-ordination between the RCC and SAR facilities;
- where the SRR encompasses a number of States or territorial divisions of a State in which, for political or administrative reasons, local facilities can only be directed and controlled through designated local authorities; and
- where local control of SAR operations will be more effective.

2.4.2 In such situations, the RCC may delegate some or all of its responsibility to an RSC, including communications, search planning and arrangements for SAR facilities. An RSC may be as capable as an RCC. The more complicated the Administration or the poorer the communications, the greater the authority that should be delegated to the RSC. Its requirements in personnel, equipment and accommodations will then be similar to those of the RCC. However, RSCs typically have fewer responsibilities and capabilities than their associated RCC and their requirements in personnel, equipment and accommodations are usually smaller.

2.4.3 An aeronautical RSC (ARSC) can be established for aeronautical SAR incidents, and a maritime RSC (MRSC) for maritime SAR incidents.

Note: The term RSC will be used within this Manual except where it applies only to aeronautical or maritime; then ARSC or MRSC will be used.

2.5 SAR Facilities

2.5.1 SAR facilities include designated SRUs and other resources which can be used to conduct or support SAR operations. An SRU is a unit composed of trained personnel and provided with equipment suitable for the expeditious and efficient conduct of search and rescue. An SRU can be an air, maritime, or land-based facility. Facilities selected as SRUs should be able to reach the scene of distress quickly and, in particular, be suitable for one or more of the following operations:

- providing assistance to prevent or reduce the severity of accidents and the hardship of survivors, e.g., escorting an aircraft, standing by a sinking vessel;
- conducting a search;
- delivering supplies and survival equipment to the scene;
- rescuing survivors;
- providing food, medical or other initial needs of survivors; and
- delivering the survivors to a place of safety.

2.5.2 The equipment needed by SRUs may be grouped as shown.

- (a) *Communications.* An SRU must have rapid and reliable means to communicate by voice or message with the SMC, the OSC if assigned, other SRUs, and the distressed persons. Chapter 4 has more information on SRU communications requirements.
- (b) *Mobility.* The effectiveness of a SAR service depends on the number, speed, location, and efficiency of the aircraft, vessels and land vehicles available.
- (c) *Supplies and Survival Equipment.* Supplies and survival equipment are carried by air and maritime SAR facilities to give aid to survivors and to facilitate their rescue. The type and number to be carried depend on the circumstances on-scene. Maritime facilities and helicopters generally can deliver this equipment directly to survivors. Fixed-wing aircraft can deliver supplies if suitable landing areas exist nearby or if the supplies can be dropped at the scene. The packing of supplies and survival

equipment should be adapted to the manner of delivery. Containers and packages of supplies and survival equipment should be strong, of a highly visible colour, waterproof and buoyant. The general nature of their contents should be clearly indicated in print in English and two or more other languages or using self-explanatory symbols, and may also be indicated by colour-coded streamers and pictograms as discussed in appendix B. Supplies and survival equipment requirements must be adapted to the circumstances of the SRR in which they are used.

- (d) *Other Equipment.* Every SRU should have at its disposal maps, charts, plotting equipment, and information relevant to the SRR(s) in which it is likely to operate.

Designated Search and Rescue Units

- 2.5.3 States may wish to designate specific facilities as SRUs. These designated SRUs may be under the direct jurisdiction of the SAR service or other State authorities or may belong to non-Governmental or voluntary organizations. In the latter situation, agreements between the SAR service and these organizations should be developed. SRUs need not be dedicated solely to SAR operations, but should have the training and equipment necessary for proficient operations.

Specialized SAR Units

- 2.5.4 Specialized SRUs are teams with specialized training and equipment created for specific rescue scenarios; e. g., mountain or desert rescue. Agreements should be developed between the SAR service and these organizations for timely provision of their services.

Other Search and Rescue Facilities

- 2.5.5 In establishing a SAR service, States can use – to the fullest extent – existing facilities established for tasks not connected with SAR. Existing facilities often may be suitable for SAR operations with minimal modifications, added equipment or additional crew training. Examples include: teaching look-out scanning techniques to volunteers and auxiliary organizations; installing radiotelephone equipment on fishing vessels, yachts and other small craft; and using isolated stations as alerting posts. By providing training, installing some low-cost equipment and integrating all facilities into the SAR system, an efficient SAR service can be set up with limited need for dedicated SRUs.

2.6 On-scene Co-ordinator and Aircraft Co-ordinator

- 2.6.1 When two or more SAR facilities are working together on the same mission, it is usually advantageous if one person is assigned to co-ordinate the activities of all participating facilities. The SMC designates this OSC, who may be the person in charge of an SRU, ship, or aircraft participating in a search, or someone at another nearby facility able to handle OSC duties. The person in charge of the first SAR resource to arrive at the scene will normally assume the function of OSC until the SMC directs that the OSC function be transferred. Conceivably, the OSC may have to assume SMC duties and actually plan the search if the OSC becomes aware of a distress situation directly and communications cannot be established with an RCC. The OSC should be the most capable person available, taking into consideration SAR training, communications capabilities and the length of time that the facility on which the OSC is aboard can stay in the search area. Frequent changes in the OSC should be avoided. When appropriate, an aircraft co-ordinator (ACO) may also be designated to assist with on-scene co-ordination of SAR aircraft.

- 2.6.2 Responsible authorities should find ways for information, training and exercising the ACO function, both for those who act as ACOs and for those who co-operate closely with ACOs.

Aircraft co-ordinator (ACO) joint training

- 2.6.3 The SAR management should provide ACO training between SRU crews from different organizations that might act as ACOs. The ACO training should improve understanding of the ACO role and increase confidence amongst the participating SRUs.

- 2.6.4 ACO training can consist of:
- Lessons from real life SAR missions;
 - Legal documents;
 - Duties of co-operating organizations;

- Performance characteristics of SRUs;
- Typical cases and methods;
- SMC - ACO role-playing; and
- Paper exercises.

2.7 Support Facilities

2.7.1 Support facilities enable the operational response resources (e.g., the RCC and SRUs) to provide the SAR services. Without the supporting resources, the operational resources cannot sustain effective operations. There is a wide range of support facilities and services, which include the following:

Training facilities	Facility maintenance
Communications facilities	Management functions
Navigation systems	Research and development
SAR data providers (SDPs)	Planning
Medical assistance	Exercises
Aircraft landing fields	Refuelling services
Voluntary services (e.g., Red Cross)	Critical incident stress counsellors

Computer Resources

- 2.7.2 A SAR organization can benefit from use of computers by either possessing the capability, or in many instances, knowing where and how to gain computer services and database support from other organizations, including support for specialized functions such as developing a search plan. Chapter 4 provides specific information on other sources of data. Additional information may be found in paragraph 1.11 of Volume II, *Mission Co-ordination*.
- 2.7.3 Large amounts of computing and data storage capability can be obtained at a relatively low cost. Modern software packages make development of helpful forms, calculations, databases and some communications reasonably easy and inexpensive. Many such aids can be developed locally and do not require any specialized expertise. A basic low-cost personal computer can assist the RCC in its daily administrative functions and also be used for search planning. More sophisticated computers can provide rapid analysis and forecasts of search effectiveness, environmental data, and other search planning aids.
- 2.7.4 Databases can perform a number of useful functions. Most databases hold detailed information which can be quickly accessed, used and also consolidated into reports. SAR managers can use this for SAR system management support, including budget efforts and the RCC can use it for search planning. Environmental databases, including weather and maritime currents, are maintained by numerous academic, oceanographic, military, scientific and meteorological organizations which may make them available for search planning. The SAR system has a growing global network of SAR data providers (SDPs) available to States. The International Telecommunication Union has information for identifying mobile radio stations which transmit distress alerts. Cospas-Sarsat also maintains registration databases with basic SAR information. These databases rely upon States to submit timely and correct information. Other databases include Inmarsat numbers, call signs, maritime mobile service identity (MMSI) numbers and shipping registers. When such databases are implemented, the data should be made readily available on a 24-hour basis to any RCC in receipt of a distress alert.
- 2.7.5 The SAR system greatly benefits from using all available facilities. Appendix C provides a list of possible sources for SAR assistance.

Training, Qualification, Certification and Exercises

3.1 Building Professionalism

3.1.1 A good training programme produces true professionals, personnel who can do it right the first time. The purpose of training is to meet SAR system objectives by developing SAR specialists.

3.1.2 Since considerable experience and judgement are needed to handle typical SAR situations, necessary skills require significant time to master. Training can be expensive. Poor training is even more expensive and can result in poor operational effectiveness, which can result in loss of lives of SAR personnel, lives of those in distress and loss of valuable facilities. Quality of performance will match the quality of training. Efforts to ensure professionalism may even extend to career development actions prior to assignment to SAR duties, ensuring SAR assignments of sufficient length to develop expertise and taking advantage of SAR experience in subsequent assignments.

Training

3.1.3 Training is critical to performance and safety. The SAR system should save those in distress when it can, and also use training to reduce risks to its own valuable personnel and facilities. Training personnel in making sound risk assessments will help to ensure that these trained professionals and valuable facilities remain available for future operations. More on the content and process of training is contained within section 3.2

Qualification

3.1.4 The purpose of qualification is to validate an individual's ability to perform certain duties. It is a minimum level of knowledge and skills which should be required to be correctly demonstrated. This validation activity may take place at a specific position, while maintaining specific equipment or performed as a team member within a unit. Qualification is not designed as a training programme but can result in training. Qualification procedures demonstrate the capability to perform specific tasks. A qualification programme covers fundamental knowledge necessary for the duties of that position and testing of individuals on the systems they will be required to operate or maintain.

Certification

3.1.5 The purpose of certification is to authorize an individual to serve in a stated capacity. Certificates may be issued to candidates who meet the requirements for service, age, medical fitness, training, qualification, examinations and maturity. Certification should be in writing prior to the person assuming watchstanding duties.

3.1.6 Training alone can provide only basic knowledge and skills. Qualification and certification processes are used to ensure sufficient experience, maturity and judgement are gained. During a qualification process, the individual must, by demonstration of abilities, show mental and physical competence to perform as part of a team. Certification is official recognition by the organization that it trusts the individual to use those abilities. Detailed qualification requirements vary with each type of workplace (a vessel, aircraft, or RCC). The trainee may be assigned to an associate who observes and can attest to the trainee's competence to perform each particular task. Thorough knowledge of the geographic area of operation should also be demonstrated. Certain tasks may require periodic re-certification.

3.1.7 The person in charge should believe that a qualified person has the maturity, leadership and integrity to perform as a team member before issuing a certificate, the final step leading to full assumption of duties. Persons who have been through the qualification process are the best source of ideas for improving it. Training and qualification improve operational effectiveness, create a feeling of fairness, reduce accidents and reduce complaints against the organization.

- 3.1.8** The RCC and RSC have particularly important duties. Upon completion of training, the prospective RCC watchstander should undergo qualification procedures. RCC staff should be fully qualified in SAR incident analysis, search planning and SAR operations management.

Note: The term “certification” is widely used by IMO, ICAO, and other organizations within the context of authorizing personnel or facilities to perform certain functions. In this chapter, “certification” is similarly used to authorize that a properly trained and qualified person can perform assigned tasks.

3.2 Training Specifics

Who to Train

- 3.2.1** All SAR specialists need some training, in particular, the SCs, SMCs, and OSCs.
- 3.2.2** Operational facilities which need training include:
- RCCs and RSCs
 - aeronautical units
 - maritime units
 - land units
 - specialized units (pararescue, paramedical, desert rescue, mountain rescue, urban SAR teams that deploy to disasters), divers, etc.
 - supply depots
- 3.2.3** An individual, a group or multiple groups may be trained. Each person should have had previous training to perform individual tasks. Where the individuals integrate into teams, team training is required so that the individuals can support the team effort. Where teams integrate, multiple team training is required to support the overall effort. An example of multiple team training is SRUs training together.
- 3.2.4** The aviation and maritime communities require training in distress prevention, escape procedures, survival techniques, how to be located and actions to be taken to assist in one’s own rescue. This training may focus on individuals or groups. Such training may be provided by the industry or company involved. It may also be provided by public and private education efforts for safety awareness.
- 3.2.5** RCC and RSC watchstanders usually need formal SAR training. If unable to immediately attend formal training, they must receive a period of on-the-job training and an interim qualification and certification.
- ### ***What to Train***
- 3.2.6** An individual’s training must be based on a needs analysis. This analysis compares actual performance and behaviour with required performance and behaviour at a currently held position. Based on this analysis, training needs and methods to overcome the deficiencies can be identified.
- 3.2.7** The need for a working knowledge of the English language may be considered. RCCs must be able to communicate with other RCCs, as well as ship masters and aircraft commanders, who are required to be able to speak English. Air traffic services units also have requirements for English language speaking skills.
- 3.2.8** The present skill of a person can also be compared with the required competency which will be needed for a known future assignment. This enables systematic preparation for a new assignment.
- 3.2.9** Planning for future training needs can be more effective if knowledge and skills which will be needed due to changing technology can be predicted.
- 3.2.10** Training of SAR service personnel can include the following:
- study of the application of SAR procedures, techniques and equipment through lectures, demonstrations, films, and SAR manuals and journals;
 - assisting in or observing actual operations; and
 - exercises in which personnel are trained to co-ordinate individual procedures and techniques in a simulated operation.

3.2.11 RCC and RSC SAR training should include at least the following topics. If search planning expertise gained from formal training is not used on a regular basis for operations or exercises, periodic refresher training will normally be needed. General categories include:

Aeronautical drift	Medical evacuations
AFN	Medical advice
AFTN	Obtain and evaluate data
Bailout scenarios and planning	On-scene co-ordinator duties
Briefing/questioning SRUs	Parachute drift
Case studies	Plotting skills
Charts	Registration databases
Coastal SAR planning	Rescue procedures
Computer applications	Resource allocation
Cospas-Sarsat	Risk assessment
Datum marker buoys	SAR agreements
Datum determination	SAR communications
Dealing with public and news media	SAR mission co-ordination
Dealing with families	SAR operations conclusion
Documentation of incidents	SAR phases, stages, and components
Electronic sweep width	SAR resource capabilities
Emergency care	SAR system organization
Environmental factors	SAR technology
Evaluation of flare sightings	Search areas
Fatigue factors	Search patterns
Inmarsat	Search planning
International aspects	Ship reporting systems for SAR
Interviewing techniques	SRU selection
Leeway drift	Stress management
Legal concerns	Survival equipment
Look-out skills and limitations	Visual sweep width
Manoeuvring boards	Water currents

3.2.12 SAR managers performing administrative functions may benefit from courses in:

- planning;
- organizing;
- staffing; and
- budgeting, performance assessment, and accounting.

3.2.13 Operating a facility in a SAR environment, such as stormy weather, may be a special skill not generally learned, and may be considered for specialized training facilities.

When to Train

3.2.14 Training is most beneficial when it is accomplished before a specialist is assigned to duties requiring that training. It matches the duties to be performed and is generally provided at three levels.

- (a) Entry level for those specialists just entering the organization.
- (b) Current level for those specialists who must remain at a certain level of proficiency to continue with their present position. This also includes any updating due to technical and equipment improvements.
- (c) Advanced level for those specialists who have proven performance in a current position and desire or need to advance.

- 3.2.15** Training may focus on awareness and knowledge at the SAR manager level; knowledge and performance at the middle (RCC chief) management level; and performance at the operational management level (to include training of the SRU crew). There are various models of training management which seek to identify specific training requirements and match the appropriate training process.

Where to Train

- 3.2.16** Training can be accomplished in a range of locations, from on-the-job site to a formal training centre. The student can be trained where work is normally accomplished, or can be transferred to another site for on-the-job training. Formal training can take place at a dedicated facility, or in a classroom adjacent to the work site. The location is determined by cost-effective use of available facilities and training staff or experts. Sometimes training received from other reputable organizations, even in other States, can meet needs very well. Normally, it is better not to depend totally on training facilities or visiting teams from other States, because availability of such training can be limited, unpredictable, expensive and only partly relevant. Sometimes, language differences can also reduce the effectiveness of training provided by other States.

How to Train

- 3.2.17** There are three ways to train.
- (a) Training based on performance helps SAR specialists and teams to perform their duties effectively. The SAR manager has the responsibility to ensure that the overall training programme is effective. The RCC chief and others must ensure that all SAR service personnel reach and maintain the required level of competence.
 - (b) Training based on knowledge provides information necessary for the SAR experts and students to perform their duties. One method is to provide knowledge to enable them to review SAR cases. Resulting recommendations can be used to review policy, update standard procedures, and improve training and other processes.
 - (c) Awareness training is required for those persons infrequently involved in SAR, such as high-level executives, budget authorities, general transportation operators and national transportation authorities.
- 3.2.18** Emphasis must be placed on results of training, not on training activities.
- 3.2.19** *On-the-Job Training.* With on-the-job training, trainees learn and, at the same time, contribute to the aims of the organization. This economical approach requires competent specialists who can teach and coach trainees.
- (a) *Checklists.* Training specialists develop checklists of job duties, skills, tasks, and procedures to be taught through on-the-job training. This ensures that all trainees receive the same information. Items on the checklist can typically be covered in any order.
 - (b) *Planned Progression.* This technique gives SAR specialists a clear idea where they are going. The specialist knows the requirements for advancement and the means to achieve it. Planned progression is a step-by-step approach which requires tasks to be performed well at each level before proceeding to the next level.
 - (c) *Assignment Rotation.* This broadens the knowledge of specialists. Rotation to different jobs allows the specialist to understand broader aspects of the organization.
 - (d) *Coaching.* This is the responsibility of every specialist in a management position. Effective coaches develop the strengths and potential of subordinates and help them overcome their weaknesses. Coaching saves time, money and costly mistakes by subordinates.
 - (e) *Library.* A training library is useful for students to increase their level of knowledge. Libraries can include different materials such as video tapes, lesson plans, reference books and papers, and audio tapes. Video tapes can be made by simply taping good classroom training sessions. A professionally produced video tape can be even more effective.

- 3.2.20** *Formal Classroom Training:* Many facilities now conduct courses, workshops, conferences and other programmes for training SAR specialists. For persons who will serve as SAR managers, or who will serve as maritime administrators with SAR management duties, the IMO World Maritime University teaches courses on SAR organization and operations. The model materials for the course are available from IMO. The University in Malmö, Sweden, can be contacted about class information. IMO and ICAO can also refer inquiries about the availability for formal SAR training available for foreign students to States which offer such training. In some cases, sources of financial assistance for foreign students may be IMO, ICAO or other international and State sources.

- (a) *Train-the-trainer.* When a person must travel abroad to receive formal SAR training, it may be more cost-effective if arrangements are made for the person to also observe use of the procedures in real operations, and to learn how to teach them. States could then make maximum use of this person upon return to conduct well-planned and organized training within the home State or region. Part of the SAR training strategy should be to train individuals in such a way that they can help train others where they work. This reduces the reliance on formal training centres and the burden of training costs.
- (b) *Maintain a Training Facility.* A formal training facility within the State or region helps to maintain professionalism and standardization. Sending students long distances for training is costly and inefficient and courses may include irrelevant topics. Importing formal training from other nations has mostly short-term benefits and is seldom possible on a consistent and reliable basis. Local trainers understand local needs best, can provide an ongoing programme and are particularly useful when a language difference could be a problem.
- (c) *Add to Curriculum.* Usually the most economical and effective way to provide formal SAR training is to add SAR to the curriculum of an existing training centre. The staff might be jointly provided by organizations that use the training, providing good cross-exposure for instructors and students. For aeronautical SAR, it is particularly useful to have staff expertise in maritime and land SAR since rescues must be carried out within both environments.
- (d) *Conferences.* Formal training should be supplemented to enhance SAR professionalism. Through mutual visits and conferences between operating units, individuals learn from real-life experiences of others and obtain information about a particular topic of interest.

3.3 Exercises

3.3.1 Exercises test and improve operational plans, provide learning experience and improve liaison and co-ordination skills. Exercises, conducted on a realistic basis, help to demonstrate and assess the true effectiveness of training and the operational efficiency and competence of the SAR service. Exercises will reveal deficiencies that may exist in SAR plans and enable them to be improved. It is safer to have shortcomings revealed by exercises rather than during actual operations.

Types of Exercises

3.3.2 Exercises can and should be conducted on three levels.

- (a) The most simple type of exercise, a *Communications Exercise*, requires the least planning. It consists of periodic use of all means of communications between all potential users to ensure capability for actual emergencies.
- (b) A *Co-ordination Exercise* involves simulated response to a crisis based on a series of scenarios. All levels of the SAR service are involved but do not deploy. This type of exercise requires considerable planning, and usually one to three days to execute.
- (c) The third type, a *Full-Scale Exercise* or a *Field Exercise*, differs from the previous types in that actual SAR facilities are deployed. This increases the scope of SAR system-testing and adds realistic constraints due to times involved in launching, transit and activities of the SRUs.

Other Considerations

3.3.3 The need for exercises varies. Some States have many SAR operations so exercises may add little to their learning experience, except when conducted with other States with which they may not routinely work. Other States may have very few SAR operations each year, so exercises will be critical to sustaining proficiency. Joint exercises among neighbouring States or parties to SAR agreements will also be valuable. It may be necessary to assign persons full-time to planning and evaluating exercises. Success of an exercise is measured by:

- how many problems are discovered;
- how much is learned;
- how much operating plans are improved; and
- how few mistakes are repeated during the next exercise.

Exercise Elements

3.3.4 Successful exercises require planning, execution and evaluation. Exercises are carried out for training, to evaluate established plans and procedures and to test new concepts. Exercises also offer experience in the management of risks and safety for SAR operations.

3.3.5 *Planning.* The typical exercise sequence involves: development of the concept (broad goals and objectives) of what is to be exercised; selection of participants (staff and facilities); detailed planning for how the exercise will be conducted; conduct of the exercise; and evaluation to determine lessons learned and to develop recommendations for improvement. It is essential to have a clear understanding of which plans and procedures are being exercised. Scenarios can then be developed that include specific situations to which personnel will react and respond. Response, or lack of response, to established policy and guidance, and need for additional policy guidance, is evaluated.

3.3.6 *Execution.* Those who plan exercises should not be the same ones who respond to the created scenarios. This avoids covering up known weaknesses to ensure ideal results, instead of revealing what would occur in an actual SAR situation.

(a) Scenarios must be as realistic as possible. The decision as to how large and realistic exercises should be will depend on the extent of the SAR service, the demands expected to be made upon it and general considerations of economy. If primary responsibility for SAR has been delegated to military authorities or Government services, full-scale exercises involving as many units and facilities as possible may provide satisfactory means of implementing training programmes. Where private concerns are relied upon to play a major part in SAR, the timing of major exercises should be arranged so as to minimize disruption to normal activities.

(b) Opportunities should be taken to complement formal training programmes with exercises conducted on a unit basis by combining them with normal activities during quiet periods. They should be carried out at regular intervals and arranged so that all personnel participate. This is particularly important in respect of those facilities which seldom receive operational calls.

(c) Exercises carried out separately by facilities will not be as valuable as combined operations, but they can ensure that the SAR service will function in an emergency.

(d) As many facilities, including air and surface craft, should be exercised as possible. Communications between the SRUs is a vital test of co-ordination.

(e) It is not always practicable for organizations to engage in formal SAR training programmes. Whenever possible, personnel from these organizations should be invited to participate in or observe training exercises. They should be provided with documents, publications or other literature which describe the SAR policies and procedures used by the SAR service, showing the desired roles of the participating organizations in SAR operations.

(f) Adjacent RCCs should periodically execute SAR exercises together to develop and maintain efficient co-operation and co-ordination between their services. These exercises need not always be on a large scale, but at least those SAR units which are likely to operate together should engage periodically in co-ordinating exercises. Much may be learned by exchanging information on training methods (e.g., programmes, literature, and films) and visits between staff of adjacent SRRs.

(g) Safety requirements, particularly when using live “survivors”, may impose significant constraints on the conduct of SAR exercises. SAR co-ordinating authorities should ensure that specific safety rules and limitations are issued for use during both the planning and conduct of SAR exercises.

3.3.7 *Evaluation.* The evaluation process is crucial. Inputs should come from a team of evaluation experts who observe the exercise, and from the people who actually participated in the exercise scenarios. Those observing and evaluating the response must have expertise in the areas they are evaluating, and clearly understand what is being evaluated. The evaluators should know the situations being posed and then record the participant’s response to the objectives of the exercise. The final step is identification of weaknesses and development of recommendations for improvement. Subsequent exercises would emphasize these recommended changes as well as other concerns.

Reports

3.3.8 A permanent record of the exercise, addressing each element, is necessary to disseminate valuable information and to maintain a historic file for later case studies, analyses and system improvements. A system of indexing and filing the reports is recommended for later retrieval.

Communications

4.1 Introduction

- 4.1.1** Communication consists of a sender passing information to a receiver by various means. SAR personnel, survivors, RCCs and RSCs, SAR facilities, and many others must have the means to be senders and receivers. SAR managers must seek to provide the essential communications elements to receive distress alerts and perform the SAR mission. Also, they should promote use of appropriate alerting equipment by those who may need SAR services.
- 4.1.2** 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.
- 4.1.3** Several reference documents and specific systems are referred to in this chapter. Appendix D contains information on how to contact sponsoring organizations for copies of the documents or for more information.
- 4.1.4** Supplemental communications information may also be found as follows:
- Chapter 4 of this volume discusses building personnel competence;
 - Chapter 6 of this volume discusses ways to improve communications;
 - The *IAMSAR Manual*, volume II: *Mission Co-ordination*, has information on how communication services are actually used for distress alerting and SAR co-ordination; and
 - The *IAMSAR Manual*, volume III: *Mobile Facilities* explains use of communications on-scene.

4.2 Basic Functions and Requirements

- 4.2.1** Communications support distress alerting, co-ordination, and locating functions by allowing:
- those in distress to alert the SAR system;
 - the SAR system to respond and conduct its mission; and
 - survivors to help SAR units respond and conduct a rescue.
- 4.2.2** General operating requirements for SAR communications include the following.
- (a) *Timely delivery of alerts.* Fast delivery of alert messages to the RCC responsible to respond to a distress alert is crucial for successful rescues. Alerts from aeronautical or maritime communications equipment must be passed to the responsible RCC directly and quickly. This should be increasingly achieved as IMO and ICAO SAR Plans continue to improve.
- (b) *Complete and easy to understand alerts.* Information in all pre-formatted data alert message fields must be complete, accurate and easy to understand. 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. Therefore, systems intended for distress alerting should be sufficiently reliable to only generate alerts in real distress situations, and the alert should not require any special time, effort or training on the part of the RCC to interpret. 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. 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. Appendix E discusses steps that SAR managers can take to reduce false alerts.
- (d) *Capability to contact units in distress.* If the vessel or aircraft sending an alert is still operational, an RCC should 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 international language of SAR is English. Where neighbouring States use languages other than English, it is useful to have someone at the RCC or on call capable in those languages, too. Advantage can also be taken of the increasing trend of communication service providers to offer translation services on the telephone. Confirmation of verbal conversations with facsimile or other written means can reduce misunderstandings and expedite co-ordination processes. However, every RCC should 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.

4.2.3 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 SRUs should carry the Code.

4.2.4 While tools like the Code and Vocabulary exist, they are not intended to be necessary for verbal communications among SAR personnel and others who should be able to speak English due to the nature of their duties.

4.3 Important Factors for SAR Communications

The following sections discuss some of the important factors that affect the quality and usefulness of communications.

Priority, Reliability, and Availability

4.3.1 To reduce delays and improve the value of communications, systems must be improved on an end-to-end basis. What matters is the overall timeliness and quality of communications from their source to final destinations. Therefore, all sea, land, air and space segments must be examined to eliminate weak links, delays and deterioration of quality.

4.3.2 *Priority or precedence* deals with the process of handling messages and other communication signals related to SAR. In particular, distress messages should always have precedence, i.e., be processed before all other communications.

4.3.3 *Reliability* is a measure of whether equipment and systems used by persons in distress and providers of SAR services are in good working condition whenever they are needed. Because of the time-critical nature of SAR services, communications must work well at all times.

4.3.4 *Availability* refers to the SAR providers' access to equipment. Not only must the equipment work well, but it must also be available to all parties involved at all times.

Interoperability

4.3.5 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. For this interoperability, every civil vessel and aircraft should have basic alerting equipment which will be effective for the area in

which they operate. States then need to arrange for associated land-based infrastructure to receive, process and route distress alerts quickly to the appropriate place in the SAR system and for available communications databases to support alerts which are data rather than voice. Sometimes systems which are not directly interoperable with each other can still, through indirect arrangements, be interlinked.

- 4.3.6** Interoperability is also important when SAR equipment and personnel are drawn from different functional areas. Ships must be able to communicate with aircraft, and both must be able to communicate with the SAR system. Co-ordination which depends on communications is essential among all involved with a SAR effort. All who may be involved with SAR should be provided with communications procedures, frequencies and equipment sufficiently compatible to carry out their duties. Special switching equipment can be employed to link means of communications which otherwise are not interoperable.

Identification

- 4.3.7** All radio transmission sources must be identifiable. There are many ways to identify a station calling or being called, depending mostly on the equipment used; sometimes there are multiple alternatives for the same station. The specific identity received with a call or message, e.g., a radio call sign or identification number, is the one usually used in returning the call. SAR authorities should work with their State's communications authorities to ensure that provisions are available so that all callers and message originators can be properly identified.

Geography

- 4.3.8** Geography should also 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. Local knowledge and tests are the best sources of reliable information on geographic factors. Longer-range communications may allow neighbouring States or authorities to share fixed facilities. Also, landline systems can be used to remotely send and receive traffic over short-range facilities (e.g., remote controlled VHF) to communicate with users which would otherwise be out of range.

International Co-ordination

- 4.3.9** Traditionally, States have independently developed shoreside and ground communications infrastructure to handle distress alerting and SAR. Co-ordination of modern communications on a regional or even global basis has become increasingly important to success. With the advent of long-range and satellite communications, automatic data alerting and messages which require international access to databases to decode, this traditional approach is less effective. National stand-alone communications have become:
- increasingly expensive;
 - prone to gaps and redundancies in coverage; and
 - inadequate to provide the seamless integration and databases needed to serve the interests of persons, aircraft and vessels in distress.

Available Technology

- 4.3.10** Many types of communications systems and equipment are available. Basic communications may be all that are needed to provide SAR services; sophisticated and expensive systems may not be the most effective. However, technological advances, like the Internet and low earth orbit satellites, are providing potential low-cost alternatives to older systems. Persons in distress may use any means available to call for help. If a system gains public popularity, the SAR system should accommodate (not necessarily encourage) its use where practicable. Cellular telephones, low-power mobile satellite equipment, paging systems, amateur radios, and portable computers are examples.
- 4.3.11** SAR personnel should be aware of capabilities and limitations of the various modern means of communications being developed which could be used for distress alerting and SAR. If a new system is being developed, consideration should be given to its intended use for emergencies, so that its alerting, SAR co-ordination and locating capabilities can possibly be influenced while the system is easier to change. Appendix F suggests some capabilities which new satellite systems can incorporate to benefit users and the SAR system.

4.4 Mobile Equipment

- 4.4.1 Mobile equipment is used by persons in distress and SAR facilities for distress communications.
- 4.4.2 Distress communications are used when immediate assistance is required by persons, aircraft, or marine craft in distress, which may include medical assistance. Distress traffic also includes time-critical SAR communications and on-scene communications. Distress calls take 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.
- 4.4.3 More information on aeronautical and maritime mobile services, including communications between vessels and aircraft, is provided in appendix G.

Equipment Used by Persons in Distress

- 4.4.4 Any available means may be used for distress alerting. Often people use equipment which was never intended for alerting, and is less than ideal for that purpose, such as mobile phones. However, as illustrated below, some vessels and aircraft are subject to international carriage requirements for distress communications.
- (a) Most civil aircraft operating over ocean areas and remote land areas, and many 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. Satellite beacons have demonstrated superior performance to those that alert on 121.5 MHz.
 - (b) Similarly, certain vessels must carry emergency position-indicating radio beacons (EPIRBs) to indicate that a distress exists and facilitate location of survivors.
 - (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. Appendix G provides more information on carriage requirements for SOLAS ships.
- 4.4.5 Alerts are often received with missing or inaccurate position information. Location information allows SRUs to be dispatched to the immediate vicinity of the distress; while direction-finding or homing devices, if available, lead the SRU directly to the distressed persons.
- 4.4.6 For operations, accurate position information received with an ELT or EPIRB alert, such 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 still useful and sometimes essential.

Search and Rescue Units

- 4.4.7 Equipment provided to be carried aboard designated SRUs should be able to support co-ordination and locating functions.
- 4.4.8 Suitable means should be provided within an SRR to determine positions, especially over land and in coastal areas, including land-based radar for aircraft, vessel traffic services systems, etc. 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.
- 4.4.9 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 SRUs.
- 4.4.10 There are also a variety of satellite systems used for navigation and for finding the search targets. With three-dimensional capability and high accuracy, the GNSS, e.g., GPS or GLONASS, is attractive for aeronautical applications.

Note: Civil uses of the world-wide GPS system are co-ordinated by the US Coast Guard, which can provide more information on the system; and for GLONASS, by the Russian Space Forces.

- 4.4.11** 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.
- 4.4.12** SAR authorities may also provide SRUs with:
- ability to operate on the frequencies 3023 kHz, 4125 kHz, 5680 kHz, 121.5 MHz, 123.1 MHz, and 2182 kHz;
 - search and rescue radar transponder (SART)-compatible 9 GHz radars;
 - 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
 - capability to actuate one of the radiotelephone alarms aboard vessels in the vicinity to help establish communications with them more directly.

4.5 Land-Based Infrastructure

- 4.5.1** The reliability and availability of the communications network which supports distress communications should be considered on an end-to-end basis. Often the land-based infrastructure is the weakest link in SAR communications, especially for maritime SAR.

Alerting Posts

- 4.5.2** “Alerting post” is a broad term which covers any facility, regardless of its primary purpose, involved in receiving information about an apparent distress situation and relaying it to an RCC or RSC. Alerting posts include, but are not limited to:
- coast radio stations (CRSs);
 - Cospas–Sarsat local user terminals (LUTs) and mission control centres (MCCs);
 - Inmarsat land earth stations (LEs) (also known as maritime coast earth stations (CESs) and aeronautical ground earth stations (GESs));
 - air traffic services (ATS) units; and
 - vessels, aircraft, or other persons or facilities which may receive and relay alerts.

- 4.5.3** The ability of an RCC to respond to an emergency depends largely on information forwarded via alerting posts. Cospas–Sarsat receives and processes alert information from ELTs, EPIRBs and personal locator beacons (PLBs). Flight information centres (FICs) or aeronautical area control centres (ACCs) receive alerts directly from aircraft or via other facilities. CRSs receive alerts from broadcasts or ships.

- 4.5.4** Communications between an alerting post and the RCC, RSC or local SAR unit should be by fast and reliable means. The channels should be checked regularly. These voice or data links could be via dedicated or public telephone, radiotelephone, radiotelegraph, or satellite.

SAR Communications Network

- 4.5.5** Communications used among SAR facilities depend upon local arrangements, the structure of SAR services within the SRR and available equipment. Suitable frequency capabilities to communicate with dedicated SRUs or other mobile SAR facilities should be selected from those authorized by the International Telecommunication Union’s (ITU’s) Radio Regulations or ICAO Annex 10, provided and covered in plans or agreements among parties concerned. This includes advance international agreement on what frequencies will be used on-scene when units of more than one State jointly respond to a distress situation. SAR managers should ensure that such arrangements exist and that their RCC staff know about them.
- 4.5.6** Communications to and from RCCs and RSCs should be as timely and reliable as possible, and sufficient to handle the diversity and volume of communications for the worst potential scenarios. Specific details are provided in the *IAMSAR Manual*, volume II: *Mission Co-ordination*.
- 4.5.7** Land-based communications infrastructure should be adapted to route all distress communications to or from the RCC as automatically and directly as possible. It is operationally important for SAR managers to obtain national authority for their RCCs and RSCs to directly respond to requests for assistance from persons or craft in distress or from other RCCs or RSCs; related communications should be routed directly to the RCC or RSC rather than via diplomatic channels.

- 4.5.8 In general, if an RCC is capable of performing all primary RCC functions and is listed along with its SRR in an ICAO regional air navigation plan (RANP) or the IMO SAR Plan, alerts from the SRR should normally no longer be routed via alerting posts like SAR Points of Contact (SPOCs), “associated” RCCs, intermediary aviation facilities, etc., unless warranted by some added SAR value or technically necessary. However, 121.5 MHz alerts via Cospas-Sarsat will always need to be routed to a SPOC (usually an ARCC or MRCC) and aircraft usually will alert an ATC on the frequency used for air traffic control and then continue on that frequency.
- 4.5.9 RCC and RSC communications with mobile facilities may be handled directly, or via communications facilities. Communications with alerting posts and other SAR system elements, including other RCCs, should be reliable and, ideally, over dedicated lines which preserve message priority.
- 4.5.10 When practicable, routing of distress alerts should include automatic retrieval of relevant associated emergency information from communications registration databases.
- 4.5.11 ARCCs and MRCCs may install and use Inmarsat GESs or ship earth stations (SESs) to improve communications with units in distress, mobile facilities performing SAR functions, other RCCs, etc. Such installations may be unnecessary where reliable landline links exist between the RCC and its servicing LES; however, when Inmarsat’s SafetyNET is used (see appendix G) to relay distress alerts or other SAR information, suitable arrangements will be needed to monitor the broadcasts. For maritime purposes, the Inmarsat-C SES is the most versatile; although it only handles data communications, it can be programmed for various functions, it can relay SAR alerts over SafetyNET, and most ships carry it.
- 4.5.12 ICAO’s Aeronautical Fixed Telecommunications Network (AFTN) and Aeronautical Fixed Network (AFN) can be important for use by ARCCs, MRCCs and Cospas-Sarsat MCCs since they can handle message priorities. They are among the most reliable links in some areas and comprise an extensive world-wide network with terminal connections at aviation facilities near most RCCs. ICAO has authorized use of these systems for maritime SAR where more suitable resources are unavailable.
- 4.5.13 Communication links to ARCCs can usually be satisfied by the nearest FIC or ACC. If the ARCC is not co-located with such facilities, circuits may be needed to connect with them.

SAR Data Providers

- 4.5.14 Ideally, all distress alerts should arrive with identification and position information. Automatic pre-formatted messages should meet formatting standards and the equipment generating the message should be registered with an appropriate SAR data provider (SDP). Complete and accurate registration databases available on a 24-hour basis can be critical for SAR operations and for identifying the calling craft, to avoid having to dispatch a SAR facility when two-way communications cannot be established.
- 4.5.15 Registration of ELTs, EPIRBs, and other distress-alerting equipment offers the chance to collect valuable emergency information which can later be made available to SAR personnel when needed. If the air or marine craft involved operates internationally, equipment registration data must be readily available to RCCs on an international basis. For this to happen, either the data must somehow be provided along with the alert, RCCs must actually maintain the data, or RCCs must be informed on how to access the data. The data must be kept up to date by the users and responsible authorities.
- 4.5.16 States must make arrangements for registering distress alerting equipment and for this registration information to be immediately available to SAR authorities. This means that register information must be available on a 24-hour basis and to all SAR authorities, including those of other States and organizations.
- 4.5.17 The ELT/EPIRB databases can be arranged for nationally or, after agreement, by another State. Where two or more States have agreed to establish one common database for ELTs/EPIRBs, the country code for the country wherein the database is established should be programmed into bits 27 to 36 of the ELT or EPIRB so that SAR authorities requiring information will know where the emergency information can be obtained.
- 4.5.18 The basic information which should be included in any database intended to be used to support SAR operations, if the equipment does not provide this information as part of the alert, is as follows:
- electronic identities (maritime mobile service identity (MMSI), call sign, Inmarsat number, EPIRB and ELT identification, etc.);
 - operator;

- type of aircraft or vessel and/or maximum number of persons on board (less than 5, 5–25, or more than 25);
- name, address and telephone number of a land-based emergency contact person;
- alternative 24-hour emergency telephone number;
- *aircraft registration marking (if not given above); and
- *communications and navigation installations on board.

* *optional*

- 4.5.19** Perhaps the most important of the above data is the emergency contacts. The value of all these data elements is independent of the type of equipment sending the alert. Communications equipment used aboard aircraft, vessels and other craft should be registered in readily accessible State databases. Communications registration data should also be submitted to ITU for vessels engaged in international travel.
- 4.5.20** The authority maintaining the ELT/EPIRB database should facilitate the updating of emergency information in the ELT/EPIRB register and should contact the ELT/EPIRB licensee on at least a biennial basis to confirm that the database information is accurate.
- 4.5.21** The authority maintaining or using the database should ensure the information supplied for ELT/EPIRB registration is treated as restricted and ensure that it is used for SAR purposes only.
- 4.5.22** To achieve the best possible result in the coding and registration of 406 MHz ELTs/satellite EPIRBs, including the timely retrieval of ELT/EPIRB emergency information by SAR authorities, the authority maintaining the database should:
- promulgate guidance to manufacturers and users on coding and registration procedures;
 - ensure that reliable means is provided for immediate 24-hour access to database information for SAR authorities;
 - co-operate closely with other States, manufacturers, owners, operators and organizations to help resolve any registration or information-retrieval problems that may arise;
 - ensure that procedures on how ELT/EPIRB database information can be obtained by SAR authorities is promulgated in the national aeronautical information publication (AIP);
 - for a joint database, formalize co-operative arrangements between parties concerned for the maintenance of the database; and
 - arrange for appropriate procedures for the registration of an ELT/EPIRB when it is sold.

GMDSS Master Plan

- 4.5.23** Regulation 5 of chapter IV of the 1988 Amendments to the SOLAS Convention requires that every State provides information to IMO about its shore-based communication facilities to support ships carrying Global Maritime Distress and Safety System (GMDSS) communications equipment off its coasts. IMO collects and publishes this information in an indispensable reference for RCCs whose short name is the GMDSS Master Plan. SAR managers must ensure that the Master Plan has current information about its facilities, and that their RCCs, communications facilities, ships and training institutes have a copy of the Plan.
- 4.5.24** The Master Plan shows for every State, in list format and on maps, which of the following services are operational and planned:
- VHF, MF and HF digital selective calling (DSC) installations;
 - Inmarsat, SafetyNET, NAVTEX, and HF narrow-band direct printing (NBDP) services;
 - satellite EPIRB registration, MCC and LUT information; and
 - which RCCs are using SESs.

Ship Reports for SAR

- 4.5.25** Ship reporting systems are communications-intensive; yet, they are often important to successful rescues of persons from aircraft or marine craft in remote ocean areas. Therefore, SAR authorities should directly or indirectly recruit ships into such systems and help them to understand how to participate. Often aeronautical and maritime SAR personnel can, either directly or via their State's maritime safety authorities, recruit or require ships to participate. SAR authorities should, where practicable:
- arrange for CRSs and CESs to relay ship messages to ship reporting systems for SAR free of charge to ships, and support any appropriate measures to enable such reports to be submitted with improved accuracy and ease; and
 - 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.
- 4.5.26** Several States operate ship reporting systems. Additional information on ship reporting systems is provided in the *IAMSAR Manual*, volume II: *Mission Co-ordination*. Regardless of which system ships participate in, they should still be urged to participate in Amver, the only world-wide system operated exclusively for SAR. Amver can be contacted (see appendix D) for user manuals for ships and information on how RCCs can obtain ship information for SAR. These services are free to all ships and RCCs.

4.6 Supplemental Capabilities

- 4.6.1** Instant-replay recording equipment to record aeronautical and maritime voice communications can help document and verify information, and make it readily available for future reference and for other RCC or RSC personnel to hear. This is especially valuable for radio communications. When managers provide this equipment, typical practice includes the following:
- all voice communications are recorded;
 - storage media are changed as necessary;
 - recordings are numbered, dated, and placed in locked storage under control and access of the RCC or RSC;
 - recordings are kept for at least 30 days;
 - recordings are retained by the RCC when an investigation or judicial inquiry is anticipated or under way, with chain of custody maintained, and the storage media not recycled until released by a higher authority;
 - requests for recordings or transcripts should be directed in writing to the RCC; and
 - recordings or transcripts are only released to authorized personnel.
- 4.6.2** Equipment installed for telephone lines, such as answering machines, voicemail, call forwarding, automatic speed dialling and re-dialling, and caller identification, can provide recorded announcements and invite the caller to leave a message, save time and reduce errors. This improves chances that an incoming call will be successfully received, it saves time and reduces errors. These labour-saving devices are a convenience to the caller if the staff cannot answer the call immediately due to other calls or duties but are no substitute for 24-hour watchstanding.
- 4.6.3** Caller identification for incoming calls is valuable for any emergency organization. It can save time, reduce errors, help identify hoax callers and enable the call to be re-established if it is inadvertently disconnected. This capability is technically feasible for long-distance calls, including cellular calls, provided the appropriate switching is installed by the service providers and obstacles are removed for exchanging information between providers. Arrangements should be made so that unlisted numbers will not be withheld from emergency personnel. SAR authorities should encourage service providers to include these capabilities in their services.
- 4.6.4** Some States and service providers offer two- or three-digit numbers for emergency landline or cellular telephone calls which are easy to remember and fast to dial. These arrangements enable a general public service answering point (PSAP) to connect the caller to the appropriate emergency response organization.

4.7 MEDICO Communications

- 4.7.1** The ITU *List of Radiodetermination and Special Service Stations* lists commercial and Government radio stations which provide free medical message service to ships. These incoming or outgoing messages should be prefixed with "DH MEDICO". Messages requesting medical advice are normally delivered only to hospitals or other facilities with which State authorities or the communications facility involved has made prior arrangements. Inmarsat provides service access codes (SACs) for medical advice and medical assistance.

4.8 Radio call signs for aircraft involved in a search and rescue operation

- 4.8.1** A prefix call sign makes the task/function of a specific aircraft easier to be understood by other aircraft and participating units in the same area.
- 4.8.2** The prefix call sign can also give the aircraft priority in some situations.
- 4.8.3** The State authority responsible for air regulation shall ensure that use of prefix call sign will conform with other national air regulation practice.
- 4.8.4** During search and rescue missions and exercises it is recommended that 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

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System Management

5.1 Understanding the SAR System

Broad Perspective

- 5.1.1 The historical process for achieving a global SAR system has been to develop national SAR systems and associate them with each other in a collection. One way to establish a national SAR system has been to assign responsibility for the system to one agency which was expected to depend on its own resources to achieve success. A better and more cost-effective alternative may be to take a more global, regional or multi-agency approach.

Global Solution

- 5.1.2 Assisting any craft or person in distress serves national interests, is an established international practice based on traditional humanitarian obligations, and is founded in international law. A distress situation can occur anywhere at any time. An aircraft in-flight emergency may take place over long distances; likewise, a person in distress at sea may drift a considerable distance. In both incidents, the emergency location may cross one or more SRRs.

- 5.1.3 The establishment of a global SAR system is intended to ensure that all persons in distress will be assisted regardless of their nationality or circumstances and wherever they may be found. Annex 12, Search and Rescue, to the International Civil Aviation Organization Convention and IMO's International Convention on Maritime Search and Rescue are the primary documents for establishing SAR service requirements.

- 5.1.4 State provisions for SAR services should be viewed as part of a global safety system. To this end, the States concerned with a particular land mass or ocean area should co-operate to use all available resources in assisting persons in distress.

Regional Approach

- 5.1.5 Neighbouring States can create a regional SAR system by means of bilateral or multilateral understandings (e.g., plans and agreements) to co-operatively provide SAR services in a specific geographic area. A regional approach like this to providing SAR services has many advantages both to the beneficiaries of SAR services and to the States which provide those services. Duplication of effort and facilities can be avoided, more uniform services throughout the region can be provided, and proficient SAR services are possible even near States with limited resources if a regional approach is taken to providing and improving SAR services. Some advantages are shown below.

- (a) The number of RCCs can be reduced when a single RCC is supported by more than one State, enabling increased proficiency and economy overall and simplifying distribution of distress alerts.
- (b) Communication databases and facilities can be consolidated where a single facility can serve multiple States and larger areas; these steps make it easier for other RCCs to access data, easier for users to register equipment, and easier for States to afford needed communications support.
- (c) Training often can be conducted more extensively and affordably on a regional basis.

- 5.1.6 Similar advantages are afforded by involving multiple agencies within a State in a co-operative SAR effort. While SAR management may become slightly more complex, the advantages gained in being able to do more with less make the approach worthwhile.

Assessing National and Regional Needs

- 5.1.7 Each State should assess its own responsibilities and requirements and then evaluate its abilities as a SAR service provider for both national and regional needs. Whether establishing a SAR system or conducting a periodic review of an established one, assessments provide a factual basis on which to make improvements. Such assessments also help to gain continued support for SAR system funding, to obtain assistance from

other agencies, or to justify procurement of additional resources. Appendix H contains a national self-assessment questionnaire which may be used to evaluate international and national SAR systems, to identify areas for improvement, and to assist SAR managers in assessing needs.

5.2 Planning Processes

5.2.1 There are specific planning processes appropriate for each level of the SAR system. Operational levels must develop plans of operation, search plans, rescue plans, etc. The SAR manager should develop what might be called “programme plans.” Plans developed by international or interagency SAR co-ordinating committees (SCCs) tend to be strategic, focused on areas of interest their members share in common, and used for implementation of higher-level conventions, legislation and plans which apply to multiple members.

Planning Activities

5.2.2 SAR management planning processes involve:

- assessing emerging technologies and other environmental changes and opportunities;
- appraising the system, including use of SAR statistics to identify recurring causes of distress incidents;
- analyzing and responding to the findings and recommendations of accident investigations;
- promoting legislation, rules, treaties, or agreements to improve safety;
- sharing information among programmes and organizations; and
- participating in SCCs and international and interagency SAR meetings.

5.2.3 SAR managers should periodically assess their programme and update their long-range plans. An annual review is suggested.

Using Goals to Improve the SAR System

5.2.4 Establishing well-defined and realistic goals is an excellent way to ensure continuous improvement in the SAR system. Goals should clearly promote public well-being by seeking to minimize injury, death and property damage related to air, sea and land transportation. Goals also should promote co-operation among Government agencies, ensuring efficient use of public resources. Such goals are often addressed by national legislation that establishes a SAR system.

5.2.5 Useful goals are consistent with SAR mission and purpose; they are associated with specific objectives, clear implementation plans, reasonable yet firm target dates and measurable outcomes. Some typical SAR goals are listed below.

- (a) Minimize loss of life, personal injury, and property loss or damage.
- (b) Minimize time spent searching for persons in distress by using technology, research and development, education, regulation, and enforcement.
- (c) Improve safety so that the number of distress events is reduced. Achieving this goal may require close co-operation with other aeronautical and maritime authorities, since they, and not the SAR managers, may be responsible for the necessary safety programmes.
- (d) Improve co-operation between aeronautical and maritime SAR authorities, which is important because:
 - aircraft may need assistance over either land or water;
 - sharing SAR resources is usually the most efficient way to maximize system success;
 - co-ordination of SAR operations and sharing of operational information can be simplified and expedited;
 - accountability for SAR system personnel is increased; and
 - routing of distress alerts to appropriate RCCs is expedited by harmonized communications plans and SAR regions.

Developing Objectives to Support SAR Goals

5.2.6 Typically, each goal will have a few associated objectives. In turn, each objective will have action items, with due dates and responsible persons assigned.

- 5.2.7 Objectives established in support of SAR goals are typically stated in terms of specified response time, rescuing a percentage of persons at risk of death, or property at risk of destruction. These objectives are meaningful and relatively easy to quantify. Other objectives, such as injuries and property damage prevented or anxiety relieved, can be used though they are more difficult to measure. Also, persons and property are not always in imminent danger when rescue facilities arrive on-scene. However, were it not for the SAR system's rapid response, their situation may well have deteriorated. In such incidents, even though SAR system presence probably prevented an eventual loss of life or property, the SAR system is credited with "assistance" only.
- 5.2.8 The following are sample objectives for which results can be measured for a particular geographic region to develop and comply with response time criteria:
- to save [X]% of individuals in distress.
 - to save [X]% of property in danger of destruction.

Long-Range Planning

- 5.2.9 SAR managers should develop long-range (typically five-year) plans for achievements in their respective areas of responsibility. These plans will document goals, objectives and intended actions. All these goals should relate directly or indirectly to SAR operational needs. They also serve as a tool for implementing higher-level directives, legislation, SCC plans, and other similar documents.
- 5.2.10 The benefits of developing SAR plans which foster ongoing improvements in SAR capabilities go well beyond the potential lives saved. For example, at the national level, goals often relate to saving property as well as lives, since saving property is often a natural by-product of lifesaving efforts. This contributes to favourable cost-benefit justifications for further investment in SAR. The potential economic value of SAR's contribution to safe transportation can be important to States which depend on international business or tourist travel for a sound economy. Looked at another way, the adverse international publicity which might result from loss of lives due to poor handling of a major distress situation could have long-term economic consequences.

SAR Plans

- 5.2.11 SAR plans describe how SAR services will be provided, organized and supported. SCs oversee and implement these documents. SAR plans should be signed by all Government agencies which can provide or support SAR services. These agencies should all be represented on the SCC which oversees these plans.
- 5.2.12 A national SAR plan is a single document that pertains to the SRRs, RCCs, and RSCs and SAR-related functions for which one State is responsible. Principles of operational co-ordination must be covered in this plan, which serves as a basis for more detailed provisions in subordinate State documents such as a SAR manual or plans of operation. Other types of SAR co-operation, such as mutual visits and training, also may be addressed. The national SAR plan may include a:
- description of the SRR, including the limits for any SRSs created to make the organization more efficient;
 - description of the available facilities, personnel, and equipment;
 - discussion of the SAR personnel training programme, qualification standards, and certification procedures;
 - discussion of the roles and responsibilities of all agencies which will provide or support SAR services;
 - copy or summary of all agreements with authorities providing facilities and services not under the direct control of the SAR managers; and
 - copy or summary of all agreements regarding mutual assistance with neighbouring RCCs.
- 5.2.13 A SAR plan may be supported by legislation or regulations if necessary, or may be a self-supporting memorandum of understanding (MOU) between appropriate agencies. Ratification of an MOU at the Ministry level recognizes the importance of SAR, while allowing for an easier revision process than higher-level agreements would allow.
- 5.2.14 A primary duty of SAR authorities is co-operation with neighbouring States. A regional SAR plan is a way to provide a framework to guide national SAR authorities towards attaining this co-operation. Once a regional SAR plan is developed, high-level commitment between States can be reached by means of written

agreement or through a multilateral MOU. A multilateral arrangement provides for consistent, harmonious and expedient response to distress incidents. Appendix I contains sample text and guidance for a national SAR plan.

- 5.2.15 Appendix K contains sample text to describe arrangements for the division of responsibilities between the Rescue Co-ordination Centre (RCC) and the Air Traffic Services (ATS) provider as component organizations contributing to the national emergency response system for aircraft.
- 5.2.16 Sometimes, Ministers of Transport sign regional SAR plans since often both civil aviation and maritime safety programmes are under their purview. They are usually in the best position to designate and support SCs, who may include the Directors of Civil Aviation, Merchant Marine Safety or other officials with similar duties. The Ministers of Transport are often in the best position to promote co-ordination and harmonization of maritime and aeronautical SAR.
- 5.2.17 Once a regional SAR plan is in effect, signatories should see that appropriate subordinate plans (and legislation or regulations needed to implement them) are developed to ensure co-operation.

Hierarchy of SAR Documents

- 5.2.18 There are different levels and types of SAR documents as illustrated in Figure 5-1. Global SAR plans include IMO’s SAR Plan and ICAO’s Regional Air Navigation Plans (RANPs). These global plans are a basis for implementing national and regional (bilateral or multilateral) plans, manuals, agreements and related SAR documents. The IMO Global SAR Plan and applicable ICAO RANP would be followed by a regional SAR plan where a regional SAR system exists. Next would be the national SAR plan, and so forth down to the RCC and local levels.
- 5.2.19 SAR manuals provide guidance on implementing the plans. International SAR manuals may be followed by regional or national manuals, and then by plans of operation for the RCCs and RSCs. Some plans have an administrative character while others have an operational focus.

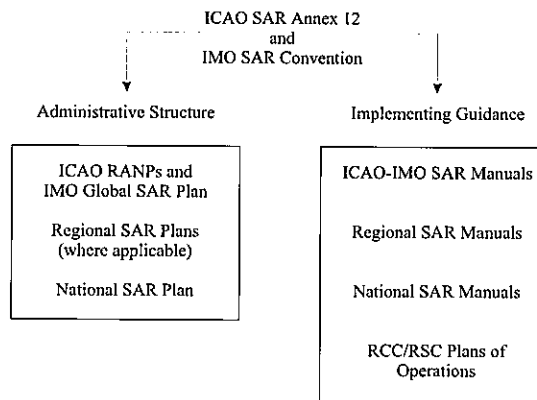


Figure 5-1 – Basic SAR documents

5.3 Organization

Managing Resources to Meet Requirements

- 5.3.1 There are two basic types of management for the SAR system: administration and operations. Administration includes planning, organizing, staffing, funding and assessing the SAR system. Operations management includes routine and emergency activities supporting SAR response operations. From an overall management perspective, a SAR system consists of:

- an area within which SAR services are to be provided; and
- a process to transform operational requirements and national commitments into the provision of SAR services.

Establishment of RCCs and RSCs

- 5.3.2** Each SRR must have an RCC. When a State assumes responsibility for an SRR, it commits to establish and staff a fully capable RCC. If necessary, RSCs may be established under an RCC to assist in providing services within an SRR. An RSC would be responsible for SAR services within its SRS.
- 5.3.3** SAR managers have the overall responsibility for establishing, organizing, staffing, equipping and controlling the SAR system. The managers also provide or arrange for legal and funding support, establish RCCs and RSCs, provide or arrange for use of SAR facilities, co-ordinate non-operational activities such as SAR training and develop SAR policies and procedures. The manager's role should be assigned to a person or an appropriate agency. Managers should ensure compliance with the SAR provisions of IMO and ICAO conventions to which their State is a party. This is an administrative position and can be full- or part-time. SAR managers normally:
- develop, co-ordinate, administer, review and evaluate plans, policies, procedures, standards and training requirements for SAR co-operation and co-ordination;
 - establish and support RCC and RSC facilities;
 - support, assist and possibly chair the SCC;
 - promote SAR system effectiveness and commitment to SAR objectives;
 - work nationally and internationally to establish recognized SAR regions, close and effective working relationships, use of common procedures and expedient exchanges of SAR information;
 - co-ordinate plans and procedures with other organizational managers that support, participate in, or provide resources for SAR operations;
 - maintain SAR plans, manuals and other SAR directives;
 - establish and maintain liaison with appropriate SAR contacts, nationally, regionally and internationally;
 - develop the SAR budget and administer appropriated funds;
 - maintain SAR data, a SAR library and SAR case files;
 - compile SAR statistics and conduct and review SAR case studies;
 - develop SAR agreements and improved international SAR capabilities and procedures;
 - promote efficient and effective use of all available SAR resources;
 - improve SAR communications;
 - provide information to facility managers for operational performance standards and resource acquisition, geographic distribution and readiness status;
 - encourage joint training and exercises leading to development of improved SAR procedures and technology;
 - initiate, review, and evaluate SAR research and development efforts;
 - participate in SAR seminars and workshops;
 - promote safety programmes to decrease distress incidents;
 - develop contingency plans for SAR resources to respond to natural and man-made disasters;
 - supervise SAR programme training;
 - provide support services such as emergency fuelling or medical assistance;
 - develop procedures to provide critical incident stress counselling to SAR personnel; and
 - promote visits between SAR programme personnel and among RCC and RSC personnel and others with special expertise related to SAR or SAR support.
- 5.3.4** Some SAR authorities have created a regional or national level SCC. This group brings together and helps to co-ordinate the activities of all agencies which are concerned with or can assist with SAR. The SCC, when it exists, usually is the approving authority for the policies and procedures that are incorporated into the SAR plan. The SCC represents the interests of both SAR service providers and probable beneficiaries in the development of SAR policies, plans, and agreements.

- 5.3.5 RCCs and their subordinate RSCs are the primary operational elements in the SAR organization. Chapter 2 discusses their roles and responsibilities.
- 5.3.6 SAR operations are normally carried out under the direction and supervision of an SMC, who is usually the supervisor of the RCC or RSC watch team. In multiple-incident situations this officer could be SMC for all incidents, or, for some of those incidents, the SMC role could be delegated to another suitably qualified member of the watch team. The SMC should in all cases be supported by RCC watch team members to undertake functions in the co-ordinating process such as communications, plotting, logging and search planning. For complex cases or those of long duration, the assisting team must be replaced at regular intervals as well as the SMC. The SMC must be able to competently gather information about emergencies, transform emergency incident information into accurate and workable plans and dispatch and co-ordinate the facilities which will carry out the SAR missions.
- 5.3.7 The OSC is usually designated by the SMC and assists with co-ordinating the detailed activities at the scene of the SAR incident. The OSC is normally the master of one of the responding vessels, the pilot-in-command of one of the responding aircraft or the most qualified person in a land party. It is desired that the OSC be trained to perform co-ordination functions, but that may not always be possible.
- 5.3.8 SRUs are the facilities which respond to the distress situation and which carry the personnel who perform the actual SAR operations. Chapter 2 discusses SRU requirements and considerations.
- 5.3.9 An alerting post is a facility involved in receiving information about an apparent distress situation and relaying it to an RCC or RSC. See chapter 4.

Maximizing System Effectiveness and Benefits

- 5.3.10 Effective SAR services consist of more than just the response to distressed persons. For the SAR system to realize maximum effectiveness, certain activities must take place.
- (a) A high degree of readiness must be maintained. Distress alerts may come at any time and the system must always be ready to receive and respond to them. Individuals, items of equipment, communications links, etc., must be examined and operated frequently to ensure they will function correctly when an emergency arises. These inspections are as important to the safety of SAR personnel as they are to the persons or craft being assisted.
 - (b) Periodic training and exercises must be conducted with the various SAR system components in order to maintain proficiency and safety. Training, and especially exercises, allow early detection and correction of procedural and equipment problems before an emergency arises. Training and exercises are addressed in chapter 3.
 - (c) “Preventive SAR” is important. All SAR systems should include activities aimed at the prevention and mitigation of SAR incidents. Patrols, supervision of large events such as regattas, air shows, safety inspections and public awareness campaigns are some of the ways to help prevent SAR incidents or mitigate the effects of those that do occur. Volunteer organizations can often assist in these activities at little or no cost to the SAR authorities.
 - (d) The focus of all activities other than actual SAR operations should be on the continuous improvement of the SAR system. Chapter 6 describes the necessary factors and recommends some techniques for creating an organizational environment that fosters continuous improvement.
- 5.3.11 Below are sample initiatives which States may consider for improving safety and SAR effectiveness; managers must determine what is appropriate to individual circumstances.
- (a) Use legislation to designate specific agencies with organizing and co-ordinating SAR services.
 - (b) Avoid policies which pre-empt the judgement of SAR professionals on whether it is safe and appropriate to render assistance in a particular situation.
 - (c) Provide urgent lifesaving measures without regard to the nationality or circumstances of those needing assistance.
 - (d) Confirm that those assigned to SAR operations have maturity and competency appropriate to their particular duties.
 - (e) Use internationally recognized procedures, types of facilities and equipment.

- (f) Ensure that RCC and RSC personnel are prepared to properly receive, collect, assess, use, preserve and provide information related to a distress situation or to SAR co-ordination.
- (g) Ensure that operational personnel are trained to work together continuously as a team, to recognize and avoid undue risks and to prevent accidents, damage, injury, death, or worsening of the situation of those in distress.
- (h) Recognize that rescue operations are often carried out under circumstances of extreme stress, hazards, and crisis where quick decisions and choices must be made which will not always be the same if they could be made with more time and information, and in a more conducive environment; and that perils inherent to a distress situation would often have worse consequences than errors made by rescuers in removing victims from those perils.
- (i) Keep complete and accurate logs of SAR operations, and include detailed information of any problems which develop to assist in carrying out a proper investigation and reporting of an incident and finding ways to apply lessons learned to prevent future recurrences.
- (j) Use directives, policies, regulations, plans, manuals, etc., to document SAR guidance or requirements.
- (k) Do not consider assumption of one effort by the SAR system (e.g., lifesaving) to automatically require another (e.g., salvage).
- (l) Understand that it is not always possible for those on-scene or others involved to know the best course of action; e.g., pulling a grounded boat free may result in its sinking, and leaving it grounded may result in its destruction by pounding on rocks, so there may be damage regardless of whether SAR personnel attempt to save the property.

5.3.12 The following provisions may help to produce a stronger and more flexible SAR system:

- ensure that SAR is recognized in legislation as an official function which will be supported by the State, which will likely facilitate any SAR manager efforts to obtain support;
- require that SAR plans and arrangements provide, as practicable, for use of all available resources; and
- adopt measures which promote safe design, construction, maintenance, and operation of aircraft, ships and other marine craft.

5.3.13 Variations of the terms “saving” and “salving” are commonly used internationally regarding removal of property from risk. Some factors to consider in developing policies on saving property include:

- cost and risks involved in saving property;
- benefits and methods of estimating the value of saved property;
- whether abandoning property may introduce other problems, such as pollution or hazards to navigation;
- whether proper facilities, equipment and skill seem to be available to conduct particular salvage operations;
- need to exercise reasonable care for the sake of safety and minimizing property damage;
- possible need for available SRUs to handle higher priority duties at the time; and
- advice of SAR personnel on-scene who are usually in the best position to assess the situation.

5.3.14 Accommodating the saving of property:

- is often a natural extension of lifesaving efforts;
- may be a means of lifesaving, e.g., saving a vessel may be the best means of saving the lives aboard the vessel;
- may help to justify SAR resources due to the value of the property saved; and
- will take advantage of SAR facility capabilities when other means of saving property may be unavailable or too expensive.

5.3.15 Dealing with emergency situations other than SAR:

Chapter 7 of Volume II of the *International Aeronautical and Maritime Search and Rescue Manual* discusses the use of SAR services to respond to emergencies that may not correspond to traditional aeronautical or maritime search and rescue operations. SAR personnel and resources may be expected or requested to assist in such situations and may need to do so in co-operation with other emergency response authorities.

5.4 Resources

Obtaining Resources

- 5.4.1 The primary resources of a SAR organization are the operational facilities made available to it by various authorities. While these facilities remain administratively under their respective authorities, their operations for SAR are co-ordinated and guided by the SMC.
- 5.4.2 SAR managers must provide or arrange for the use of the primary SAR facilities. Although the SCs have overall responsibility and the RCC has operational responsibility to co-ordinate SAR operations, they may have limited facilities directly under their control. They usually depend on other agencies and organizations to provide SAR response facilities. The military services, due to their resources and training, often are a primary source of response assets. MOUs should be arranged at both the SC and RCC levels to provide for the efficient use of military resources when needed. These arrangements should be part of a SAR plan. An SCC often can provide a forum for resolving such issues.
- 5.4.3 In establishing a SAR service, States should use existing facilities to the fullest extent possible. A successful SAR organization can be created without having designated, full-time SAR units. Facilities used for operations not connected with SAR often may be made more useful for SAR service by adapting them, e.g., instructing volunteers and auxiliary organizations in first aid and radiotelephony procedures; installing radiotelephone equipment on fishing vessels, yachts and other small craft; and using isolated stations as alerting posts. By providing training and equipment, and integrating all facilities, an efficient SAR service can be set up with little or no need for designated SAR units.
- 5.4.4 Different geographic areas pose varying problems for SAR operations because of climates, topography or physical characteristics. Such factors will influence which facilities, equipment and personnel are required and available for SAR services. Appendix C lists potential sources from which assistance may be obtained; common sources include:
- State, provincial, and local Government departments;
 - fire and police departments, military, coastguard, lifeboat and other auxiliary services;
 - communications facilities;
 - aircraft operating agencies;
 - commercial ships of all sizes and types;
 - fishing vessels, yachts and small craft;
 - ship reporting systems;
 - auxiliaries (privately owned craft organized for SAR);
 - volunteer SAR organizations;
 - sports clubs and similar organizations; and
 - commercial enterprises.

Obtaining Funds

- 5.4.5 The SAR system must have funding support commensurate with national goals. Support is often improved when the manager is able to educate others about the importance of the SAR system and keep them informed of significant ongoing activities. Funding can be minimized by making use of all available resources, but there may be specific SAR needs, such as training, specialized equipment, and others, which require funding. The national SAR plan and the SCC can support budget issues.
- 5.4.6 Sound funding decisions arise out of accurate assessments made of the SAR system. To measure the performance or effectiveness of a SAR system usually requires collecting information or statistics and establishing agreed-upon goals. All pertinent information should be collected, including where the system failed to perform as it should have; failures and successes provide valuable information in assessing effectiveness and determining means to improve.
- 5.4.7 On an international basis, custom and practice hold that the State providing aeronautical and maritime SAR services fund those services, even if the assistance is provided at the request of another entity, e.g., an RCC of another State. Requests for reimbursement are not normally made, therefore, to the State requesting or receiving the services.

- 5.4.8** With respect to SAR services rendered domestically, it is normally impractical to charge those assisted, since they would be unable to afford the full cost in most cases. However, some authorities have initiated advance fees charged to certain groups, or to participants in certain dangerous activities, to help offset the general costs of providing SAR services needed by those groups or for those activities. It is important to consider that a policy of charging for SAR services after they are rendered may prompt those in danger to delay calling for assistance until it is either too late to save them, or until the resulting level of SAR effort needed is much greater. Deciding in each case whether to charge for a response will often also need to be subjective.

General Staffing Considerations

- 5.4.9** Administrative and support functions combine with operational functions to form a SAR structure as shown in Figure 5-2.

SAR Requirements	Functional Areas	Positions
Establish national or regional SAR systems as part of the global SAR system	Develop legislation Arrange to use resources Provide resources Establish SRRs with RCCs Establish SRSs with RSCs Provide staff Train personnel Ensure adequate communications Develop plans and agreements Form SAR Committees	SAR co-ordinators and managers, administrative staff and support staff within the State's Administration
Receive distress alerts	Monitor common means of alerting Acknowledge distress alerts Relay distress alerts to the RCC	Communications watchstanders at alerting posts and RCCs
Co-ordinate SAR services	Relay distress alerts if necessary Acknowledge alerts if necessary Co-ordinate response Plan searches <ul style="list-style-type: none"> - Alert and dispatch SAR facilities - Assign OSCs and OSC duties - Prepare SAR action plans - Provide medical advice - Document each case 	SMC with support of staff at the RCC or RSC
Conduct SAR operations	On-scene co-ordination Search Rescue Medical evacuations	Personnel aboard SRUs and other mobile SAR facilities
Support SAR Services	Support SAR facilities and personnel Training Communications Supplies Facility maintenance	Logistics and support managers, administrative and training staff, suppliers, maintainers, computer operators, communications providers, etc.

Figure 5-2 – SAR System staffing overview

- 5.4.10** Staffing consists of filling positions in the SAR organization by identifying work requirements, and then recruiting, selecting, placing, evaluating, promoting, compensating and training needed personnel. Staffing must be closely linked with organizing roles and positions.
- 5.4.11** The objective of staffing is to fill organizational roles with qualified persons. Clear organizational roles and requirements and sound managerial appraisal and training techniques help to ensure quality performance.
- 5.4.12** Staffing has several key aspects.
- (a) *Position definition.* The more precisely the functions and tasks of a position are identified, the better the requirements of the position can be defined.
 - (b) *Skill definition.* Skills and personal characteristics needed by the person are defined.
 - (c) *Matching qualifications.* The candidate's abilities are compared to the position requirements.
 - (d) *Performance evaluation.* When position objectives are clear, staff performance can be better assessed.
 - (e) *Training, qualification, and certification.* Qualification is achieving skills. Certification is acknowledgment of overall competence.
 - (f) *Continuing development.*
- The first four of these aspects are discussed in this chapter; the last two are discussed in chapters 3 and 6.
- 5.4.13** A range of general skills helps SAR personnel to be more effective.
- (a) Particularly at upper organizational levels, managers should be able to see a problem and design a workable solution. If they merely see the problem and become "problem watchers," they will fail.
 - (b) The ability to see the "big picture", to recognize significant elements in a situation, and to understand the relationships among elements, is valuable at all levels, with the possible exception of the task-focused operational level.
 - (c) The ability to work with people, to engage in co-operative effort, to foster teamwork, and to create an environment in which people feel secure and free to express their opinions is needed throughout the SAR organization.
 - (d) Proficiency in activities involving methods, processes, and procedures, usually working with support equipment, is especially useful for SAR facility operators, searchers and rescuers.
- 5.4.14** Desired personal characteristics for SAR personnel include:
- (a) *Persistence.* The SAR person exhibits a dedication to find the victim. Patience, tenacity and perseverance are common in SAR team members.
 - (b) *Dedication to rescue.* SAR personnel must often walk a fine line between personal safety and endangerment during a rescue. In the rescuer's mind, the safety of the victim may rise above personal safety.
 - (c) *Ability to communicate with empathy.* Reports, letters, speeches, and discussions about SAR demand clarity and accuracy, but they also require the ability to understand the feelings of other people and to deal with emotional aspects of communications.
 - (d) *Integrity and honesty.* SAR members should be morally sound and worthy of trust. Integrity in SAR requires being honest about search parameters and results, keeping superiors informed, adhering to the full truth at all times.
 - (e) *Experience.* Past exposure to a wide range of SAR situations is valuable. Prior experience is a predictor of future performance. Although organizations often promote their operationally experienced personnel into management or administrative positions, caution must be exercised to ensure that the required expertise remains available at the operational level to train others.
- 5.4.15** After SAR positions are identified, candidates who best meet a position's specific requirements should be selected to fill them as practicable.

5.4.16 Systems of appraising personnel performance against verifiable pre-selected goals have great value.

5.5 Leadership and Operations

5.5.1 The ultimate goal of a safety system is to foster safety. As the number of unsafe events declines, so does the perceived need for the safety system. Without someone to defend the safety system, it could eventually lose support because of its own success. In developing a SAR system, such a person can be essential for providing focus on the problem and the need for co-operation.

5.5.2 SAR system success occurs each time a person is removed from a distress situation. The operational goal of the system is to match the rescuer with the person(s) in distress and move that person to a position of safety. All the elements and components of the system must work together to that end.

5.6 System Assessment

5.6.1 The following questions should be considered when establishing SAR services.

- (a) Will the goal of the services be to always provide comprehensive SAR response on demand, or to respond with available resources when it can be done safely and the service provider judges the response to be warranted?
- (b) Will national SAR services include saving property, and if so, under what conditions?
- (c) Will non-Administration resources used for SAR be supported by the State, train and exercise with State-owned resources and operate under the same authority and policies as State facilities?
- (d) To what degree will the SAR organization ensure adequate coverage and readiness for its geographic areas of responsibility?
- (e) How will geographic areas of responsibility be delineated?
- (f) Will civil SAR normally be given priority over other missions of multi-mission facilities, and, if so, how will that be ensured?
- (g) How will physical risk be held to reasonable levels for those assisting and those being assisted, and who will determine when a particular aspect of an operation would involve undue risk?

Data Requirements

5.6.2 Statistical analysis of programme data is important for documenting the need for a well-functioning and efficient SAR system. Knowing the numbers of lives saved, people assisted and amount of property loss prevented can be very useful when competing for limited resources. SAR programme statistics tend to underestimate the total national SAR effort expended because the SAR system is typically not made aware of all distress incidents or assistance provided.

5.6.3 SAR data tracking should include at least the total number, or amounts, of:

incidents	persons otherwise assisted
responses	value of property lost
sorties	value of property saved/assisted
lives saved	property loss prevented
lives lost	time expended on sorties.

5.6.4 This data should also reference the types of participating SAR facilities, types of units assisted and geographic distribution of SAR cases. Other useful data includes the type of alerting means, method of locating the distressed person or property, nature and cause of the incident, distance offshore, size of units assisted and assistance rendered. To aid in analysis, this data should be coded and entered into a computer database for ease of information management and use when practicable.

5.6.5 The types of data collected, the collection methodology, and methods of calculating SAR costs must remain the same from year to year in order to yield credible results. Include adjustment for inflation (a similar adjustment to the effectiveness measures is *not* required).

System Effectiveness and Efficiency

5.6.6 For States which use the SAR system to minimize loss of both life and property, system effectiveness must be measured in terms of how well the programme accomplishes those objectives.

5.6.7 The two measures below relate SAR system effectiveness to the primary benefits to the population it serves.

$$\text{Programme Effectiveness for Preventing Loss of Life} = \text{EFF(L)} = \frac{\text{LS}}{\text{LS} + \text{LLA}}$$

$$\text{Programme Effectiveness for Preventing Loss of Property} = \text{EFF(P)} = \frac{\text{PLP}}{\text{PLP} + \text{PL}}$$

Where:

LS	=	Lives Saved
LLA	=	Lives Lost After Notification
PLP	=	Value of Property Loss Prevented (Calculated estimated amount of property loss that would have occurred had the SAR system not rendered assistance.)
PL	=	Value of Property Lost

5.6.8 In both measures, the denominator represents the total lives or property available to be saved. The numerator represents the lives or property actually saved. The resultant ratios measure the proportion of lives or property actually saved versus the total available to be saved.

5.6.9 Lives lost before SAR system notification were not saveable; therefore, they are excluded from the life-saving effectiveness measure. Lives lost after notification reflect the potential number of additional lives that may have been saved. Studies suggest that about one third of the deaths that occur after SAR system notification happen soon thereafter before help can arrive, or due to such serious injury or sickness that saving life was not possible. The remaining lives lost may be attributed to a less than optimal SAR system.

5.6.10 Property lost after notification is a more subjective measure. For lack of a better value to apply to the property lost equation, subtract the property's value after loss from its value before SAR notification, the remainder being the loss.

5.6.11 Measures of system effectiveness must be sensitive to changes in the SAR system. Improved response time of rescue units, improvements in alerting and determining datum and improved search sensors and search techniques are some enhancements that should increase effectiveness. Conversely, degradation of these factors will lead to lower levels of effectiveness.

5.6.12 Effectiveness measures are also influenced by factors external to the SAR system. For example, aviation or boating safety initiatives, or legislation to reduce drinking of alcoholic beverages, should reduce the number of people and property in need of saving. Some variability in these measures is beyond SAR system control. A single incident resulting in either a large number of lives saved or lost, or a major natural disaster, could produce a significant change for a particular year. However, this data will help to determine viable long-term SAR system effectiveness trends.

5.6.13 Cost-benefit ratios can be determined and used to measure SAR system efficiency; however, the need to determine the general value to assume for a human life may be difficult. Sometimes other Government services can be identified which have already dealt with the human life value issue, because cost-benefit analyses of safety programmes are typically the concerns of several agencies of each State. Another approach relates the effectiveness of saving lives to the total direct SAR costs for a given year, as shown below.

$$\text{Programme Effectiveness} = \frac{\text{EFF(L)} \times 100,000}{\text{Direct SAR Programme Costs}}$$

An arbitrary scaling factor (100,000 in this example) is used to eliminate excessively small numbers. The effectiveness measure for saving lives was selected in preference to the measure for saving property simply because saving lives is the primary goal of the SAR system.

5.6.14 SAR data should be reliable even though some of the data elements such as Lives Saved, Persons Otherwise Assisted, and Value of Property Assisted are subjective. SAR data collection and subsequent analyses are not discredited by its inability to collect data related to incidents not reported, or responded to, by the SAR system.

5.7 Dealing with the Media

5.7.1 The management of media affairs is an important element in SAR operations and should be an integral part of the SAR system. It should thus receive appropriate consideration and planning. If the media do not obtain information from the primary source they will seek it elsewhere. Incorrect or misleading information may then emerge which will benefit no-one and may lead to undue concern amongst Next of Kin.

5.7.2 As search and rescue operations often take place in public, it is important that the information that emerges is correct. The SAR service thus has a responsibility to ensure that an accurate picture is reported. As the primary source, the SAR service should be proactive in communicating facts to the media. Holding back information that is available from other sources may lead to incorrect information being communicated by the media.

5.7.3 All personnel who may be required to have direct contact with the media should receive appropriate training.

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Improving Services

6.1 Managing for Success

The SAR Manager's Mission

- 6.1.1 The mission of SAR is to find persons in distress, assist them, and deliver them to a place of safety. A key to building successful SAR services is the SAR manager, whose mission is to carry out duties that result in better SAR operations, i.e., improved services to persons in distress.
- 6.1.2 This chapter provides guidance and principles to help the SAR manager perform more effectively. The SAR manager should also seek to instil these principles, as applicable, to operational levels of the SAR organization.
- 6.1.3 No SAR system, domestic or otherwise, is built overnight. Neither is there, nor will there ever be, sufficient SAR resources to ensure successful response to every distress incident. Therefore, the manager must first identify available resources, either under the manager's direct control or available through co-operative arrangements, and ensure that these resources are being used to their full potential to support or carry out SAR operations. Then, processes that enable continuous improvement in the use, capabilities, qualities and quantities of these resources should be employed. A manager always begins with available resources and then works with others who can help plan and implement improvements.

Focus on Quality

- 6.1.4 Common reasons that SAR managers fail are that they are doing the wrong things, doing the right things the wrong way, or attempting to do everything alone; this chapter may help prevent these mistakes.
- 6.1.5 Focus on improving the quality of SAR services simultaneously improves results and reduces costs, goals important to any Administration regardless of the amount of resources at its disposal. SAR organizations which focus on quality tend to:
- do more and make fewer mistakes;
 - enjoy a sound reputation; and
 - attract resources needed for growth and better performance.
- 6.1.6 SAR organizations that do not focus on quality are susceptible to errors that could lead to:
- reduction in lives saved;
 - poor or late operational decisions;
 - confusion, accidents, and equipment failures; and
 - under-use or mis-use of resources.

Profile of Successful SAR Management

- 6.1.7 Successful SAR managers typically emphasize areas such as those below.
- (a) *Processes more than results.* Mission statements, goals, and objectives are important to any organization, but if sound processes are used the desired results are more naturally identified and achieved.
 - (b) *Important matters more than urgent matters.* A SAR manager must first manage time. Planning, coordinating, directing, evaluating, and other basic management functions which bring lasting improvements require dedicated time which must be set aside, protected and used for those purposes.

- (c) *Satisfaction of the needs of others.* The manager depends on people throughout and outside the SAR organization to accomplish the SAR mission. All these people, in turn, depend upon the SAR manager to provide what they need; the manager should involve them in identifying these needs. Such needs include information, training, policies and funding. The successful manager will identify these people and strive to see that what they need to support the SAR system is provided.
- (d) *A philosophy of continuous improvement.*

6.2 Reducing System Problems

6.2.1 A SAR manager must identify and resolve problems that hamper improvements in SAR services. The thoughts of others familiar with the situation should be sought and considered in identifying and prioritizing SAR system problems, selecting the next problem to solve and finding and dealing with the cause(s) of that problem. The following sections discuss general problem-solving within the SAR system.

Finding the Cause

6.2.2 One method used to find the source of a problem is to ask why that problem exists. Each time the question “why?” is answered, again ask “why?” about the answer, until that process leads to the true source of the problem. For example, if the problem is too many accidents aboard boats used for SAR, the initial causes may appear to be inadequately trained personnel and inadequately maintained equipment. Why do the training and maintenance problems exist? Perhaps the personnel were assigned to jobs before the training they needed was scheduled and the provided training did not cover all the needed skills. Perhaps the supervision and tools needed for adequate equipment maintenance were not available. One or two more uses of the question “why?” in this process will soon lead to the root causes.

Creating the Solution

6.2.3 Once a SAR problem and its causes have been analyzed, reasonable solutions must be developed. In considering solutions, it helps to keep in mind general factors which, in dealing with problems in the past, have:

- contributed to solutions; and
- held back progress, efficiency, and effectiveness.

6.2.4 Possibly, the favourable factors can be employed again, and a plan can be developed, if necessary, for dealing with the unfavourable ones. For example, if involvement of all affected persons in the development of a solution contributed to successful implementation in the past, a similar approach might be considered for the new problem; or if poorly informed top management disapproved use of a previous plan, more care in briefing such persons on the problem, solutions and the benefits of the preferred solutions could be wise this time.

Monitoring Results

6.2.5 Once a plan is developed to solve a SAR system problem, the improved plan or process is implemented, and the results are monitored. The plan will be revised and tried again as many times as is necessary. Once it works well, it can be institutionalized by a new or better policy, standard, equipment design, co-ordination procedure, training requirement, or other solution.

6.2.6 SAR problems are reduced, and SAR service effectiveness is optimized, by ensuring that only relevant and proper things are being done and that these things are done in the proper way.

6.3 Applying Risk Management

6.3.1 A similar process to reducing system problems could be used to examine how risk management methodology can be applied to improve SAR response and SAR system performance. This process can be applied to any State regardless of its political system or organization structure.

6.3.2 Search and rescue (SAR) organizations have a lot to learn from the emergency management community where risk management principles are used so that the uncertainties that exist in potentially hazardous situations can be minimized and public safety maximized. Emergency managers commonly use three phases to describe their response to natural or technical disasters. They are preparedness (i.e., the pre-disaster phase), response (i.e., the immediate post-disaster phase), and recovery (i.e., return to a normal state). From a SAR perspective, we could call these phases pre-incident, incident response and post-incident, with each

phase requiring attention from SAR practitioners as they have a need to understand their particular role at that time, whether lead or support, and the interaction that is occurring within a broader government context.

- 6.3.3 The application of risk management can bring order to the uncertain environment in which SAR organizations exist. It is a very valuable tool to determine future work priorities and to improve the ability to meet the organizational objective of finding persons in distress and removing them to a place of safety.
- 6.3.4 Risk analysis is a valuable tool for managers of SAR organizations as it can set the resource priorities for an organization and its output can be used externally to promote SAR issues. SAR organizations are encouraged to undertake a risk analysis process and to use the information gained to advance the objective of saving lives.
- 6.3.5 An example of a Risk Management Process is at Appendix L.

6.4 Co-operating to Improve Services

Need for SAR Managers to Involve Others

- 6.4.1 Managers should understand the importance of involving others in support of the SAR system and seek to create an environment where such involvement thrives. Failure to do this often makes managers their own worst enemy. The nearly unique humanitarian and non-political nature of SAR is an inherent advantage in fostering co-operation and involvement of others. The SAR manager should work to overcome organizational traits, if they exist, such as the following:

- limited communications between organizational elements;
- focus only on short-term planning and cost reductions;
- more concern about detecting than preventing problems;
- adversarial, blaming, and self-serving ways; and
- rewarding heroes rather than successful teams.

- 6.4.2 SAR managers should associate with others to:

- collaborate with and develop teamwork with other SAR personnel, suppliers and support agencies and with SAR personnel and organizations of other States;
- do both short- and long- term planning for SAR services;
- focus on continuous improvement and error prevention to provide the best SAR services possible; and
- develop support of top management.

Using SAR Committees to Improve SAR Services

- 6.4.3 A popular and effective process for SAR co-ordination is the establishment and use of SAR co-ordination committees (SCCs). These can be established within a SAR agency, on a national or regional level, or ideally, at all of these levels. SAR committees can work to improve and support the SAR system by efforts such as the following:

- provide a standing forum for co-ordination of administrative and operational SAR matters;
- develop plans, policies, positions, manuals, etc., to:
 - resolve cross-agency jurisdictional issues;
 - develop joint solutions for SAR matters of common concern;
 - assign and co-ordinate SAR responsibilities; and
 - develop and implement SAR requirements and standards.
- effectively use all available resources for SAR, including global, regional, national, private, commercial, and volunteer resources (such resources may include advice, communications facilities and databases, ship reporting systems, training, SAR facilities, search planning expertise, technical assistance, foreign language assistance, medical or fuelling facilities, regulatory support and others);
- develop common equipment, facilities and procedures as appropriate;
- interface with other national and international organizations involved with emergency services;

- promote close co-operation and co-ordination between civilian and military authorities and organizations for the provision of effective SAR services;
- serve as a co-operative forum to exchange information and develop positions and policies of interest to more than one member agency;
- improve co-operation among aeronautical, maritime and land SAR communities;
- determine ways to enhance overall effectiveness and efficiency of SAR services;
- promote safety programmes to help citizens avoid or cope with distress situations; and
- develop contingency plans for use of SAR resources during disasters.

6.4.4 A national SAR plan or a regional SAR agreement should establish an SCC. This provides the process for SAR co-operation and co-ordination. Participating organizations would include those directly involved with SAR and those in a supporting role.

6.4.5 SAR managers may find it useful to establish regular conferences of representatives of departments and public and private concerns. This could gain the co-operation of those whose primary function is not SAR and would reach agreement on the respective roles to be performed by these facilities. Appendix J contains sample text and guidance for an SCC. The sample is for a State SCC but the text can be reworded for a regional SCC as well.

Using International Co-operation to Improve SAR Services

6.4.6 International co-operation such as the following can be used to improve SAR services:

- training and exercises;
- joint operational and long-range planning;
- SCCs;
- working relationships between SAR managers;
- liaison visits between SAR personnel;
- sharing lessons learned from actual SAR incidents and exercises;
- development of common SAR and communication procedures;
- combined public education efforts;
- collection, integration, analysis and use of SAR statistics;
- establishment of JRCCs and information databases;
- co-operation in research and development;
- making fuelling and medical facilities and medical advice available on an international basis for SAR support;
- co-operation in conducting safety inspections;
- participation in organizations or systems such as IMO, ICAO, Cospas-Sarsat, Inmarsat and Amver; and
- use and support of international SAR-related conventions, agreements and plans and manuals.

6.5 Reducing Response Time

6.5.1 The most important element in improving the effectiveness of SAR services is the reduction in the elapsed time between when an incident occurs and when the persons in distress are rescued. A SAR manager may not be directly responsible for all efforts needed to minimize this elapsed time, but should work with others as necessary to address the vital time element.

6.5.2 All SAR incident aspects must be sensitive to timeliness, i.e., alerting, planning transit, location and rescue. Information derived from survival data and incidents involving fatalities indicates that two (2) hours is generally the average critical time within which persons in distress must be rescued in order to survive. Initial action should begin within five minutes of initial notification of a distress incident.

6.5.3 Alert Phase activities, i.e., receiving knowledge of a distress incident, effectively processing that information, and directing appropriate response actions, can be improved upon by the following initiatives:

- improving communications systems so that calls can be received directly from those in distress;
- minimizing search time, particularly by promoting, supporting, and using systems such as Cospas-Sarsat;
- developing and installing locating equipment;
- actively promoting and supporting IMO and ICAO efforts to improve distress alerting;
- supporting RCC automation research and development to expedite decision making and deployment of SAR facilities;
- continually reviewing technology that might improve Alert Phase effectiveness and efficiency; and
- reviewing historical incidents to identify and correct weaknesses in Alert Phase operations.

6.5.4 To improve SAR communications, SAR authorities should consider initiatives like the following:

- ensure that suitable national legislation and regulations are in place and support international aeronautical and maritime mobile service developments;
- reduce total communication facility shortfalls and costs by sharing facilities between organizations or States with similar needs, and to serve multiple units which are co-located, or which can be suitably connected;
- establish written communications maintenance plans, and written policies for communications procedures, reports, files and logs;
- use landline, cable, or microwave when possible for point-to-point or fixed communications;
- use the most efficient signal characteristics and control techniques commensurate with required reliability, speed, and traffic volume for long-range communications and line-of-sight techniques for short-range communications;
- provide compatible communications for civil and military facilities used for SAR to the maximum extent possible;
- provide equipment and personnel adequate to handle both operational communications and distress, urgency and safety communications;
- ensure that communications can be carried out rapidly with operating facilities, and that high-priority messages can be routed quickly;
- arrange for communications personnel to report observed frequency violations to enforcement authorities;
- establish communications reliability goals for the coverage areas and assess performance;
- institutionalize sufficient training for proper operation and administration of communication facilities;
- ensure that commercial proprietary information, such as ship reports for SAR, remains proprietary and used only for SAR or safety purposes, to help safeguard continued availability of this information;
- ensure that distress communications are always recognized and handled as a higher priority than logistic, administrative, training and routine operational communications;
- where practicable, enable SAR personnel to communicate directly with potential craft in distress, including aircraft, ships, fishing vessels, recreation vessels and other types of marine craft;
- provide comprehensive distress communications throughout SRRs, but especially along the coast and over land;
- use automation techniques and phone patch capabilities to keep resource needs reasonable as workloads increase;
- ensure that communications funding needs are included in SAR agency and SAR facility budget plans;
- address personnel qualification and replacement needs from both a SAR and communications perspective;
- prepare radio coverage charts;
- develop written test and casualty restoration procedures; and
- co-operate with other organizations to provide disaster-recovery sites for each other for crucial alerting posts, computer centres and RCCs.

- 6.5.5** The following are some measures which SAR authorities can help implement to improve the land portion of distress alerting:
- use dedicated circuits for land connection to RCCs from land facilities such as LESs, DSC coast stations, and MCCs and use switching and software arrangements to preserve message priority;
 - in areas of unreliable landline operations, equip RCCs with Inmarsat stations to facilitate emergency communications between RCCs or to enable direct communications with aircraft (which are now more and more being fitted with AESs linked to satellite communication (satcom) equipment) and vessels when required;
 - upgrade circuits connecting RCCs with LESs and DSC coast stations using caller identification displays, where practicable, at the RCC for messages from vessels using Inmarsat or DSC-initiated radiotelephone; and
 - provide appropriate computer software to automatically decode message contents not in plain language prior to delivery of distress alerts to the RCC and automatically retrieve supporting emergency data on distressed aircraft and vessels from available databases as soon as possible for delivery to the RCC.
- 6.5.6** Transit time must be minimized. SRUs should get under way and arrive at the distress location, or in the search area if the actual location is not known, without delay. The ways in which transit time can be minimized include:
- review resource readiness standards to minimize resource unavailability (e.g., SAR equipment and personnel should be ready to deploy quickly, but not later than 30 minutes after notification);
 - review geographic sites of SAR facilities to ensure optimal placement for current and projected distress incidents; consider closing, reducing, seasonalizing, or relocating units not optimally located or used (e.g., SAR units should arrive on-scene within 90 minutes after deployment);
 - review the mix of resources at SAR facilities; ensure they are correct for the environment and types of incidents experienced or anticipated;
 - replace SAR resources as they exceed useful life, keep abreast of advancements in order to identify better and more cost-effective response resources;
 - monitor SAR asset reliability and take corrective action as necessary;
 - standardize SRUs and maintenance when possible;
 - train personnel to ensure that they can safely and effectively conduct SAR operations in anticipated environment(s);
 - review and update SAR assistance policies in response to changing conditions;
 - maximize use of secondary sources of SAR resources in less critical cases in order to increase availability of additional experienced and capable resources;
 - maintain close liaison with other organizations; know their capabilities to ensure that the most capable and timely resources, regardless of ownership, respond to SAR situations; and
 - review historical incidents and apply lessons learned to identify and correct transit weaknesses.
- 6.5.7** Maximize ability to locate, and provide assistance to, the distressed craft upon arrival in the search area, using actions such as the following:
- ensure that search units and sensors use the best visual and electronic sweep-width data available;
 - improve calculation of datum on the water, including use of real-time wind and current information;
 - increase probability of detection by using sensors;
 - consider crew fatigue when purchasing new search resources and in daily operations;
 - review and modify SAR training as necessary to optimize search effectiveness;
 - review requirements for qualified medical personnel in the SAR programme;
 - evaluate improved rescue and survival equipment; and
 - review historical incidents and apply lessons learned to identify and correct on-scene operational weaknesses.

6.6 Mass Rescue Operations

- 6.6.1** A mass rescue operation (MRO) is one that involves a need for immediate assistance to large numbers of persons in distress such that capabilities normally available to SAR authorities are inadequate.
- 6.6.2** MROs are required less frequently than typical rescue efforts, but have high potential consequences. Flooding, earthquakes, terrorism, and large passenger aircraft or ship disasters are examples of scenarios that may involve the need for MROs. Extensive preparations and resources are required to conduct MROs successfully.
- 6.6.3** Such incidents might involve hundreds or thousands of persons in distress in remote and hostile environments. A large passenger ship collision, for example, could call for rescue of thousands of passengers and crew in poor weather and sea conditions, with many of the survivors having little ability to help themselves. Preparedness to mount a large and rapid response would be critical to preventing large-scale loss of lives.
- 6.6.4** MRO plans and exercises are challenging and relatively complex. Effective arrangements for use of national and often international resources beyond those normally used for SAR are essential. Preparations require substantial commitments and partnerships among SAR authorities, regulatory authorities, transportation companies, sources of military and commercial assistance and others.
- 6.6.5** MROs often need to be carried out and co-ordinated within a broader emergency response context that may involve hazards mitigation, damage control and salvage operations, pollution control, complex traffic management, large-scale logistics, medical and coroner functions, accident-incident investigation, and intense public and political attention, etc. Efforts must often start immediately at an intense level and be sustainable for days or weeks.
- 6.6.6** SAR authorities should co-ordinate MRO plans with companies that operate aircraft and ships designed to carry large numbers of persons. Such companies should share in preparations to prevent MROs and to help ensure success if they become necessary.
- 6.6.7** What the media reports may matter more than what SAR services do for shaping of public opinion about MROs. There should be no unwarranted delays in providing information to the media. Information must be readily available, and freely exchanged among emergency service providers and shipping, airline or other primary companies involved.
- 6.6.8** Since opportunities to handle actual incidents involving mass rescues are rare and challenging, exercising MRO plans is particularly important.

6.7 Research and Development

- 6.7.1** Research and development efforts for SAR, carried out either alone or in co-operation with other States, often lead to improvements in SAR services. The focus of such efforts usually is to develop data, procedures, or equipment which will make SAR services more effective. Finding ways to exploit new and emerging technologies for SAR to do more with less is a common focus of research and development. Other parts of this chapter may suggest fruitful areas for research and development efforts.
- 6.7.2** Research and development results should be shared to reduce the risk of duplicated efforts and to maximize the benefits of the results. States which may not be directly involved in research and development efforts should still seek to remain informed about such efforts undertaken by others.

6.8 Other Factors

- 6.8.1** The following is a list of some practical principles and suggestions which will help SAR managers be more effective in improving SAR services. SAR managers should consider these and add to the list from their own experiences.
- (a) Seek suggestions from people who will be most affected by your decisions.
 - (b) Never be satisfied with the status quo, but continually seek ways to improve processes.
 - (c) Realize that it always costs less to prevent than to solve a problem.
 - (d) Take time to thoroughly understand basic international SAR principles, procedures and vocabulary.
 - (e) Authorize the making of operational decisions at the RCC level and provide any general guidance or arrangements needed by the RCC to make those decisions.

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Appendix A

Sample Legislation Establishing a SAR Organization

Note: The sample legislation can be adapted for use by aeronautical, maritime, or authorities of both.

[Type of Legislation] of the [Legislative Body]
concerning
the Establishment of a Search and Rescue Organization
[Date]

Article 1

A Search and Rescue Organization shall be established for the provision of search and rescue services in accordance with the IMO International Convention on Maritime Search and Rescue, 1979, as amended, and the Convention on International Civil Aviation, Annex 12.

The Search and Rescue Organization shall, as far as its primary function permits, assist in other emergencies.

Article 2

The competent national authorities shall be responsible for the provisions of the Search and Rescue services.

Article 3

During search and rescue operations, the competent national authorities shall be entitled to call for the collaboration and support of other Government services.

The competent national authorities shall be authorized to conclude agreements concerning the provision of assistance with local (State, provincial, municipal) authorities and suitable private agencies or persons.

Article 4

The competent national authorities shall be responsible for negotiating the terms of international agreements with the Search and Rescue organization of other States.*

All Government services concerned shall take measures to facilitate, as far as possible, the immediate and temporary entry of personnel, and their equipment, from other States who, in agreement with the competent national authorities are participating in search and rescue operations.

All Government services concerned shall seek to implement, as appropriate, the search and rescue recommendations and standards of the International Civil Aviation Organization and/or the International Maritime Organization.

* Depending on the administrative practices, agreements of this type may have to be endorsed at higher levels.

Article 5

Questions of assignment of costs, connected with the conduct of a search and rescue operation, shall not be allowed to interfere with its prompt and effective execution by the [Departments in charge of Civil Aviation and/or Merchant Marine].

Article 6

This [type of legislation] shall be effective as of [date].

[place] [date]

For the [legislative body]

[signature]

Appendix B

Supply Colour Coding and Pictograms

- 1 Containers or packages containing survival equipment for dropping to survivors should have the general nature of their contents indicated by a colour code and by printed indication and self-explanatory symbols.
- 2 The colour identification of the contents of droppable containers and packages containing survival equipment should take the form of streamers coloured according to the following code:
 - RED: Medical supplies and first aid equipment.
 - BLUE: Food and water.
 - YELLOW: Blankets and protective clothing.
 - BLACK: Miscellaneous equipment such as stoves, axes, compasses, and cooking utensils.
- 3 Bands of suitable pictograms in retroreflective material should also be used. Pictograms are shown in Figure B-1.

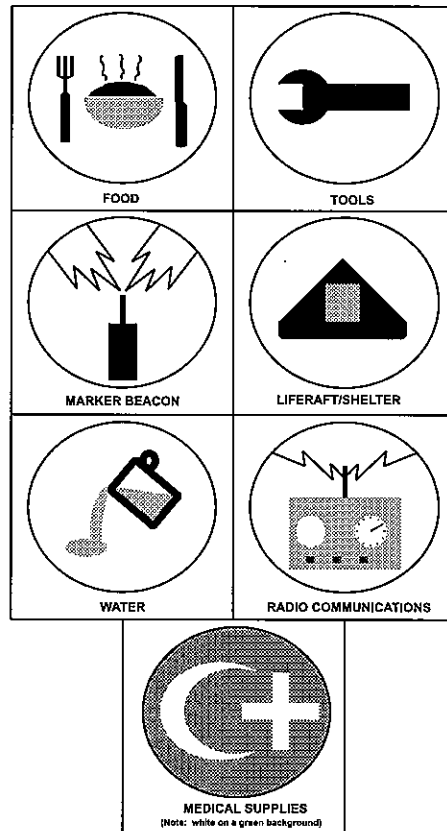
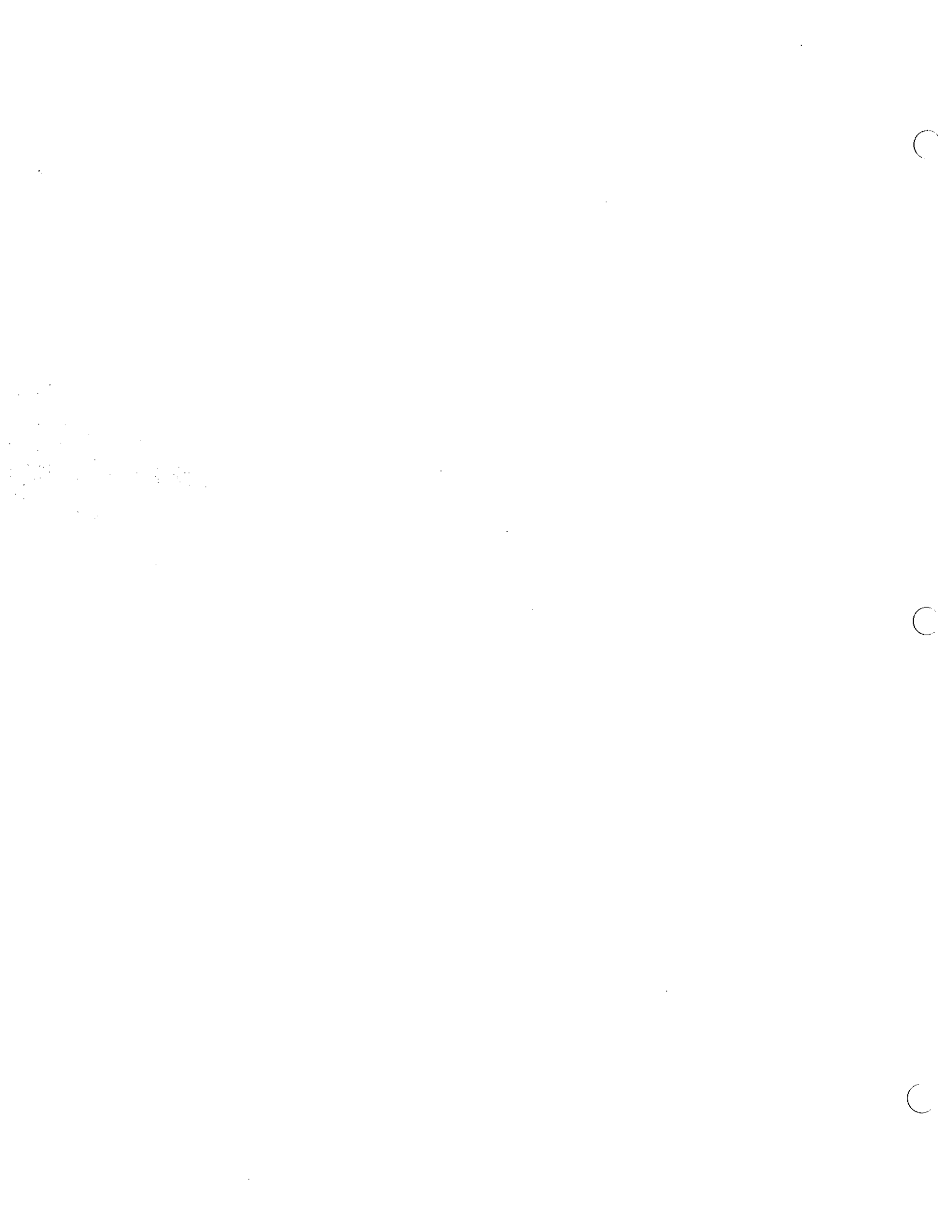


Figure B-1



Sources for SAR Assistance

C.1 State, Provincial, and Local Government Departments

- C.1.1 Many Government departments can give valuable aid to SAR operations. The national SAR Plan should specify the extent and manner in which each department is expected to aid the SAR system when called upon. Consideration should be given to calling upon public departments for assistance, rather than upon private concerns, as the latter may demand considerable payment for services. Examples of public departments and the facilities they may provide for SAR assistance are:
- (a) *Agricultural and forestry departments.* Personnel and organization for land searches, fire fighters and first-aid personnel, communication networks, light aircraft and helicopters.
 - (b) *Broadcasting stations.* Communications networks and public information broadcasts.
 - (c) *Civil aviation administrations.* Air traffic services personnel, communications networks and departmental aircraft.
 - (d) *Coastguard and lifeboat authorities.* Where established, these authorities are typically the primary source of maritime SAR assistance. The services which these authorities may provide cover a wide range, but the following are among the more important:
 - trained personnel and specialized, all-weather SAR equipment;
 - medical assistance and emergency medical evacuation;
 - alerting posts, communications networks, direction-finding and radio facilities;
 - survival equipment; and
 - testing, prototype and experimental equipment.
 - (e) *Electric and public works departments.* First-aid personnel, helicopters and communication lines.
 - (f) *Fire departments.* Fire departments are often focal points to which the general public turns for help or to report an accident. They may provide:
 - alerting post services; and
 - rescue units, including vessels, ambulances, emergency medical technician teams and fire-fighting brigades.
 - (g) *Health departments.* Hospital and first-aid facilities, ambulances and medical stations in remote areas.
 - (h) *Hydrographic and other marine survey departments.* Marine navigation warnings and information, and vessels.
 - (i) *Land survey departments.* Aircraft, aerial photography and photo-interpretation personnel.
 - (j) *Lighthouse and pilotage authorities.* Vessels and crews.
 - (k) *Marine and fisheries departments.* Vessels and crews, and vessel reporting systems.
 - (l) *Meteorological departments.* Weather information and communications networks.
 - (m) *Military services.* Often the military services are the best source of all-weather facilities and trained personnel, rivalling even an established coastguard or lifeboat service in SAR capabilities. With their communications networks, military operations centres make excellent sites for co-locating an RCC.

- (n) *Police departments*, including municipal, State or provincial police forces. Police departments are focal points to which the general public often report abnormal observations. SAR-related services that police departments may provide are:
 - alerting posts;
 - helicopters, small aircraft, rescue boats and land search parties;
 - communications facilities;
 - traffic control; and
 - fencing and guarding of accident sites.
- (o) *Railway departments*. Communication networks.
- (p) *Telephone and telegraph departments*. Communications networks and repair personnel.

C.2 Communications Facilities

C.2.1 Communications are vital to an effective SAR system. The SAR system must have ways to receive distress alerts and to direct the efforts of responding SAR facilities. Immediate access to the lines of communication owned by Government departments and private concerns is most important. SAR managers should ensure that, whenever possible, each RCC has access to the following communications networks:

- air traffic services networks;
- amateur radio stations;
- State-owned and private broadcasting stations;
- cable, telephone and telegraphic corporations;
- coast radio stations;
- meteorological communications networks;
- military communications networks;
- railway communications systems;
- dedicated SAR communications networks;
- satellite communications systems, e.g., Inmarsat and Cospas-Sarsat; and
- transport communications systems.

C.3 Aircraft Operating Agencies

C.3.1 Arrangements should be made with aircraft operating agencies for their co-operation in SAR. They may be able to provide limited assistance by:

- requesting air crews to keep a visual or radio watch for aircraft or vessels lost in the vicinity of their route;
- diverting *en-route* aircraft to the extent practicable for SAR purposes;
- making suitable aircraft and crews available for SAR operations;
- providing RCCs with detailed information concerning one of their own aircraft in distress and the survival equipment carried by that aircraft; and
- encouraging aircraft operators and aerodromes to monitor the radio frequency 121.5 MHz.

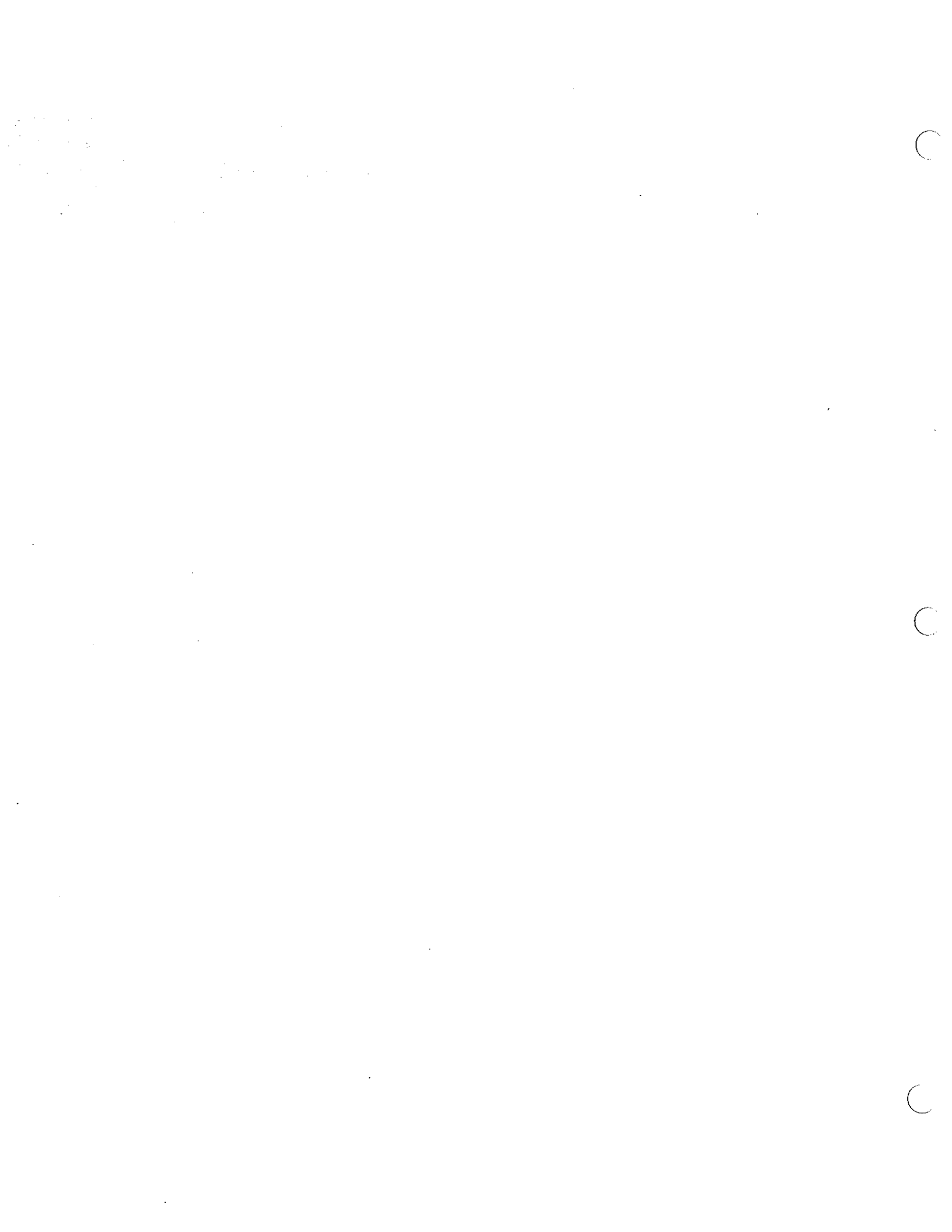
C.4 Fishing Vessels, Yachts, and Small Craft

C.4.1 Fishing vessels, yachts, and other private small craft are sources from which volunteer assistance may be obtained. Those sources will have various levels of training in SAR operations. Police, customs and harbour authorities also usually have small craft suitable for SAR operations in coastal or protected waters.

C.5 Merchant Vessels

C.5.1 Several international conventions require that the master of a vessel, on receiving a message that persons are in distress at sea, proceeds to assist them when it can be done without undue risk to the safety of the responding vessel and crew.

- C.5.2** Vessels at sea, although not always available to participate in extended search operations, are potential SAR assets. Masters of vessels have a duty to assist others whenever it can be done without endangering the assisting vessel or crew. A ship reporting system enables the SMC to quickly know the approximate positions, courses, and speeds of vessels in the vicinity of a distress situation and other information about the vessels which may be valuable, e.g., whether a doctor is aboard. Masters of vessels sailing the areas of concern should be encouraged to send regular reports to the authority operating a ship reporting system for SAR in the area. Ships are a key SAR resource for RCCs, but requests for them to assist must be weighed against the considerable cost to shipping companies when they do divert to assist. Ship reporting systems enable RCCs to quickly identify the capable vessel which will be least harmed by a diversion, enabling other vessels in the vicinity to be unaffected. The basic functional requirements of a ship reporting system are:
- one or more communications stations that receive and relay vessels' reporting messages;
 - a facility (personnel and equipment) for recording, plotting, updating and filing vessels' reports;
 - a standard operating procedure available to participating ships; and
 - immediate access to system information by any RCC which may need the data.
- C.6 Auxiliaries**
- C.6.1** Auxiliaries, both maritime and aeronautical, are organizations which provide training and an operational framework for privately owned craft that volunteer to do SAR. Though not specifically designed for SAR, these craft frequently are useful over land and in coastal waters. These craft vary in size, type, design, power, endurance and durability. SAR planners should maintain updated information on how to contact these volunteer resources and be familiar with their capabilities and limitations.
- C.7 Sports Clubs and Similar Organizations**
- C.7.1** Aviation clubs, parachute jumping clubs, scouting troops, mountain climbing and hiking clubs may give valuable assistance, particularly with SAR over land. Aircraft operated by parachute clubs may be used for dropping supplies and aircraft operated by aviation clubs may be used for air searches that must be conducted at low speed and altitudes in areas well known to the pilots.
- C.8 Commercial Businesses**
- C.8.1** A number of commercial businesses may be able to contribute substantially to SAR, in view of their location, equipment and the nature of their business. They may include:
- (a) *Crop and insect spraying corporations.* Aircraft and helicopters.
 - (b) *Polar trading posts and tropical plantations.* Alerting posts.
 - (c) *Oil companies and others exploiting natural resources.* Vessels and crews; aircraft and helicopters normally used for patrolling pipelines, transportation and surveying; and first-aid and communications facilities.
 - (d) *Salvage companies.* Undersea salvage equipment and personnel, vessels and crews, salvage expertise, equipment and ocean-going tugs.
 - (e) *Shipping information agencies and classification societies.* Sailing and arrival schedules, descriptive information and shipping particulars.
- C.9 Other Institutions**
- C.9.1** Institutions situated in isolated locations are particularly valuable to the SAR system. They are generally well equipped to serve as alerting posts, organize search parties and give medical aid. Examples include missionary and medical stations, monasteries, convents and other voluntary enclaves.



Appendix D

Information Sources

The following contacts may be helpful in obtaining reference documents mentioned in this Manual. International documents are available in the official languages of the sponsoring organizations.

International Telecommunication Union
Director, Radiocommunications Bureau
Place des Nations
1211 Geneva 20
Switzerland

Telephone: +41 22 730 51 11
Facsimile: +41 22 733 72 56
Email: itumail@itu.ch

International Civil Aviation Organization
External Relations and Public Information Office
Air Traffic Management Section
999 University Street
Montreal, Quebec
Canada H3C 5H7

Telephone: +1 514 954 8219
Facsimile: +1 514 954 6077
SITATEX: YULCAYA
Email: icaohq@icao.int
Website: <http://www.icao.int>

International Maritime Organization
Operational Safety Section
4 Albert Embankment
London SE1 7SR
United Kingdom

Telephone: +44 (0)20 7735 7611
Facsimile: +44 (0)20 7587 3210
Email: info@imo.org
Website: <http://www.imo.org>

Inmarsat Customer Care
99 City Road
London EC1 1AX
United Kingdom

Telephone: +44 (0)20 7728 1000
Facsimile: +44 (0)20 7728 1752
Email: customer_care@inmarsat.com
Website: <http://about.inmarsat.com>

Cospas-Sarsat Secretariat
700 de la Gauchetière West
Suite 2450
Montreal, Quebec
Canada H3B 5M2

Telephone: +1 514 954 6761
Email: mail@cospas_sarsat.int

Centro Internazionale Radio-Medico
Via dell'Architettura, 41
00144 Rome
Italy

Telephone: +39 0 65923331-2
Facsimile: +39 0 65923333
Telex: 612068 CIRM I
Email: telesoccorso@cirm.it

Amver Maritime Relations
Commandant (G-OPR-2)
US Coast Guard
2100 Second Street, SW
Washington, DC 20593
USA

Telephone: +1 212 668 7762
Facsimile: +1 212 668 7684

Appendix D - Information Sources

Global Positioning System (GPS)
US Coast Guard Navigation Center
7323 Telegraph Road
Alexandria, VA 22310-3998
USA

Telephone: +1 703 313 5900
Facsimile: +1 703 313 5910
Website:
<http://www.navcen.uscg.mil>

Global Navigation Satellite System (GLONASS)
Coordinated Scientific Information Center
of the Russian Space Forces
P/O Box 14
Moscow
Russia 117279

Telephone: +7 95 333 8133/333 7200
Facsimile: +7 95 333 8133
E-mail: sfcsic@space.ru

False Alerts

E.1 Importance of Preventing False Alerts

- E.1.1** 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.
- E.1.2** With the advent of more alerting equipment which transmits automatic pre-formatted data messages, a tendency for the numbers of false alerts received to increase is inevitable. 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.
- E.1.3** It is essential that SAR personnel treat every distress alert as genuine until they know differently.
- E.1.4** For a false alert, an unnecessary SAR alert (UN SAR) message should be sent by the RCC to the appropriate authorities for follow-up to prevent re-occurrence of similar false alerts. The follow-up should include the person or persons responsible for the false alert and may include information such as the effort expended by the SAR organization in response to the false alert.

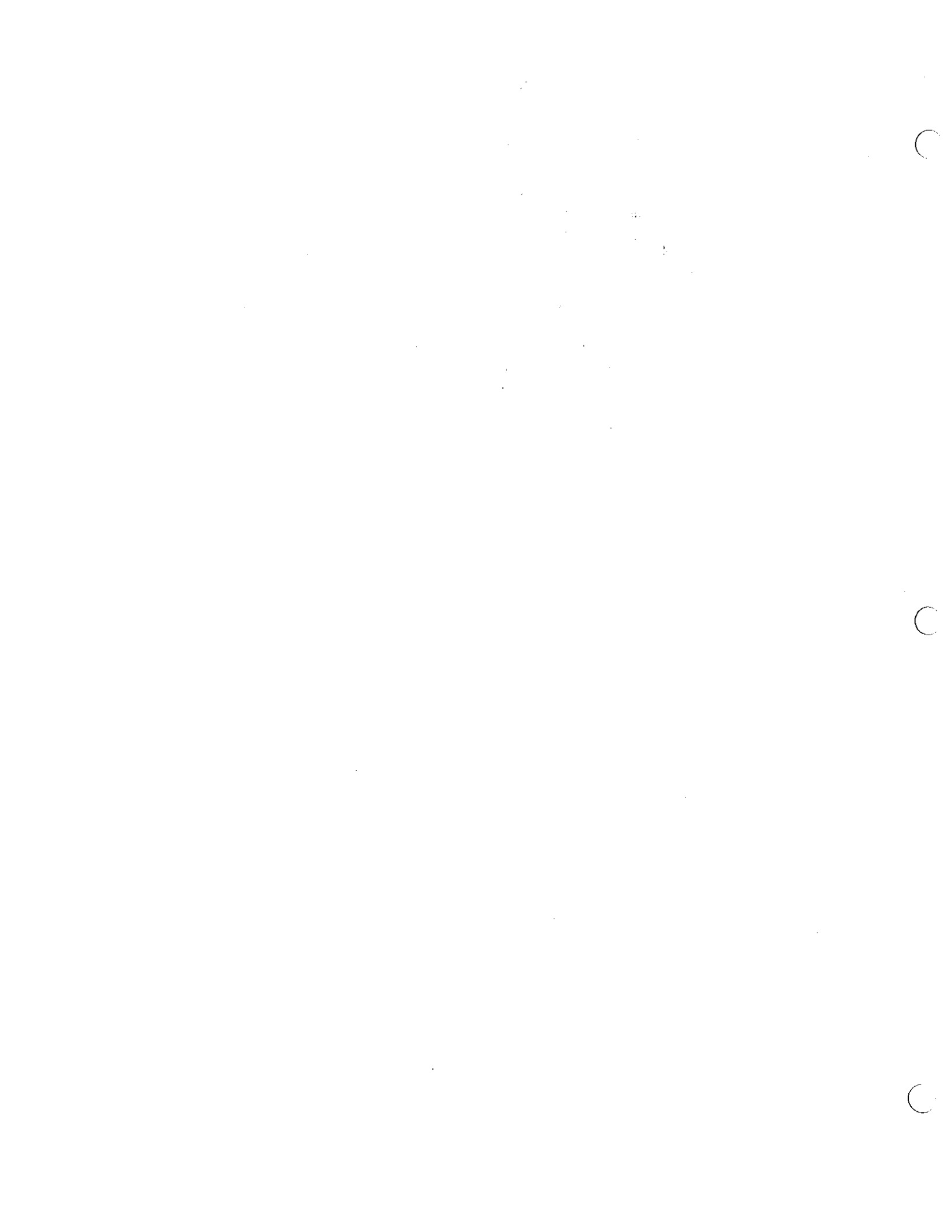
E.2 Preventing False Alerts

E.2.1 Steps SAR authorities can take to reduce false alerts are suggested below:

- inform aircraft and vessel owners and operators about implications of the rising number of false distress alerts;
- provide for vessels to properly register all communications equipment, and to ensure that this registration data is readily available to RCCs;
- follow-up on UNSAR messages;
- consider establishing or using enforcement measures to prosecute those who:
 - inadvertently transmit a false distress alert without proper cancellation, or who fail to respond to a distress acknowledgement due to misuse or negligence;
 - repeatedly transmit false alerts; and
 - deliberately transmit false alerts.
- use the ITU violation reporting process for false distress alerts;
- ensure that communications equipment operators are well informed on how to operate their equipment, the importance of avoiding false alerts and steps to be taken to prevent transmitting false alerts;
- inform equipment approval authorities of false alert problems to draw their attention to testing and alerting functions of radio equipment during the type approval process;
- urge companies installing radio equipment to train the users to ensure they become familiar with operation of the installed equipment;
- investigate the cause when a specific model of communications equipment repeatedly transmits unwanted alerts and inform appropriate organizations;
- ensure that surveyors and inspectors are informed about communications equipment and particularly how to operate and test it without transmitting a false alert;
- require that operators be appropriately certificated for installed communications equipment.

- urge *manufacturers, suppliers, and installers* of communications equipment to:
 - provide clear and precise operating instructions that are easy to understand (maintenance and operating instructions should be separated, and should be delivered in English and any other language deemed necessary);
 - ensure that supplier and installation personnel understand how the equipment works and the consequences of transmitting a false alert;
 - ensure that equipment is designed for distress alerting so that it will be impossible to transmit an alert unintentionally; any panel for emergency operation is separated from the one for normal operation, is fitted with a cover, and has colour-coded switches; and that there are standardized arrangements of control panels and standard operational procedures;
 - design test features so that testing equipment will not result in false distress alerts;
 - ensure that when any communications equipment has been installed, necessary instructions are given to users, specifically pointing out the operating procedures (log that the instructions have been given);
 - ensure that any distress alert activation is indicated visually and/or aurally, showing that the equipment is transmitting a distress alert, until manually deactivated;
 - implement any appropriate technical and operational measures to avoid unwanted transmission of alerts;
 - ensure that the ELT or EPIRB handling procedures and installations, including the location on board the aircraft or vessel and the release and activation mechanisms, preclude unwanted activation;
 - design EPIRBs so that when they are out of their brackets they must also be immersed in water to activate automatically; when operated manually, a two-step activation procedure should be required; and
 - consider ELT and EPIRB installation locations for new aircraft and vessels at early stages of the craft design and construction.
- urge *trainers and educators* to:
 - ensure that aviation and maritime education centres are informed and teach about false alert problems and implications to safety and SAR;
 - obtain and use actual case histories as examples when teaching;
 - emphasize the need to avoid false distress alerts in all aviation and maritime training and education; and
 - ensure that no inadvertent transmissions of false distress alerts occur during communications training.
- educate *users of communications equipment and their employers* to:
 - ensure that all personnel responsible for sending a distress alert have been instructed and are competent to operate all radio equipment aboard the aircraft or vessel;
 - have the person(s) responsible for communications during distress incidents give necessary instructions and information to any crew members who should know how to send a distress alert;
 - give instruction to the crew during each drill on evacuating the aircraft or vessel on how emergency equipment should be used for emergency functions;
 - ensure that equipment testing is only undertaken under supervision of the person responsible for communications during distress incidents;
 - ensure that equipment testing or drills are never allowed to cause false distress alerts;
 - ensure that encoded identities of satellite ELTs and EPIRBs, which are used by SAR personnel responding to emergencies, are properly registered in a database accessible 24 hours per day or automatically provided to SAR authorities (aircraft and vessel operators should confirm that their beacons have been registered with such a database to help SAR services to identify the unit in the event of distress and to rapidly obtain other information to help them respond);

- immediately update ELT, EPIRB, Inmarsat and DSC registration data and, if necessary, reprogram the equipment codes, if the aircraft or vessel change ownership, name, flag, or similar information;
- install and maintain satellite ELTs and EPIRBs carefully in accordance with manufacturers' instructions and using qualified personnel;
- avoid activating EPIRBs if help is already available (EPIRBs are intended to call for assistance if the vessel is unable to obtain help by other means, and provide position information and homing signals for SAR units);
- once an EPIRB is switched on, whether accidentally or intentionally, the vessel should make every reasonable attempt to communicate with SAR authorities by other means to advise them of the situation before turning the EPIRB off;
- after emergency use, if possible, retrieve and deactivate the EPIRB;
- when an ELT or EPIRB is damaged and needs to be disposed of, or if an aircraft or vessel is sold for scrap or for any other reason a beacon will no longer be used, ensure that it is made inoperable by removing its battery if possible and returning it to the manufacturer or demolishing it;
- take measures, such as wrapping the ELT or EPIRB in tin foil, to prevent transmission of signals during shipment to the manufacturer for any reason; and
- when the ELT or EPIRB is destroyed or demolished, ensure that the beacon is removed from registration lists.



Appendix F

Alerting and Locating Capability Preferences for New Mobile Satellite Systems Used for Distress Alerting

PSTN - Public switched telephone network
 PSDN - Public switched data network
 PSAP - Public safety answering point other than an RCC

R - Required capability
 D - Desired capability

	Primary SAR	Limited SAR	Capabilities and Functions
1	R	R	Two-way data or voice to establish communications
2	R	R	PSTN compatible via gateway to allow use of telephones without special equipment
3	R	R	PSDN compatible via gateway to allow use of normal data equipment without special equipment
4	R	D	Data message confirmation for data systems to enhance survivor will to live
5	R	D	Message accountability to ensure alerts are received by responsible RCC
6	R	R	Callback capability to re-establish communications with those in distress
7	RCC or PSAP	Service provider	Connectivity to route alerts with minimum delay to RCC or PSAP; otherwise to service provider operator
8	R	D	Position available to RCC or PSAP for SAR plans
9a	D	D	Position accuracy < 100 m to help find distress
9b	R	D	Position accuracy < 5 km to help find distress
10	R	D	Locating to home in on precise position
11	D	D	Global coverage to provide maximum SAR benefit
12	D	D	Minimum terrain limitations to maximize probability of good communications
13	D	D	Internationally operable for maximum SAR benefits
14	D	D	Selective position polling to query disabled party
15	D	D	Alerting time less than five minutes to increase chance of recovering survivors
16	R	D	Priority access for rapid communications link
17	R	R	Caller identification with alert (may require real-time database access) to confirm distress, help plan rescue, and mitigate false alerts
18	R	D	Emergency points of contact from registry on a 24-hour basis to obtain additional needed information
19	D	D	Identity of unit type, e.g., aircraft or vessel, to route alert to correct RCC with minimum delay

Search and Rescue and Disaster Support Capabilities Matrix for Commercial Mobile Satellite Services (CMSS) in the Post-Alerting Phase

Fifteen capabilities are listed in the matrix with an "X" in the Basic Services or Enhanced Services columns. Notes are used in some cases to clarify what is meant by a given capability.

PSTN - Public switched telephone network

PSDN - Public switched data network

Capabilities	Basic Services	Enhanced Services	Comments
1 Two-way data and/or voice	X		
2 Facsimile		X	
3 Still images		X	
4 Video imagery		X	
5 PSTN compatible or PSDN compatible	X	X	
6 Position available at mobile		X	
7 Position accuracy 125 m 2 drms		X	
8 Selective polling		X	The ability to query a unit for its position
9 Broadcast		X	One-way transmission to a specified terminal within a geographic area via a ground terminal
10 Conference		X	The ability to set up private communications with selected parties
11 Global coverage		X	The ability to communicate from any place in the world
12 Callback capability	X		The ability to restore communications with another party
13 International operability	Via PSDN and PSTN		The ability to operate in various countries
14 Priority access	X		The capability to gain priority access ahead of other communications
15 Access control	X		Blocking of calls from outside a disaster area when sufficient capacity is not available.

Mobile Communication Services

G.1 ITU Radio Regulations

G.1.1 The ITU *Radio Regulations*, which were developed in co-operation with its Member States and IMO and ICAO, provide for use of radio frequencies with which SAR personnel should be familiar. Following is an overview of mobile services and the frequencies they use.

G.1.2 The Regulations and other ITU documents referred to in this appendix may be obtained from ITU.

G.2 Aeronautical Mobile Service

G.2.1 Frequency bands allocated by ITU for the aeronautical mobile service include some in the high frequency (HF) spectrum (3000 to 30000 kHz), others in the very-high frequency (VHF) spectrum (30 to 300 MHz) and ultra-high frequency (UHF) (300 MHz to 3000 MHz).

G.2.2 ICAO *Regional Air Navigation Plans (RANPs)* or other regional SAR plans or agreements may provide guidance on selection of appropriate aeronautical frequency bands for SAR.

G.2.3 RANPs and other documents of ICAO referred to in this appendix may be obtained by contacting ICAO.

G.2.4 *Annex 10 to the Convention on International Civil Aviation* allocates blocks of VHF band frequencies for aircraft; certain of these are allocated for specific purposes, while others are assignable. Annex 10 provides the basis for regional plans, such as provisions found in the applicable RANP.

G.2.5 121.5 MHz services are normally available at any aeronautical facility where needed to ensure immediate reception of distress calls. Aerodromes should always monitor 121.5 MHz for voice emergency calls and ELT aural signals (which have a WOW WOW sound from the transmission of two alternating tones). 123.1 MHz can be used for on-scene communications.

G.3 Communications between Vessels and Aircraft

G.3.1 Designated SAR aircraft operating in maritime areas are required to be equipped with a frequency for communicating with vessels during SAR operations.

G.3.2 It may help to equip a SAR aircraft with an automatic alarm signal device to enable it to indicate directly to a ship that it wishes to communicate with it. This will allow the aircraft to avoid the delay that would result from the use of relay stations. However, a SAR organization can effectively overcome this factor by providing means of immediate communications and developing procedures whereby ships in the areas to be searched are requested to guard a specific frequency. This would allow a SAR aircraft to establish immediate communications with the vessels concerned.

G.3.3 Communications between SAR aircraft and civil aircraft could also be effected by providing SAR aircraft with the frequencies used by civil aircraft for their routine communications. This would mean that SAR aircraft should be provided equipment for communications on the aeronautical mobile HF and VHF channels.

G.3.4 Additional information about the types of equipment and systems used aboard aircraft, vessels, and survival craft can be obtained from IMO and ICAO publications, Government communication authorities, service providers, equipment manufacturers, appropriate training institutions, etc.

G.3.5 The installation of automatic radiotelephone alarm signal devices is a matter for determination by SAR authorities in light of use that may be made of such devices in the areas concerned, particularly with regard to the number of ships carrying this equipment.

G.4 Maritime Radio Service

- G.4.1** Vessels communicate with coast radio stations and with each other on maritime frequencies available in MF, HF and VHF bands.
- G.4.2** Medium frequencies (MF – 300 to 3000 kHz), seldom used by aircraft, are commonly used for maritime services.
- G.4.3** A wide range of maritime HF frequencies (3000–30000 kHz) are allocated and subdivided for radiotelegraphy and radiotelephony.
- G.4.4** The frequency 156.8 MHz (Channel 16) is the international VHF maritime voice distress, safety and calling frequency. The frequency 156.3 MHz (Channel 06) may be used for communications on-scene.

G.5 Global Maritime Distress and Safety System

- G.5.1** After February 1, 1999, ships subject to the SOLAS Convention are obliged to be outfitted with certain communications equipment, collectively referred to as the shipboard portion of the *Global Maritime Distress and Safety System (GMDSS)*. Certain fishing vessels and other marine craft may also be obligated to carry GMDSS-compatible equipment, or may do so voluntarily.
- G.5.2** Development of GMDSS was recommended by the SAR experts who drafted the *IMO International Convention on Maritime Search and Rescue* in Hamburg, Germany in 1979. The intent of the recommendation was to develop communications adequate to support the global SAR Plan prescribed by the Convention and to improve maritime safety.
- G.5.3** The SAR Convention and other IMO documents can be obtained from IMO.
- G.5.4** GMDSS also addresses problems like radio congestion; delayed, poor-quality and limited-range communications; uncertainty about receipt of messages; and vessels vanishing without a trace or a successful call for help. When the system is mature, it should be able to provide alerting and locating with minimal delay, automatic alerting, a reliable network for SAR communications, integration of satellite and terrestrial communications and adequate frequencies in all maritime bands.
- G.5.5** Administrations must ensure that installed shoreside communications facilities are sufficient to support shipboard GMDSS equipment. Furthermore, GMDSS can only work when an agreed international SAR plan is developed in accordance with the IMO SAR Convention to ensure that SAR services are available and that alerts can be routed quickly and reliably to the proper place within the SAR system.
- G.5.6** RCC personnel should be familiar with the SOLAS GMDSS provisions and associated IMO documents. The general goal of GMDSS is to take advantage of available technology to shift alerting emphasis from ship-to-ship (though this can still be done), towards ship-to-shore where SAR professionals can help arrange assistance. GMDSS capabilities of vessels not subject to SOLAS may range from full compliance with SOLAS to no GMDSS capabilities at all.
- G.5.7** Introduction of GMDSS aboard only some vessels adds capabilities for those vessels, but also introduces incompatibility between those vessels and vessels not GMDSS-equipped. It also introduces need for SAR authorities to support two maritime mobile systems both ashore and afloat. When most ships discontinue watchkeeping on Channel 16, most small vessels will still depend on Channel 16 for distress, safety and calling.
- G.5.8** Modern communications tend to offer challenges, e.g., new training requirements and more complex equipment controls; relatively low reliability of automated distress alerts; varying levels of integration of GMDSS systems; inadequacy of supporting databases; and incomplete development of related shore-based infrastructure. Until these matters are resolved, the level of effort needed for training SAR personnel and others on communications matters, and for coping with and reducing difficulties with GMDSS, will be substantial.
- G.5.9** The equipment which ships must carry to comply with SOLAS may be affected by CRSs with DSC availability, NAVTEX transmitters, etc. For example, if a State does not provide short-range DSC coastal coverage, ships must outfit with longer-range equipment even if it sails only in those coastal waters.

G.5.10 Another key consideration is that expensive land-based receivers for longer-range systems, like HF DSC or satellite systems, do not generally need to be duplicated by all States in an area; co-operative arrangements for provision and use of such equipment can not only reduce costs, but can simplify distribution of distress alerts.

G.6 EPIRBs and ELTs

G.6.1 Two types of maritime satellite Emergency Position-Indicating Radio Beacons (EPIRBs) have been accepted into GMDSS:

- 406 MHz satellite EPIRBs whose signals are relayed via Cospas-Sarsat satellites, local user terminals (LUTs) and mission control centres (MCCs) to SAR Points of Contact (SPOCs); and
- Inmarsat-E EPIRBs whose distress messages are relayed via Inmarsat satellites and Inmarsat-E coast earth stations (CESs) to Inmarsat-E RCCs.

G.6.2 Cospas-Sarsat relays alerts from aviation 406 MHz satellite ELTs and from 406 MHz satellite Personal Locator Beacons (PLBs). Alerts are also relayed via overflying aircraft and satellite from 121.5 and/or 243 MHz ELTs and EPIRBs, not specifically designed for satellite compatibility nor considered part of GMDSS.

G.6.3 Close to shore, non-satellite VHF EPIRBs operating on Channel 70 may be used in lieu of satellite EPIRBs. Without VHF DSC coast stations, signals from these EPIRBs may go undetected.

G.6.4 Most ELTs and EPIRBs provide homing signals on 121.5 MHz; some also on 243 MHz, and some EPIRBs may also integrate SARTs into their designs.

G.6.5 Users of ELTs and EPIRBs need to be made aware how to properly install, register, and use this equipment and of what happens when these devices are activated. They should understand that these are the alerting means of last resort and should not be depended upon to replace two-way communications as the primary means of alerting.

G.7 Satellite Communications

G.7.1 New satellite systems are emerging which can relay distress alerts, but the primary ones used now for SOLAS compliance are Cospas-Sarsat and Inmarsat.

G.7.2 The most capable Inmarsat equipment can handle distress communications, telephone, telex, facsimile, data and other general services. The Inmarsat-C SES does not handle voice communications, but it is important because of its ability to receive maritime safety information, relatively low cost to obtain and operate, versatile when coupled with a personal computer and in widespread use. Other common maritime terminals carry Inmarsat designations like A, B, M, and E (E is the EPIRB). Inmarsat SESs communicate to subscribers ashore via national and international public switched telephone networks (PSTNs) and public switched data networks (PSDNs) which interlink Inmarsat to other systems and can also communicate with suitably equipped SESs in any ocean area.

G.7.3 For more information on equipment, performance standards, alert messages, distribution procedures, users manuals and other Inmarsat-related matters, Inmarsat may be contacted.

G.7.4 Many people voluntarily use Inmarsat and similar global or regional systems using the same frequencies. Users need to know how these systems work, how to use the equipment in emergencies, and how to ensure that position information is correctly and continually updated for distress alerting. If users send an alert, they need to be prepared to be contacted by an RCC for more information. They should understand the equipment's limitations and capabilities to receive safety and SAR broadcasts. Users should be taught to follow up their semi-automatic (distress button) alerting with additional information to SAR authorities when possible.

G.8 Inmarsat SafetyNET

- G.8.1** Inmarsat can and should also be used to broadcast MSI. Every RCC should make arrangements with an associated NAVAREA Co-ordinator or other authority recognized by Inmarsat to make such broadcasts on its behalf over Inmarsat's SafetyNET system.
- G.8.2** It is appropriate and advisable to promulgate distress alerts over both NAVTEX and SafetyNET. SOLAS ships and many fishing and other vessels sailing within NAVTEX coverage areas can be expected to carry 518 kHz NAVTEX receivers. However, some may carry equipment to receive MSI over SafetyNET in lieu of, or in addition to, NAVTEX, and some may carry neither.
- G.8.3** While SafetyNET and NAVTEX are valuable tools for SAR personnel, due to the ranges of shore facilities which transmit these broadcasts, not every State needs to provide the equipment. Normally, provision of these services should be arranged, provided, and shared on an international basis to maintain appropriate global broadcast co-ordination, reduce redundant alerts to vessels and reduce costs of providing these services.

National Self-Assessment on Search and Rescue

- 1 Is the Government party to the following Conventions:
 - a Convention on International Civil Aviation, 1944?
 - b International Convention on Maritime Search and Rescue, 1979?
 - c Safety of Life at Sea (SOLAS) Convention, 1974?
 - d Convention on the High Seas, 1958?
 - e Law of the Sea Convention, 1982?
- 2 Which government agencies have authority and responsibility for co-ordination of aeronautical SAR? Where is this authority and responsibility described (law, regulation, agreement, etc.)?
- 3 Is the same agency responsible for co-ordinating aeronautical SAR over both land and sea?
- 4 Which government agencies have authority and responsibility for co-ordination of maritime SAR? Where is this authority and responsibility described?
- 5 Does the State have a national SAR Plan which describes the roles of all Government and non-government organizations which have resources that can support SAR?
- 6 Do provisions exist to keep maritime SAR authorities informed of aeronautical distress situations, and to hand over SAR responsibility to them when an aircraft has an actual or potential ditching at sea?
- 7 Are emergency plans in place and recovery resources in place at all airports located near water for rescue of survivors in the water?
- 8 Do facilities which serve as alerting posts for receiving aeronautical and maritime distress information operate on a 24-hour basis?
- 9 Does your State have both aeronautical and maritime SAR regions (SRRs) or SAR sub-regions (SRSs) established?
- 10 Do the geographical limits of your State's aeronautical and maritime SRRs or SRSs coincide?
- 11 If your State has an aeronautical Flight Information Region (FIR), does your aeronautical SRR have the same limits?
- 12 Have the aeronautical and maritime SRR or SRS limits been formally agreed to by neighbouring countries or jurisdictions?
- 13 Are there any gaps, overlaps, or size or shape problems with national SRRs or SRSs?
- 14 Are maritime and aeronautical Rescue Co-ordination Centres (RCCs) or Rescue Sub-centres (RSCs) staffed on a 24-hour basis?
- 15 Are RCC(s) or RSC(s) assigned to perform other tasks which might detract from their ability to handle SAR responsibilities?
- 16 Have ICAO and IMO been provided with up-to-date information on your RCCs, RSCs, SAR resources and areas of responsibility?

- 17 Does each RCC and RSC have full information about the capabilities (range, number of persons they could rescue, alert status, launch authority point of contact, etc.) for all the primary rescue units in their area of responsibility?
- 18 Which national agencies or organizations are responsible for:
- (a) Aircraft registration and safety?
 - (b) Air traffic safety?
 - (c) Investigation of aviation casualties?
 - (d) Maritime vessel registration and safety?
 - (e) Investigation of maritime casualties?
 - (f) Regulation and enforcement of radio frequency usage?
 - (g) Serving as the national SAR point of contact for receipt of Cospas-Sarsat alert data?
 - (h) SAR on the ground?
 - (i) Managing national civil emergencies?
 - (j) National defence?
 - (k) Providing paid SAR resources?
 - (l) Providing volunteer SAR resources?
 - (m) State law enforcement?
 - (n) Emergency medical advice and care?
 - (o) Medical evacuations?
 - (p) Supporting participation by ships in reporting systems, such as the Automated Mutual-assistance Vessel Rescue (Amver) system?
- 19 Is there a formal national SAR co-ordinating committee to co-ordinate the actions of the organizations indicated in answers to question 18?
- 20 Is your State implementing the provisions of the IMO Global Maritime Distress and Safety System (GMDSS)?
- 21 Does your State send delegates to participate directly in meetings of IMO and ICAO that deal with SAR issues? If not, how do your SAR managers stay informed on decisions of these organizations?
- 22 Is each RCC or RSC staff fully trained to do the following:
- (a) Recognize the stages and phases of a SAR mission?
 - (b) Determine search datum, search areas, and probability of success?
 - (c) Account for aerospace and ocean drift?
 - (d) Develop search action plans and rescue action plans?
 - (e) Allocate resources?
 - (f) Arrange air escorts, ships and other assistance for aircraft situations involving potential ditching?
 - (g) Carry out international SAR obligations?
- 23 Have all of your RCC or RSC personnel attended formal SAR training?
- 24 Does each element in the SAR organization regularly evaluate its staff training status and take steps to correct all identified training needs?
- 25 Does each RCC or RSC have a Plan of Operation manual which provides guidance in handling all foreseeable SAR situations?
- 26 Are complete records (sufficient to reconstruct the incident) maintained of all SAR events? Are SAR case records used to analyse and improve the SAR system? Do SAR case records satisfy legal requirements?
- 27 Does your State maintain a statistical database on SAR events?

- 28 Do crews of primary rescue units participate in regular SAR-related training or exercises? Is there a formal planning and evaluation process for these exercises?
- 29 Do your RCCs or RSCs carry out exercises involving other RCCs and RSCs and rescue units on a regular basis?
- 30 Does your State have formal SAR agreements for inter-agency co-ordination and for co-operation with neighbouring countries?
- 31 Which categories of aircraft and ships registered in your State are required to carry 121.5 MHz radio distress beacons? 406 MHz beacons? Inmarsat-E EPIRBs?
- 32 Are 406 MHz beacon registrations maintained in a database? Is that database available on a 24-hour basis to SAR authorities?
- 33 Is the Aeronautical Fixed Telecommunication Network (AFTN) or Aeronautical Fixed Network (AFN) co-located or readily accessible to your RCC(s) and RSC(s)?
- 34 Are there rapid, reliable means for communications between RCCs or between RCCs and RSCs?
- 35 Does your national landline communications system provide full coverage of your State and rapid, reliable service?
- 36 Do your RCC(s) and RSC(s) have reliable radio communications capabilities covering their entire area(s) of responsibility for working with ships, aircraft and SAR units?
- 37 Do the RCC and RSC Plans of Operation manuals include procedures for establishing communications with civil ships and aircraft?
- 38 Do ships and aircraft that are used for SAR have communications and electronic direction-finding capabilities covering all frequencies likely to be used?
- 39 Do ships and aircraft that are used for SAR have accurate navigation systems?
- 40 Do your RCC(s) or RSC(s) use satellite communications?
- 41 What means are most often used to notify your RCC(s) or RSC(s) of a distress?
- 42 What means are used to alert and inform rescue units of a distress, and to direct them?
- 43 Do all SAR units have mutually compatible communications?
- 44 Is your State planning to change communications or direction-finding capabilities in any of the following areas?
 - Medium frequency (MF)
 - High frequency (HF)
 - VHF-FM
 - VHF-AM
 - UHF
 - Telephone
 - Telex
 - Satellite communications
- 45 Do your RCC(s) and RSC(s) use international systems that assist SAR, e.g., Amver, Cospas-Sarsat, Computer Assisted Search Planning (CASP)?
- 46 Can your RCC(s) monitor progress of a SAR response and adjust search planning if necessary?
- 47 Can the RCC(s) or RSC(s) order the deployment of all primary SAR units? If not, does the co-ordination for use of SAR resources take place in a timely manner?
- 48 Do your RCCs regularly work with other RCCs outside your region?

Appendix H – National Self-Assessment on Search and Rescue

- 49 Have there been any problems encountered when working with RCCs outside your region? If so, have steps been taken to solve these problems?
- 50 Volunteer SAR resources include privately-owned aircraft and boats, fishing vessels, industry-owned helicopters and boats, professional organizations, etc. To what extent have these resources been organized? Do the RCCs and RSCs Plans of Operation manuals include guidance on use of volunteer SAR resources?
- 51 Do your RCC(s) and RSC(s) have procedures for providing timely and competent medical advice to ships?
- 52 Have formal procedures been developed for making medical evacuation decisions?
- 53 Do SAR units in your State have special equipment for medical evacuations?
- 54 Do the RCC(s) and RSC(s) co-ordinate with hospitals to receive all personnel evacuated due to medical emergencies?
- 55 Do the RCC(s) have continuous and capable English language capabilities?

SAR Agreements

Notes regarding SAR agreements, and the sample agreement that begins on the following page:

Parties may be organizations within a State, maritime and/or aeronautical SAR authorities of two or more different States (particularly with neighbouring search and rescue regions), or higher authorities of two or more States, i.e., the sample agreement can be adapted for local, national, or international use.

Each section of the sample agreement may be optionally used or adapted as the Parties agree, bearing in mind consistency with the principles of international law, and the goals of IMO, ICAO and the States and organizations concerned.

It is generally advisable to include specific information, such as phone numbers or addresses, in appendices or other documents separate from the basic signed agreement.

When SRRs are addressed in the agreements, normally only the lines separating the SRRs of the Parties are described, since other delimitation of the SRRs would normally involve States other than the Parties. Agreements between national organizations may or may not need to address geographic areas of responsibility. It should be recognized among the Parties that the establishment of SRRs is mainly for ensuring the availability of SAR services, and to facilitate proper distribution of distress alerts to RCCs; SRRs should not be viewed as affecting political boundaries, and do not need to align with political boundaries if the Parties so agree for the sake of improving or simplifying SAR operations. SRR delimitation over international waters is not intended to obstruct the provision of SAR services in any way. Furthermore, the provision of SAR services within an SRR shall be without regard to the nationality or circumstances of the persons in distress.

If agreements discuss territorial entry for SAR, provisions should account for a balance of concerns for sovereignty and concerns for saving lives.

The concept of "territory" is understood to include territorial land, airspace and seas.

It is advisable that SAR agreements address sensitive issues to the degree necessary for practical SAR co-operation between or among the Parties, while emphasizing the humanitarian nature of SAR, and avoiding topics which are unrelated to SAR, or which are both politically sensitive and unnecessary.

Agreement on [Aeronautical and/or Maritime] Search and Rescue between
[name the Parties]

1 INTRODUCTION

Knowing the importance of co-operation in search and rescue (SAR), and of the provision of expeditious and effective SAR services;

Desiring to support the provisions of the [*International Convention on Maritime Search and Rescue of the International Maritime Organization (IMO) and/or the Convention on International Civil Aviation of the International Civil Aviation Organization (ICAO)*]; and

Seeking to provide an overall plan for SAR co-ordination, use of available resources, mutual assistance, and efforts to improve SAR services;

The Parties have agreed as follows:

2 EXTENT OF ASSISTANCE

The Parties agree to co-operate in the following areas:

- (a) Support each other by pooling SAR facilities as appropriate for operations within their respective search and rescue regions (SRRs);
- (b) Make, and respond to, requests for operational assistance between the designated rescue co-ordination centres (RCCs) or rescue sub-centres (RSCs) of the Parties as capabilities allow;
- (c) Develop procedures and communications appropriate for co-ordination among facilities of both Parties responding to the same distress incident, and for co-ordination between the RCCs or RSCs of the Parties;
- (d) Normally apply the guidance of the International Aeronautical and Maritime SAR Manuals regarding SAR operational procedures and communications;
- (e) Work to establish agreed procedures, which balance concerns for sovereignty and for saving lives, regarding entry of various types of SAR facilities into the territory of the other Party, solely for a search or a rescue operation; and
- (f) Enter into other collaborative SAR efforts which may include:
 - mutual visits by SAR personnel of the Parties;
 - joint training or exercises;
 - co-operation in development of SAR procedures, techniques, equipment, or facilities;
 - exchange of pertinent SAR or communications information; and
 - establishment of one or more SAR committees to provide a means for ongoing co-operation in improving SAR effectiveness.

3 SEARCH AND RESCUE REGIONS

Establishment of SRRs is intended only to effect an understanding concerning where each Party accepts primary responsibility for co-ordinating or providing SAR services. SRRs of the Parties shall be separated by lines connecting points as follows: [*appropriate co-ordinate points describing applicable lines*]

4 TERMS OF AGREEMENT

Each Party will:

- (a) Keep information readily available on availability of any SAR facilities or other resources which may be needed for implementing this Agreement.
- (b) Keep each other fully and promptly informed of all SAR operations of mutual interest, or which may involve use of facilities of the other Party;
- (c) Authorize its RCC(s) to request assistance via the RCC(s) of the other Party, and to provide all pertinent information on the distress situation and the scope of assistance needed;
- (d) Authorize its RCC(s) to promptly respond to a request for assistance from an RCC of the other Party;
- (e) Authorize its RCC(s) to promptly arrange, or arrange in advance, with other national authorities for territorial entry of SAR facilities of the other Party (including overflight or landing of SAR aircraft, and similar accommodation of surface (land or water) SAR units) as circumstances dictate for fuelling, medical, or other appropriate and available operational support, or in response to a request to the RCC of the other Party for assistance of those facilities which would involve territorial entry;
- (f) Normally fund its own activities in relation to this Agreement unless otherwise arranged by the Parties in advance, and, in any event, will not allow a matter of reimbursement of cost to delay response to persons in distress.

5 GENERAL PROVISIONS

This Agreement:

shall enter into force . . . [*provisions as appropriate*].

may be amended . . . [*provisions as appropriate*]; and

may be terminated or superseded . . . [*provisions as appropriate*];

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Sample Terms of Reference for a SAR Co-ordinating Committee

The following text could be used as a guide in the development of a State SAR Co-ordinating Committee.

STATE SAR CO-ORDINATING COMMITTEE

for [State]

- 1 BACKGROUND: The SAR Plan for [State] provides for establishment of SAR co-ordinating committees on a national level.
- 2 OBJECTIVES: The establishment of the [State] SAR Co-ordinating Committee is intended to accomplish the following:
 - (a) Provide a standing national forum for co-ordination of administrative and operational SAR matters;
 - (b) Provide an interface with other national, [regional,] and international organizations involved with emergency services;
 - (c) Oversee the SAR Plan for [State], and develop and maintain a [national] SAR Manual;
 - (d) Promote effective use of all available facilities for SAR;
 - (e) Serve as a co-operative forum to exchange information and develop positions and policies of interest to more than one Party to the Plan;
 - (f) Promote close co-operation and co-ordination between civilian and military authorities and organizations for the provision of effective SAR services;
 - (g) Improve co-operation among aeronautical, maritime and land SAR communities for the provision of effective SAR services; and
 - (h) Determine other ways to enhance the overall effectiveness and efficiency of SAR services within [State] and to standardize SAR procedures and equipment where practicable.
- 3 MEMBERSHIP: Members will be made up of a person designated by each Party to the SAR Plan for [State]. In addition:
 - (a) The Parties will each designate an alternate member; and
 - (b) Members will be responsible for any appropriate co-ordination with interested agencies within their respective countries and organizations.
- 4 PROCEDURES:
 - (a) General meetings of the Committee, which will be held at least once per year, will be open to designated observers, advisors and visitors.
 - (b) Executive meetings may also be held as necessary, and working groups may be established to handle detailed work and bring proposals to the Committee.
 - (c) The Chairperson or any member may call a special Committee meeting when necessary.
 - (d) The Committee Chairperson will be [State agency] or [rotate annually among the members]. Secretariat services will normally be provided by [State agency].

AGREEMENT FOR SUPPORT: By signing the SAR Plan for [State], each Party agrees to fully support the [national/regional] Committee within its means.

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Model Agreement for the Division of Responsibility between the SAR Authority and the Air Traffic Services Provider in Providing Emergency Response Services for Aircraft

1 Purpose

- 1.1 The purpose of this document is to outline the division of responsibilities between the SAR Authority and Air Traffic Services (ATS) provider as component organizations contributing to the national emergency response system for aircraft, and to propose a model arrangement for co-operation between the parties.

2 Background

- 2.1 The responsibility for the various aspects of the national emergency response system required under the Convention on International Civil Aviation may fall within two or more agencies of the national government. The SAR Authority has broad responsibilities under annex 12 for SAR response (and ancillary functions are described in annexes 10 and 15) and the ATS provider has broad responsibilities under Annex 11 for aviation SAR alerting. ATS also provides in-flight emergency response services for aircraft and assists Rescue Co-ordination Centres (RCCs) with their SAR response task by providing access to its aeronautical expertise and resources.

3 Duration and amendment

- 3.1 A Memorandum of Understanding (MoU) may be in force for a period of five years from the date of commencement and be extended for a further period or periods as agreed by the parties in accordance with the following principles:
- 1) No variation is to be made to either the MoU or the agreed operational procedures dealing with in-flight emergencies or SAR alerting procedures without the consent of both parties.
 - 2) Where the parties agree to an alteration to this MoU, the alteration must be expressed in writing and be ratified by the signatories of both parties to this MoU, with sufficient notice to allow adoption of any agreed amended practice.

4 Scope

- 4.1 This MoU and associated operational information contained in the associated procedures is designed to facilitate a system for effective operational interface, and to positively manage the transfer of operational responsibility, between the ATS provider and the RCC during aircraft emergency phases.

4.2 This MoU does not alter the respective statutory, administrative or other obligations of the parties and any specific requirement under this MoU shall not involve any alteration to those obligations.

5 Management arrangements

5.1 There should be regular consultation between the agency managers to review the operational procedures to which this document applies.

5.2 Such consultation should occur whenever either of the parties considers changes to the procedures to be appropriate to meet operational commitments, and at least once every 12 months from the commencement of this MoU.

6 Operational principles

6.1 The overriding principle governing the relationship of the agencies and the performance of activities covered by this MoU is that the safety of life is paramount.

6.2 All services related to the MoU are to be provided in accordance with the agreed practices laid down in this MoU and the agreed operational procedures. Such services may include the provision of assistance to aircraft in distress in the State's Search and Rescue Region (SRR).

6.3 When handling an aircraft emergency or responding to a SAR incident, there is a need for the RCC and the ATS provider to work co-operatively and effectively together. It is important that there be no ambiguity with respect to the agency taking the lead and the agency providing support as an incident progresses. The lead agency role is determined by mutual agreement according to the division of responsibilities at paragraph 9.

7 Recorded operational information

7.1 RCCs may access information held by ATS units. For SAR purposes, ATS will provide the RCC, as soon as practicable, all information relevant to a state of emergency of an aircraft, including copies of journals, flight plans, audio tape records, recorded radar data plots and all other relevant documentation.

7.2 Both parties acknowledge that telephone conversations regarding operations or exercises between the two agencies may be recorded with or without prior warning.

8 Provision of information

8.1 Subject to their legal obligations relating to privacy and protection of commercial in-confidence information, each party agrees that the agencies will exchange information as necessary to successfully execute emergency response actions. Each agency shall use such information only for the purpose of properly meeting its legal obligations.

8.2 Each party agrees that, except as required to properly perform its statutory obligations, it will not release information received by it from the other party without prior agreement.

9 Division of responsibilities

(Note: Paragraphs 9.1 and 9.2 serve as an outline of ATS and RCC responsibilities that may be expanded upon by States to suit their individual circumstances.)

9.1 In relation to the emergency response system, ATS will provide the following types of services:

- a) In-flight emergency response to provide assistance to a pilot to operate in safe airspace and land the aircraft safely.
- b) SAR alerting and, in the case of aerodrome emergency procedures, alerting the appropriate emergency agencies.
- c) Assistance to the RCC with ATS expertise, information and resources.

- 9.2** In relation to the State aviation SAR and emergency response system, the RCC will provide the following types of services:
- a) Co-ordination of appropriate SAR response.
 - b) Assistance to ATS with reference to relevant data.
 - c) Co-ordination with ATS, when ATS is managing an in-flight emergency and RCC is managing a parallel SAR response to the incident.

10 Costs

- 10.1** Each party will be responsible for all costs associated with its responsibilities under this MoU, unless otherwise agreed by the parties.

11 Signature

- 11.1** In signing this MoU, both parties agree to abide by its provisions.

Signature

Signature

Agency A

Agency B

C

C

C

Applying Risk Management Principles to Assess SAR Response and SAR System Performance

Risk Management Process

For the risk analysis to be effective it needs to take a broad view of the SAR system or response and, ideally, all stakeholders and interest groups should be involved. The process should be documented, noting that the value of the risk analysis is that it is an iterative process that, when repeated, provides valuable feedback on risk mitigation effectiveness. The steps in the risk management process are shown at figure 1, and provide a logical and systematic methodology for identifying, analysing, assessing, treating and monitoring risks.

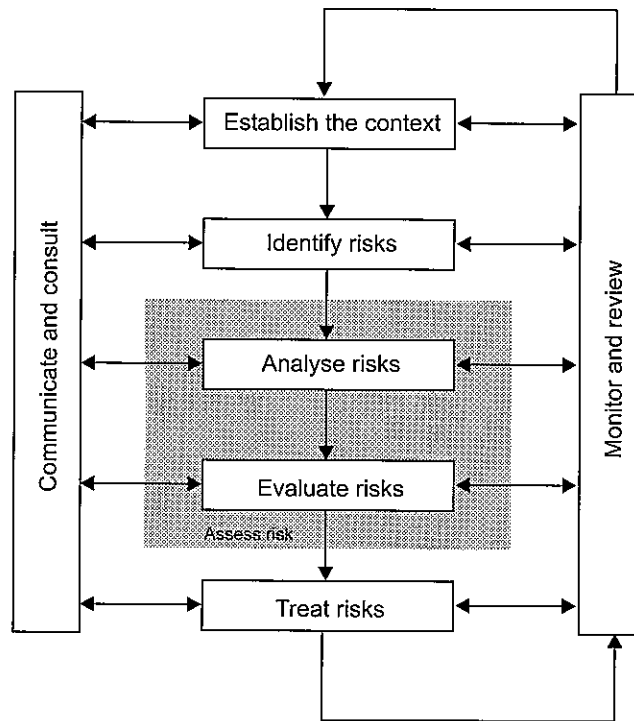


Figure 1 – The Risk Management Process

The determining of risk requires a well-structured approach with all risk factors being subjected to an iterative process. Although from a SAR perspective it should be used to assess the overall SAR system, the technique can equally be applied to the SAR response phase.

Establishing the Context

The first step in the process is **establishing the context** in which the SAR risks will be determined. Will the analysis include the parts that other organizations, their resources and response plans play in assisting the SAR function? Will it make judgements on the complex national arrangements and their effectiveness if a major SAR incident occurs? If this is the context that is being examined, there is a need to gain wide support for the analysis by promoting stakeholder involvement from appropriate decision makers outside the SAR organization.

If the context is internally focused, there may still be a need to make judgements about the external environment and the analysis may be able to determine priorities and the order in which they should be addressed. There is also a need to understand the government policy framework in which the SAR organization exists and its funding basis. However, the risk process should put the question of limited funds being available aside until after the analysis is complete so that the outcomes are not distorted by self-imposed constraints before it has begun.

Identifying the Risks

The second step in the process is **identifying the risks**, which is ‘the process of determining what can happen, why and how’ as the basis for further analysis. People have different risk perceptions and this step requires taking an objective view of current or potential situations where the objective of finding persons in distress and removing them to a place of safety may be compromised.

Some approaches used to identify risk include whether the risk is easily managed, if exposure is voluntary, whether the risk is familiar, making an assessment that the situation may become catastrophic, the innate fear of the worst occurring, and personal or organizational win/loss assessments. The process can be based on formal analysis tools (e.g., quantitative analysis, Pareto analysis, systems engineering, etc), where appropriate. However, in most circumstances for SAR it can be more simply accomplished by people that work in the activity sitting down and coming to a collective view of the exposures facing the organization (e.g., experience, brainstorming, scenario analysis, lessons learned, etc.).

The subject matter could be discussed by using the divisions used in IAMSAR to break down the analysis. These are Organization and Management (Volume I), Mission Co-ordination (Volume II), and Mobile Facilities (Volume III).

Analyse the Risks

The third step in the process is to **analyse the risks**. This is done by establishing the cause of the risk, which is important when it comes to treating it, and determining its likelihood and consequences. Likelihood is a qualitative description of probability or frequency; and consequences are the outcome of an event, expressed qualitatively or quantitatively, expressed in terms of loss, injury, disadvantage or gain.

A common approach to document this interaction is to set values for likelihood and consequences of each risk. An example that may be useful in terms of determining likelihood for SAR is shown in table 1.

Level	Descriptor	General description
A	Almost certain	daily occurrence
B	Likely	weekly occurrence
C	Occasional	monthly occurrence
D	Possible	yearly occurrence
E	Unlikely	1 year > occurrence < 10 years
F	Rare	> 10 years

Table 1 – Qualitative Measures of Likelihood

The assignment of consequences is also done using general descriptions and an example is shown in table 2. Caution needs to be exercised in assigning consequences, as every incident is not necessarily a potential major catastrophe. The history of SAR incidents and their outcomes over the last ten years is a good starting point when approaching consequences.

Level	Descriptor	General description
1	Very low	<ul style="list-style-type: none"> ● routine or business management task with no life-saving consequence ● non-critical support role to other agency leading incident response ● staff have good SAR support tools available ● robust communications systems available ● excellent level of response assets available
2	Low	<ul style="list-style-type: none"> ● routine or business management task with potential life-saving consequence ● lead role in non-SAR/safety of life activity ● staff have adequate SAR support tools ● fair communications systems available ● adequate level of first response assets available
3	Medium	<ul style="list-style-type: none"> ● routine or business management task with demonstrated life-saving consequence ● staff have inadequate SAR support tools ● poor communications systems available ● inadequate first response assets available ● a situation that may lead to an internal decision to make a major change to procedures, structure or staffing ● fatality (1-5 people) ● hull loss
4	High	<ul style="list-style-type: none"> ● a situation that may lead to an external decision to make major changes to structure or staffing at the management level ● fatality (6-14 people) ● hull loss
5	Extreme	<ul style="list-style-type: none"> ● a political review of the SAR organization and its effectiveness ● fatality (>14 people) ● hull loss

Table 2 - Qualitative Measures of Consequences or Impact

Once the likelihood and consequence elements are determined, a risk analysis matrix is developed and tested using sample scenarios. This is a most important step as it allows the risk analysis team to develop a common understanding of likelihood and consequence and their interrelationship. Also, there may be situations where there are multiple likelihood and consequence relationships, and each of these should be scored and the highest resultant value recorded in the next step of the risk analysis.

Evaluate the Risks

The fourth step in the process is to **evaluate the risks**. This is done by comparing likelihood against consequence, as shown at table 3, and comparing the results with any previous risk analysis. The table 3 comparison matrix will result in an ordering of risks and assist to develop an effective risk mitigation plan. An extreme risk requires immediate remediation, a high risk requires urgent attention, a medium risk should be addressed as a priority, and a low-level risk can be addressed through routine processes.

		Consequences				
		1	2	3	4	5
Likelihood	A	H	H	E	E	E
	B	M	H	H	E	E
	C	L	M	H	H	E
	D	L	L	M	H	H
	E	L	L	L	M	H
	F	L	L	L	L	M

Table 3 – Qualitative Risk Analysis Matrix
(Level of Risk E = Extreme, H = High, M = Medium, and L = Low)

Treat the Risks

The fifth step in the process is to **treat the risks**. In terms of SAR, it is important to minimize risk where it can be practically reduced on a cost/benefit basis. It may be possible to reduce low-level risk by introducing simple reduction measures such as additional staff training or SAR customer education. At the other end of the scale, it may not be possible to treat extreme risks due to inadequate resources or Government policy decisions. However, the risk analysis process will prioritize these factors for the SAR Manager and it may be a powerful ally to assist in change management.

Monitor and Review

The sixth step in the process is to **monitor and review** the performance of the risk management system and the changes that may affect it. Regular reviews (e.g., six-monthly) of the analysis should be conducted and the effectiveness of risk mitigation strategies re-examined. Some risks may be transitory (e.g., contract renewals, changes to procedures, etc.) and others may be inherent in operating a SAR system. The iterative approach of the analysis means that SAR organizations will have a good understanding of the challenges facing them and will have considered approaches to remediate them. It may only be possible to alleviate some risks rather than removing them entirely.

Communicate and Consult

The seventh and last step in the process is the most important, being **communicate and consult**. It is important to have a communications plan for stakeholders and involve them in the process. Industry peak representative bodies, if they exist, can be important stakeholders as they have a vested interest in the outcomes and may have the ability to influence higher level Government decision-making processes.

National Responsibilities of Contracting States under International Conventions

M.1 Aviation Arrangements

M.1.1 The Convention on International Civil Aviation (Chicago Convention) provides a basis for international co-operation between Contracting States in the provision of international civil aviation SAR services. The Chapters, Articles and Annexes detail certain principles and arrangements in order that international civil aviation services may be developed in a safe and orderly manner, international air transport established on the basis of equality of opportunity and all such services operated soundly and economically.

M.1.2 The Convention Articles include the following:

Articles specific to search and rescue and aircraft emergencies are as follows:

Articles 1 and 2	Airspace and Sovereignty;
Article 12	Rules and Regulations;
Article 25	Search and Rescue;
Article 26	Accident and Incident Investigation;
Article 28	Air Navigation Facilities;
Article 31	Certificate of Airworthiness;
Article 32	Licences of Personnel; and
Article 68	Designation of Routes and Airports;

M.1.3 Details of the Articles are elaborated in Annexes to the Convention.

The Annexes that have a bearing on emergency situations involving aircraft are the following:

Annex 2	Rules of the Air;
Annex 3	Meteorological Services;
Annex 6	Operation of aircraft and helicopters;
Annex 10	Communications;
Annex 11	Air Traffic Services (including the responsibilities for search and rescue alerting and in-flight emergency response);
Annex 12	Search and Rescue;
Annex 13	Aircraft Accident Investigation;
Annex 14	Aerodrome and Heliport Design and Operations; and
Annex 17	Security and Unlawful Interference;

M.1.4 It should be noted that the Chicago Convention does not provide any minimum response standards or sanctions in relation to the non-provision of aviation search and rescue services but relies on Contracting States to provide a level of service commensurate with their perceived requirements and available resources. There is also an assumption that neighbouring countries will work together to achieve the common good.

M.2 Maritime Arrangements

M.2.1 The International Convention on Maritime Search and Rescue, 1979, known as the SAR Convention 1979, is designed to provide a framework for carrying out search and rescue operations following accidents at sea.

M.2.2 The SAR Convention, as amended, clarifies the responsibilities of Governments and puts emphasis on the regional organizational approach and co-ordination between maritime and aeronautical operations.

M.2.3 Articles I to VIII of the Convention discuss the general obligations of Parties under the Convention, and the obligations or rights of vessels provided for in other international instruments.

M.2.4 The chapters and resolutions that have a bearing on the management of emergency incidents involving persons in distress at sea include the following:

Chapter 1 Terms and definitions used;

Chapter 2 Organization and co-ordination of Search and Rescue services;

Chapter 3 Co-operation between States;

Chapter 4 Overview of Rescue Co-ordination Centre and Rescue Sub-Centre operating procedures, and

Chapter 5 Operational requirements of ship reporting systems.

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