

VOLUME I

ORGANIZATION AND
MANAGEMENT

IAMSAR MANUAL

INTERNATIONAL AERONAUTICAL AND MARITIME
SEARCH AND RESCUE MANUAL

2019 EDITION



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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, 1979 and the International Convention for the Safety of Life at Sea, 1974 (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, cooperate 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. Depending on the duties assigned, it may be necessary to hold only one, or two or all three volumes.

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

The *Mission Coordination* volume (volume II) assists personnel who plan and coordinate 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 coordinator function and with aspects of SAR that pertain to their own emergencies.

Organization and Management

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 coordination centres and sub-centres, operational and support facilities and the on-scene coordinator.

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 coordination 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 (ICAO) and the International Maritime Organization (IMO). This edition of the Manual includes amendments adopted by the following MSC circulars:

Circular number	Adoption by MSC	Entry into force
MSC/Circ.999	MSC 74: June 2001	1 July 2002
MSC/Circ.1044	MSC 75: May 2002	1 July 2003
MSC/Circ.1080	MSC 77: June 2003	1 July 2004
MSC/Circ.1124	MSC 78: May 2004	1 July 2005
MSC/Circ.1173	MSC 80: May 2005	1 June 2006
MSC.1/Circ.1181	MSC 81: May 2006	1 June 2007
MSC.1/Circ.1249	MSC 83: October 2007	1 June 2008
MSC.1/Circ.1289	MSC 85: December 2008	1 June 2009
MSC.1/Circ.1311	MSC 86: June 2009	1 June 2010
MSC.1/Circ.1367	MSC 87: May 2010	1 June 2011
MSC.1/Circ.1415	MSC 90: May 2012	1 July 2013
MSC.1/Circ.1513	MSC 95: June 2015	1 July 2016
MSC.1/Circ.1594	MSC 99: May 2018	1 July 2019

A new edition is published every three years. The 2019 edition includes the 2018 amendments (adopted by ICAO and approved by IMO's Maritime Safety Committee at its ninety-ninth session in May 2018 by means of MSC.1/Circ.1594), which became applicable on 1 July 2019. The amendments were prepared by the ICAO/IMO Joint Working Group on Harmonization of Aeronautical and Maritime Search and Rescue and were endorsed by the IMO Sub-Committee on Navigation, Communications and Search and Rescue (NCSR) at its fifth session in February 2018.

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Abbreviations and acronyms

ACC.....	area control centre
ACO	aircraft coordinator
ADT	autonomous distress tracking
AFN.....	aeronautical fixed network
AFTN.....	aeronautical fixed telecommunications network
AIS	aeronautical information services
AIS	automatic identification system
AIS-SART.....	automatic identification system – search and rescue transmitter
AM.....	amplitude modulation
AMS	aeronautical mobile service
ARCC	aeronautical rescue coordination centre
ARSC.....	aeronautical rescue sub-centre
ATC	air traffic control
ATS.....	air traffic services
CRS	coast radio station
C/S	call sign
DF	direction finding
DSC.....	digital selective calling
ELT	emergency locator transmitter
EPIRB	emergency position-indicating radio beacon
FIC	flight information centre
FIR	flight information region
FM.....	frequency modulation
GADSS	Global Aeronautical Distress and Safety System
GHz	gigahertz
GLONASS	global navigation satellite system
GMDSS	Global Maritime Distress and Safety System
GNSS	Global Navigation Satellite System
GPS	global positioning system
HF.....	high frequency
IBRD	Cospas-Sarsat International 406 MHz Beacon Registration Database
ICAO.....	International Civil Aviation Organization
IFR	instrument flight rules
IMO	International Maritime Organization
Inmarsat.....	an IMO recognized mobile satellite service
ITU.....	International Telecommunication Union

JRCC	joint (aeronautical and maritime) rescue coordination centre
kHz	 kilohertz
LES	 land earth station
LRIT	long-range identification and tracking
LUT	 local user terminal
MCC	mission control centre
MEDEVAC	medical evacuation
MEDICO	medical advice, usually by radio
MF	medium frequency
MHz	 megahertz
MMSI	maritime mobile service identity
MRCC	maritime rescue coordination centre
MRO	mass rescue operation
MRSC	 maritime rescue sub-centre
MSI	maritime safety information
NBDP	narrow-band direct printing
NM	 nautical mile
NRP	National Response Plan
NSARC	 National Search and Rescue Committee
NSP	 National Search and Rescue Plan
OSC	 on-scene coordinator
PLB	personal locator beacon
RANP	 regional air navigation plan
RCC	 rescue coordination centre
RSC	rescue sub-centre
SAC	special access code
SAR	 search and rescue
SAREX	Search and rescue exercise
SART	 search and rescue radar transponder
SC(s)	SAR coordinator(s)
SCC	 SAR coordinating committee
SDP	 SAR data provider
SES	ship earth station
SITREP	situation report
SMC	 search and rescue mission coordinator
SMCP	(IMO) Standard Marine Communication Phrases
SOLAS	(IMO) International Convention for the Safety of Life at Sea
SPOC	 SAR point of contact
SRR	search and rescue region
SRS	 search and rescue sub-region
SRU	 search and rescue unit
SURPIC	 surface picture
TMAS	 telemedical assistance service

UHF	ultra-high frequency
UIR	upper flight information region
UTC	Coordinated Universal Time
VHF	very high frequency
VMS	vessel monitoring system
VTs	vessel traffic services

Glossary

Aircraft coordinator (ACO)	A person or team who coordinates the involvement of multiple aircraft in SAR operations in support of the SAR mission coordinator and on-scene coordinator.
Aircraft operator	ICAO Annex 12 – <i>Search and Rescue</i> , “A person, organization or enterprise engaged in or offering to engage in an aircraft operation.” This means (i) a person or company who, for compensation or hire, participates in the carriage by air transport of persons or property, or other aerial-work services using aircraft; commonly an “airline” or other type of air transport or services company and (ii) a person who owns or shares ownership of a general aviation aircraft that is used by them but not for commercial air transport purposes.
Aircraft tracking	A process, established by the aircraft operator, that maintains and updates, at standardized intervals, a ground-based record of the four dimensional position (latitude, longitude, altitude and time stamp) of individual aircraft in flight (ICAO Annex 6).
Air traffic service	A generic term meaning variously, flight information service, alerting service, air traffic advisory service, air traffic control service (area control service, approach control service or aerodrome control service).
Air traffic services unit	A generic term meaning variously, air traffic control unit, flight information centre or air traffic services reporting office.
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 coordination centre or rescue sub-centre.
Amver	A worldwide 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.
Area of SAR action	An area of defined dimensions that is established, notified or agreed for the purposes of protecting aircraft during SAR operations and within which SAR operations take place.
Area remote from SAR facilities	An area within which there may be an extended SAR response time due to the incident location and/or environmental conditions.
Automatic identification system (AIS)	A system used by ships and vessel traffic services (VTS), principally for identifying and locating vessels.

Autonomous distress tracking	The capability to transmit information from which the position of an aircraft in distress can be determined at least once every minute and which is resilient to failures of the aircraft's electrical power, navigation and communication systems. Note: This capability is described under <i>Location of an Aeroplane in Distress</i> in ICAO Annex 6, Part 1.
Captain	Master of a ship or pilot-in-command of an aircraft, commanding officer of a warship or an operator of any other vessel.
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)	Radiodetermination using the reception of radio waves for the purpose of determining the direction of a station or object.
Distress alert	The reporting of a distress incident to a unit which can provide or coordinate 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)	A generic term (related to aircraft) describing equipment which broadcasts distinctive signals on designated frequencies and, depending on application, may be automatically activated by impact or be manually activated.
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.
Geographic information system (GIS)	A system which captures, stores, analyses, manages and presents data that is linked to location.
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.
IMO recognized mobile satellite service	Distress and safety communication service provided by a mobile satellite service recognized by the International Maritime Organization (IMO), for use in the GMDSS.

Inmarsat	A system of geostationary satellites for worldwide mobile communications services and which support the Global Maritime Distress and Safety System and other emergency communications systems.
Joint rescue coordination centre (JRCC)	A rescue coordination 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.
Locating	The finding of ships, aircraft, units or persons in distress.
Long-range identification and tracking (LRIT)	A system which requires certain vessels to automatically transmit their identity, position and date/time at six-hour intervals, in accordance with SOLAS regulation V/19-1.
Maritime domain awareness (MDA)	The effective understanding of any activity associated with the maritime environment that could impact upon the security, safety, economy or environment.
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.
MAYDAY	The international radio telephony distress signal.
MEDEVAC	Evacuation of a person for medical reasons.
MEDICO	Medical advice. Exchange of medical information and recommended treatment for sick or injured persons where treatment cannot be administered directly by prescribing medical personnel.
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 coordination centres or other search and rescue points of contact.
Mobile satellite service	A radio communication service between mobile earth stations and one or more space stations, or between space stations used by this service; or between mobile earth stations by means of one or more space stations.
NAVAREA	A geographical sea area [*] established for the purpose of coordinating the broadcast of navigational warnings. The term NAVAREA followed by a roman numeral may be used to identify a particular sea area. The delimitation of such areas is not related to and shall not prejudice the delimitation of any boundaries between States.
NAVTEX	The system for the broadcast and automatic reception of maritime safety information by means of narrow-band direct-printing telegraphy.
On-scene coordinator (OSC)	A person designated to coordinate search and rescue operations within a specified area.

^{*} Which may include inland seas, lakes and waterways navigable by seagoing ships.

Personal locator beacon (PLB)	A portable device, manually activated, which transmits a distress signal on 406 MHz, and may have an additional homing signal on a separate frequency.
Pilot-in-command	The pilot responsible for the operation and safety of the aircraft during flight time.
Place of safety	A location where rescue operations are considered to terminate; where the survivors' safety of life is no longer threatened and where their basic human needs (such as food, shelter and medical needs) can be met; and, a place from which transportation arrangements can be made for the survivors' next or final destination. A place of safety may be on land, or it may be on board a rescue unit or other suitable vessel or facility at sea that can serve as a place of safety until the survivors are disembarked at their next destination.
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 coordination centre (RCC)	A unit responsible for promoting efficient organization of search and rescue services and for coordinating the conduct of search and rescue operations within a search and rescue region. Note: The term RCC will be used within this Manual to apply to either aeronautical, maritime or joint centres; ARCC, MRCC or JRCC will be used as the context warrants.
Rescue sub-centre (RSC)	A unit subordinate to a rescue coordination centre established to complement the latter according to particular provisions of the responsible authorities. Note: The term RSC will be used within this Manual except where it applies only to aeronautical or maritime; ARSC or MRSC 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 coordinated by a rescue coordination centre or rescue sub-centre, using available personnel and facilities to locate persons in distress.
Search and rescue coordinating communications	Communications necessary for the coordination of facilities participating in a search and rescue operation.
Search and rescue coordinator (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 coordinated.
Search and rescue data provider (SDP)	A source for a rescue coordination 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 coordinator (SMC)	The official temporarily assigned to coordinate 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)	A point of contact for SAR, designated by the national administration, that is responsible for receiving distress alert information and providing the information to appropriate SAR authorities.
Search and rescue region (SRR)	An area of defined dimensions, associated with a rescue coordination centre, within which search and rescue services are provided.
Search and rescue service	The performance of distress monitoring, communication, coordination 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 cooperating 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.
Ship reporting system (SRS)	Reporting system which contributes to safety of life at sea, safety and efficiency of navigation and/or protection of the marine environment. This is established under SOLAS regulation V/11 or, for SAR purposes, under chapter 5 of the International Convention on Maritime Search and Rescue, 1979.
Telemedical assistance service (TMAS)	A medical service permanently staffed by doctors qualified in conducting remote consultations and well versed in the particular nature of treatment on board ship.
Uncertainty phase	A situation wherein doubt exists as to the safety of an aircraft or a marine vessel, and of the persons on board.
Unnecessary SAR alert	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.
Vessel monitoring system (VMS)	Systems primarily used by environmental, fisheries and regulatory organizations, but also used by other organizations, to monitor the position, time of the position provided, course and speed of vessels.
Vessel tracking	A generic term applied to all forms of vessel track data derived from multiple sources such as ship reporting systems, AIS, LRIT, SAR aircraft, VMS and VTS.
Vessel traffic services (VTS)	A marine traffic monitoring system established by harbour or port authorities to keep track of vessel movements and provide navigational safety in a limited geographical area.

Chapter 1

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 cooperate 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 cooperation and coordination on a daily basis.
- 1.1.3** ICAO and IMO jointly developed this Manual to foster cooperation 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 coordinate, 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 volume II for *Mission Coordination* and volume III 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) 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 worldwide publicity and adversely affect sensitive industries such as tourism and transportation.
- (d) SAR provides an excellent means for promoting cooperation and communication among States and between organizations at local, national, and international levels, because it is a relatively non-controversial and humanitarian mission. Cooperation in this area can lead to cooperation 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 coordination 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, cooperate 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 Convention on International Civil Aviation, the International Convention for the Safety of Life at Sea (SOLAS), and the International Convention on Maritime Search and Rescue.
- 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 provide all SAR services:
- receive, acknowledge, and relay notifications of distress from alerting posts;
 - coordinate search response;
 - coordinate rescue response and delivery of survivors to a place of safety; and
 - provide medical advice, initial medical assistance or medical evacuation.
- 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.

1.5 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 coordinators (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 coordination is important at the management level, in addition to the coordination 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 cooperate 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 cooperation between various civilian and military organizations is essential. One way to handle this is through national SAR coordinating 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, analyse and recommend improvements in the SAR system and its operation. However, 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** SAR cases, accidents, exercises and drills should be carefully assessed and potential improvements to the SAR system identified. Lessons identified in such cases, and other information of use to the SAR community, should be shared as appropriate at local, national, regional and/or international level. States should consider whether to make formal reports to IMO and/or ICAO. The International Maritime Rescue Federation also provides an information-sharing platform: see appendix D “Information sources”.
- 1.5.9** It is important to note the distinction between a “lesson identified” and a “lesson learned”. Lessons from SAR events may be identified by SAR authorities, responders, investigation authorities and others involved. These lessons should be analysed and decisions made about what actions may be required as a result. Once actions are agreed, effort, resources and time are required to implement them. Only when the actions have been fully implemented can the lessons be said to have been learned.
- 1.5.10** 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.
- 1.5.11** 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.
- 1.5.12** 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.
- 1.5.13** When necessary, a rescue coordination 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.
- 1.5.14** The general levels and functions of the SAR system are shown in table 1-1.

Table 1-1 – Coordination structure

General levels	General functions
SAR coordination	Management
SAR mission coordination	Mission planning
On-scene coordination	Operational oversight

1.6 The global concept

- 1.6.1** Understanding national SAR efforts as an integral part of a worldwide 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 worldwide 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 cooperate 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 worldwide. 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 coordinate 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 Search and rescue (SAR) operations by maritime rescue services in time of armed conflict

Note: The guidance contained in section 1.8 has been prepared by the International Committee of the Red Cross.

- 1.8.1** The four Geneva Conventions of 1949 and their Additional Protocols of 1977 are the bedrock of international humanitarian law (IHL). IHL is a body of law underpinned by the principle of respect for the life and dignity of the individual in situations of armed conflict. The second of the four Geneva Conventions (GC II) concerns armed conflicts that take place wholly or in part at sea and extends this principle to the wounded, sick and shipwrecked members of the armed forces at sea. Recognizing the important role search and rescue operations play in implementing its provisions, GC II extends protection to small coastal rescue craft and fixed coastal rescue installations used by such craft, such as rescue coordination centres, repair boats, sickbays and hangars for their humanitarian mission, including for SAR operations concerning civilians.
- 1.8.2** Such craft and their associated fixed coastal rescue installations, when employed by a State that is party to a conflict (whether by its armed forces or by civilian governmental agencies) or by officially recognized lifeboat institutions (i.e. the institution must have been approved or authorized by a governmental authority or other public body to perform coastal rescue functions, which presupposes the existence of a legal or administrative framework in the State in which the lifeboat institution operates to provide for its prior approval or authorization in peacetime) **“shall be respected and protected, that is, may not be attacked, captured or otherwise prevented from performing their humanitarian tasks, so far as operational requirements permit”**.
- 1.8.3** In contrast to the protection owed to large hospital ships, the concession that coastal rescue craft must be respected and protected **“so far as operational requirements permit”**, allows for operational considerations by a reasonable commander to justify interference with a rescue craft by, for example, preventing them from performing their humanitarian tasks in a given sea area. However, the rules on the conduct of hostilities, as set out in Additional Protocol I of 1977 (API), apply in parallel and an attacker would not be absolved from the fundamental obligations to target only military objectives, to take all feasible precautions and to refrain from attacks that would be indiscriminate.
- 1.8.4** Neutral coastal rescue craft (i.e. craft of a State which is not a Party to an armed conflict between two or more other States) enjoy protection under other sources of international law and may also obtain special protection under GC II. Neutral vessels that agree to take on board and care for the wounded, sick and shipwrecked and to collect the dead **“shall enjoy special protection and facilities to carry out such assistance”**.
- 1.8.5** The marking of coastal rescue craft in times of armed conflict is not constitutive of their protection but merely facilitates their identification by parties to the conflict. GC II provides that all exterior surfaces of the craft shall be white and that one or more dark red crosses or other emblems recognized by international humanitarian law, in particular the red crescent and the red crystal, shall be displayed on each side of the hull and on the horizontal surfaces. Although the Convention is silent on the marking of fixed coastal installations, it is reasonable that they may, in wartime, display the distinctive emblem of the red cross, the red crescent or the red crystal on a white background.
- 1.8.6** These traditional marking methods might not suffice to ensure the proper identification of protected vessels in view of modern techniques of naval warfare, such as long-fire and submarine capabilities. Under GC II, the parties to the conflict are encouraged to conclude special agreements on the **“most modern methods available to facilitate the identification of hospital ships”**. There is no reason why agreements could not also be concluded for coastal rescue craft. Such agreements could be critical to ensure that protected craft are effectively identified by parties to the conflict, and given the protection to which they are entitled in order to carry out their humanitarian work.
- 1.8.7** GC II moreover requires that the parties to the conflict be notified of the names and characteristics of coastal rescue craft at least 10 days before they are used in wartime. This requirement is dispensed with in API, although the parties are invited to inform each other of any details of such craft which will facilitate their identification and recognition. In addition, GC II provides that rescue craft employed by

private lifeboat institutions must have received an official commission and provided with certificates from the responsible authorities stating that they have been under proper control. Furthermore, to benefit from the protection of GC II the rescue craft must not be used for any military purpose and must not hamper the movements of combatants. They must also afford relief and assistance to the wounded, sick and shipwrecked without distinction of nationality.

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 coordinate 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 worldwide 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 coordination 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;
- medical advice and medical assistance and evacuation services;
- on-scene coordinator (OSC) assigned, as necessary, for coordinating the on-scene activities of all participating facilities; and
- support facilities that provide services in support of SAR operations.

2.1.3 Establishment of the global aeronautical and maritime SAR systems under their respective international conventions provides the framework for a national system to handle SAR matters on land within the State and its SRR. Local government authorities and police would typically have the responsibility for land SAR and may not involve an RCC. However, the national SAR system should have arrangements in place for coordination with local authorities for land SAR response, as appropriate. In some cases, the national SAR system may be designated as being responsible for conducting certain land SAR operations; or, it may have a supporting role because the RCC received the initial alert or the local authorities requested the support of nearby national SAR facilities.

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.

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 coordinator (SMC), OSC and SAR facilities for coordination 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.

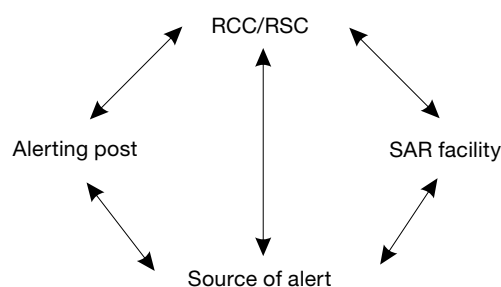


Figure 2-1 – General SAR system communications

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 coordination

- 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 coordinator (SMC) to handle a SAR incident. The SMC may specify pre-planned communications channels for coordination 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 IAMSAR Manual, volume II, *Mission Coordination*.
- 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 coordinators 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 coordination centres

- 2.3.1** The RCC is an operational facility responsible for promoting efficient organization of SAR services and for coordinating the conduct of SAR operations within an SRR. An RCC coordinates, 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 colocating 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** Cooperative 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 cooperation 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 coordination and sharing of SAR expertise.

A coastal State may have an 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 IAMSAR Manual, volume II, *Mission Coordination*.
- 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." Table 2-1 outlines these capabilities.

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. Coordination 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.

Table 2-1 – Capabilities of a fully capable RCC

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 Ability to coordinate provision of medical advice Ability to coordinate provision of medical assistance or evacuation	Wall chart depicting SRR, SRSs and neighbouring SRRs, SAR resources Computer resources Databases Vessel tracking information including AIS, LRIT, VMS and SRS

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 cooperation among RCCs should also minimize costs, enhance coordination 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, cooperation 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 h 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 coordinating 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 coordinator.* 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 rescue operations and coordinating the transit of SAR facilities to and from the scene. SCs are not normally involved in the conduct of the SAR operation. (Duties of the SMC are discussed further in the IAMSAR Manual, volume II, *Mission Coordination*.) The number of persons to be available for assignment as SMC will depend on:
- possible need to coordinate 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, coordination 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 coordinated 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 coordination 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 IAMSAR Manual, volume II, *Mission Coordination* 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 coordinating 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 coordinates SAR aircraft and other air traffic operating within the FIR.
 - Simplified notification, coordination 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 coordinated 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 coordination 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 coordinating 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, cooperation 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 coordination 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 to survivors 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 additional languages appropriate to the intended area of operation or using self-explanatory symbols 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.

Medical advice and medical assistance

- 2.5.6** The International Convention on Maritime Search and Rescue provides for parties to the Convention to provide, on request from masters of ships, medical advice and initial medical assistance and, as required, to make arrangements for medical evacuations for patients. An RCC should establish a relationship with a maritime telemedical assistance service (TMAS) to ensure that medical advice can be provided to masters at sea within its SRR 24 h a day. The RCC should have the means to coordinate medical assistance and evacuation in consultation with a TMAS. It is desirable to have a doctor or paramedic who has been briefed by the TMAS on board the evacuation craft. The RCC may establish contractual arrangements with a suitably recognized medical authority to provide this telemedical

assistance service. A sample text of a contractual arrangement between an RCC and a TMAS is at appendix N.

Area of SAR action

- 2.5.7** During SAR operations the SAR aircraft involved should be able to carry out their activities without interference from other air activity. Additionally, aeronautical organizations and aircraft not involved in a SAR operation need to be made aware of it for their safety. The temporary establishment of appropriate areas surrounding SAR operations might improve safety and inform others of SAR activity.
- 2.5.8** An “Area of SAR Action” is an area of defined dimensions used or agreed by appropriate authorities for the protection of aircraft during SAR operations. It should be assumed that within areas of SAR action special flying procedures relevant to SAR operations might take place. Areas of SAR action are described in further detail in Volume II Chapter 7.
- 2.5.9** SAR organizations should arrange that RCC have methods in place for implementing areas of SAR action to facilitate SAR operations.

2.6 On-scene coordinator (OSC) and aircraft coordinator (ACO)

- 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 coordinate 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 and/or rescue 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 coordinator (ACO) may also be designated to assist with on-scene coordination of SAR aircraft.
- 2.6.2** Responsible authorities should find ways of training and exercising the OSC and ACO functions, both for those who act in these roles and for those who cooperate closely with them.

On-scene coordinator (OSC) and aircraft coordinator (ACO) joint training

- 2.6.3** The SAR management should provide OSC and ACO training between SRU crews from different organizations that might act as OSCs or ACOs. The training should improve understanding of the OSC and ACO roles and increase confidence amongst the participating SRUs.
- 2.6.4** OSC and ACO training can consist of:
 - lessons from real life SAR missions;
 - legal documents;
 - duties of cooperating organizations;
 - performance characteristics of SRUs;
 - typical cases and methods;
 - SMC– OSC– 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 facilities	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 and gaining access to vessel tracking information such as AIS, LRIT, VMS used by fisheries and ship reporting systems (SRSs). Chapter 4 provides specific information on other sources of data. Additional information may be found in paragraph 1.11 of the IAMSAR Manual, volume II, *Mission Coordination*.

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 (C/S), 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.

SAR refuelling facilities

2.7.6 In parts of an SRR without refuelling facilities, SAR organizations should arrange that RCC have alternative plans for refueling SRUs in place.

2.7.7 Existing facilities, such as airfields, land-based refuelling facilities close to coastlines, offshore drilling platforms and vessels that can refuel aircraft, could also be used. Where possible, it is recommended for SAR management to make preparatory agreements with operators of such facilities for use in SAR operations.

Chapter 3

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 training, in particular, the SCs, RCC chiefs, SMCs, RCC staff, OSCs, ACOs and SRUs.

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 coordinate 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 advice
AFN	Medical evacuations
AFTN	Obtain and evaluate data
Bailout scenarios and planning	On-scene coordinator 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 families	SAR mission coordination
Dealing with public and news media	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	Vessel tracking systems (AIS, LRIT, VMS)
Manoeuvring boards	Visual sweep width
Mass rescue operations	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 coordination 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. Appendix O provides a sample template to serve as a guide to assist a State to develop a SAR exercise with its local SAR supporting agencies as well as with one or more neighbouring States.

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 *coordination 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 coordination.
- (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 cooperation and coordination 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 coordinating 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 coordinating 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.

Chapter 4

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 Coordination*, has information on how communication services are actually used for distress alerting and SAR coordination; 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, coordination, 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 life-saving. 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 need for RCC staff and SAR unit crews to be proficient in speaking, writing and comprehending a common language to ensure effective information transfer is vital to successful conduct of SAR operations. In the case of a SAR action involving cooperative input from a number of RCCs and SRUs within a region, the most convenient language may be a common regional language. In the case of a SAR action likely to extend beyond regional areas, the appropriate common language is English. English, in any case, serves as the default SAR operational language in all cross-boundary operations where there is no other common language. Defining and mandating specific levels of proficiency in languages for RCC staff and SRU crews is, however, impractical because the regulatory framework of SAR services is insufficiently robust to support its implementation and maintenance. SAR service providers should, nonetheless, appreciate that where there is dependence upon spoken communication, mistaken transfer of operational information has been shown to be the most common causal factor in the occurrence of accidents and incidents and that every effort should be made to mitigate its risks by requiring SAR staff to attain a high level of appropriate language proficiency. As supportive tools, in undertaking coordination across language barriers, SAR service providers may take advantage of commercial interpretation services that are now readily available. Confirmation of verbal conversations with facsimile or other written messages can reduce misunderstandings and expedite coordination processes.
- 4.2.3** Publications which can be used to alleviate language barriers between vessels, aircraft, survivors, and SAR personnel include: the *International Code of Signals*, the *Standard Marine Communication Phrases* (SMCP) and appendix I, “SITREPs and MAREC Codes” of the IAMSAR Manual, volume II, *Mission Coordination*. 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 *International Code of Signals* and SMCP are readily available and can be genuinely useful, they should not be thought of as total solutions for the challenges of communicating effectively across language barriers. Because of the range of topics and behaviours requiring common understanding, effective transfer of information in situations of operational emergency is dependent upon a very comprehensive command of language. Thus, no form of standardized phraseology or code can address the extent of need. A high level of proficiency in common (or plain) language is necessary.

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. Coordination 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 coordination

4.3.9 Traditionally, States have independently developed shoreside and ground communications infrastructure to handle distress alerting and SAR. Coordination 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 coordination 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 the 406 MHz distress beacon called an emergency locator transmitter (ELT). Designated SAR aircraft should be able to home on ELT 121.5 and 406 MHz signals for locating a distress scene and survivors.
- (b) Similarly, certain vessels must carry the 406 MHz distress beacon called an emergency position-indicating radio beacon (EPIRB) to indicate that a distress exists and facilitate location of survivors.