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Virtual Workshop on the establishment of an effective Search and Rescue (SAR) organization

SAR Best Practices

Albert Aidoo Taylor (RO-ATM & SAR, WACAF) / Keziah Ogutu (RO-ATM & SAR, ESAF)

Search and Rescue (SAR) Organization and Management

- **SAR System Concept**
 - Benefits of Services
 - Global, National, Regional Systems
- **Components of SAR System**
 - SAR as a System
 - Rescue Co-ordination Center and Sub-Centers
- **Training, Qualification, & Certification of SAR Professionals**
 - Building Professionals – Training, Qualification, Certification
 - Exercising Capability
- **SAR Communications**
 - Basic Functions and Requirements
 - Co-ordination of components of the SAR System
- **SAR System Management & Organizational Improvement**
 - Planning and Resource
 - Assessment, Analysis, and Implementation
 - DOTMLPF Analysis



SAR System Concept

Overview

- Why Provide SAR?
 - Benefits of SAR Services
- International SAR Agencies
- International SAR Documents
- Global SAR Concept
- National and Regional Systems



Why Provide SAR?

DUTY TO ASSIST

This international principle conveys that:
Vessels and aircraft have a duty to provide assistance to other vessels, aircraft or persons in distress, without regard to location, nationality or circumstances.



Why Provide SAR?

Benefits of SAR Services

- Reduction of loss of life and suffering
- Safe/Secure environment for maritime related industries, commerce, recreation, and travel
- Resource for initial response during natural disasters as integrated into national emergency management system
- Positive publicity about responses to SAR events
- Method of promoting co-operation between States
- Legal basis – as a party to the International Convention for the Safety of Life at Sea (SOLAS) – State provided SAR



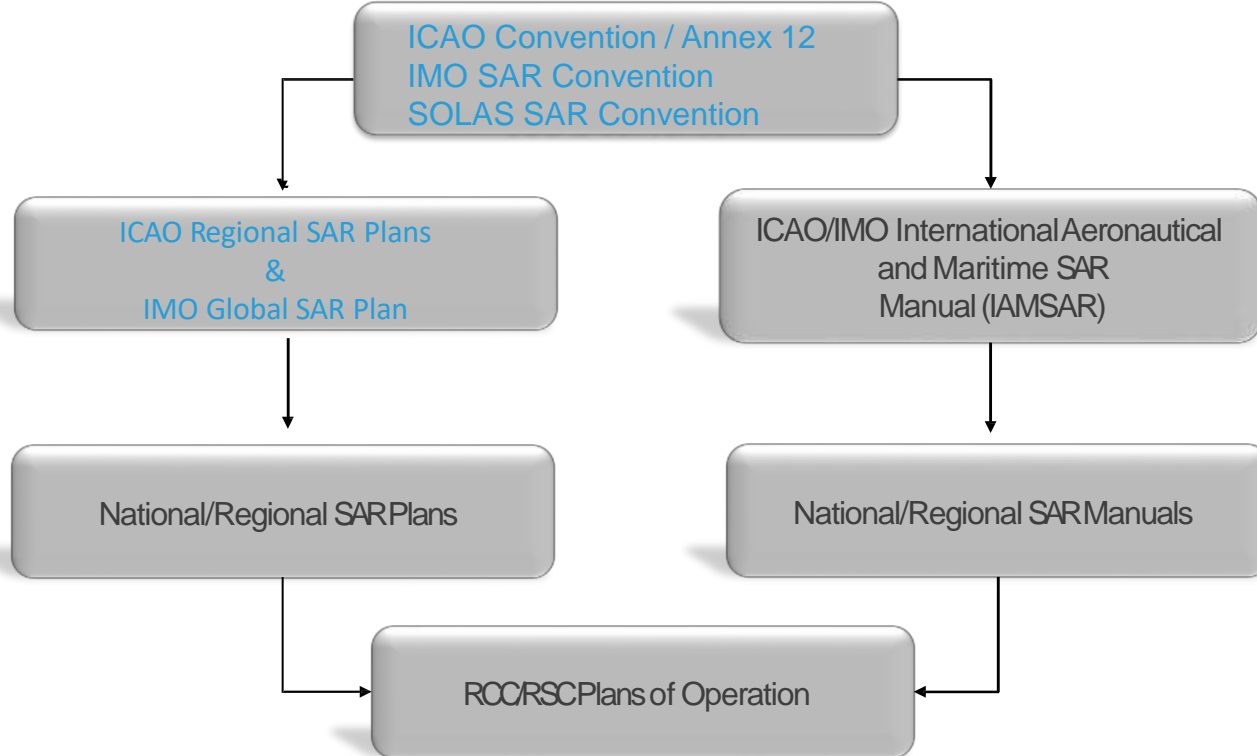
International SAR Agencies

- International Maritime Organization (IMO)
- International Civil Aviation Organization (ICAO)
 - Focus on SAFETY
 - Develop global SAR plans, procedures, techniques and training for SAR
 - Both envision a “patchwork” of SAR Regions (SRRs) encompassing globe with rescue coordination centers responsible for assigned SRRs





International SAR Documents





IAMSAR Manual

Purpose

- Designed to harmonize Aeronautical and Maritime SAR:
 - Organization
 - Procedures
 - Equipment
- Comprehensive manual using standardized terminology and functions to ease aeronautical and maritime SAR Coordination
- Approved by ICAO and IMO



IAMSAR Manual

Description

- 3-volume Manual
 - Volume 1 – *Organization and Management*
 - Volume 2 – *Mission Coordination*
 - Volume 3 – *Mobile Facilities*
- Each Volume created for specific SAR system duties
- Each Volume can be used as “stand-alone” document or in conjunction with other two volumes

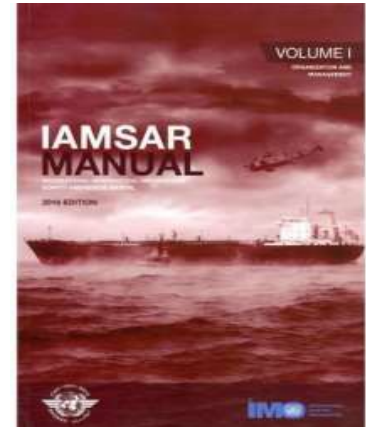




IAMSAR Manual

VOLUME 1 – *Organization and Management*

- **Purpose** – Discusses global SAR system concept, establishment and improvement of national and regional SAR system, and cooperation with neighboring nations to provide effective and economical SAR services
- **Primary User** – SAR System Managers

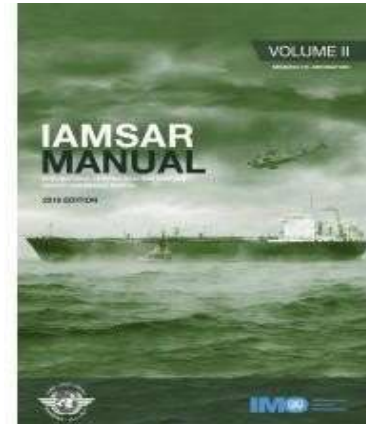




IAMSAR Manual

VOLUME 2 – *Mission Co-ordination*

- **Purpose** – To assist personnel who plan and coordinate SAR operations and exercises
- **Primary User** – Rescue Co-ordination Centers (RCCs) and Rescue Sub-centers (RSCs)

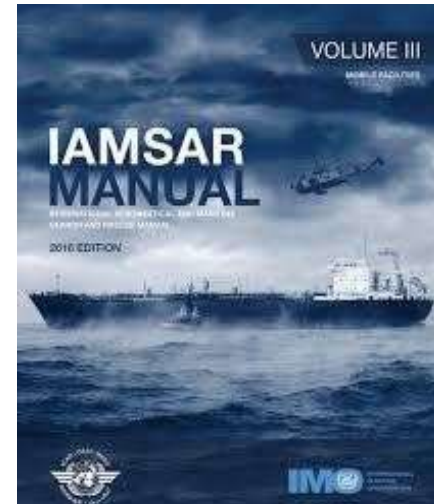




IAMSAR Manual

VOLUME 3 – *Mobile Facilities*

- **Purpose** – To assist vessels and aircraft with performance of search, rescue, or on-scene coordinator function and with aspects of SAR that pertain to their own emergencies
- **Primary User** – Rescue units, civil aircraft and vessels





IAMSAR Manual

VOLUME 1 – *Organization and Management*

- **Chapter 1** – SAR system concept overview
- **Chapter 2** – SAR system key components
- **Chapter 3** – Training, qualification, certification
- **Chapter 4** – SAR organization communications
- **Chapter 5** – SAR system management
- **Chapter 6** – Factors for improvement of SAR services



IAMSAR Manual

VOLUME 2 – *Mission Co-ordination*

- **Chapter 1** – Focused view of SAR system concept
- **Chapter 2** – SAR communications specifics
- **Chapter 3** – 5 stages of SAR response
- **Chapter 4** – Search planning and evaluation concepts
- **Chapter 5** – Search techniques and operations
- **Chapter 6** – Rescue planning and operations
- **Chapter 7** – Emergency assistance other than SAR
- **Chapter 8** – Concluding SAR operations
- **Appendices** – *RCC Checklists, procedures, worksheets*



IAMSAR Manual

VOLUME 3 – *Mobile Facilities*

- **Section 1** – Overview of SAR information
- **Section 2** – SAR response facilities
- **Section 3** – On-scene coordinator (OSC) or aircraft coordinator (ACO) specific information
- **Section 4** – SAR information for vessels, aircraft or other craft in need of assistance
- **Appendices** – Specific information, forms and message formats for mobile facilities engaged in SAR operations



SAR System Management & Support

Basic SAR System Functions

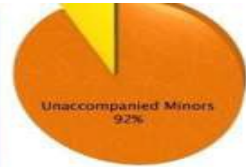
- Receive, acknowledge, and relay distress alerts
- Coordinate SAR response
- Conduct SAR operations
- *The SAR System cannot be organized and effective without management and support*





SAR System Management & Support

- **SAR System Managers must 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





Basic Requirements

- Basic requirements for developing an effective SAR system include:
 - **legislative establishment** of the SAR services 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.



Global SAR Concept

- Eliminates the need for each State to provide SAR services for its own citizens wherever they travel world-wide
- 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





National and Regional Systems

- A regional approach can reduce cost and improve distribution of distress alerts, coverage and services.
- States can sometimes support each other with SRUs to reduce the total number of units needed for adequate coverage and readiness.
- Establishment of national or regional SAR systems is typically based on development of multilateral national or regional plans, agreements, etc.
- Usually provides for;
 - effective use of all available resources for SAR;
 - delineation of SRRs,
 - description of relationships between the parties





SAR and the 1949 Geneva Conventions and their Additional Protocols

- In times of armed conflict, SAR services will normally continue to be provided in accordance with the Second Geneva Convention of 1949
- The SAR services recognized by their Administrations are afforded protection for their humanitarian missions
- Coastal installations should, in time of armed conflict, display the distinctive emblem (red cross or red crescent)
- Parties to a conflict notify the other Parties with the name, description and locations (or area of activity) of their above-mentioned rescue craft and coastal installations in the area they are located.





Summary

- SAR System Concept
 - Why Provide SAR?
 - International SAR Agencies
 - International SAR Documents
 - Global SAR Concept
 - National and Regional Systems





SAR SYSTEMS

Components of SAR System



Overview

- Components of SAR System
 - Search and Rescue Region (SRR)
 - Communications / SAR Coordination
 - Rescue Coordination Centers (RCC)
 - Purpose and Requirements
 - Facilities and Equipment
 - Staffing and Training
 - Rescue Sub-Centers (RSC)
 - SAR Facilities
 - On-Scene Coordinator (OSC)
 - Support Facilities
 - Computer Resources





Search and Rescue Regions (SRR)

- SRR is an area of defined dimensions associated with an RCC within which SAR services are provided
- The purpose of having an SRR is to clearly define who has primary responsibility for coordinating responses to distress situations
- Factors Affecting SRR Size and Shape 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



Communications

- **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.





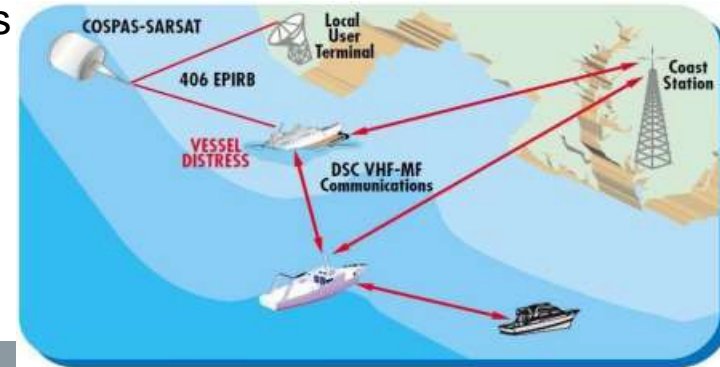
Main Functions SAR Communications

- **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
- **Direction Finding** (DF) and homing which allow SRUs to be dispatched to the vicinity of the distress and to home on signals from equipment used by survivors



Alerting Posts

- **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 post must be able to forward the distress information to the RCC
- 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





Locating

- Locating capabilities enable the responding SAR facilities to minimize the search time and to get to the actual position of distress for rescue
- Most civil aircraft operating over ocean areas and remote land areas, and many other aircraft, are required to carry an Emergency Locator Transmitter (ELT)
- Ships and some other craft are required to carry emergency position-indicating radio beacons (EPIRBs) capable of transmitting signals.
- Having a very precise search object position is useful but does not eliminate the need for SRU homing capabilities





SAR Coordination

- Communications among SAR facilities will depend on **local agreements** and the **organization** of the SAR services in the SRR and on the **equipment** available
- RCCs normally assign a **SAR Mission Coordinator (SMC)** to handle a SAR incident
- 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



Rescue Coordination Center (RCC)

- 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
- SAR managers should ensure that the RCC is familiar with the capabilities of all of the facilities available for SAR in its SRR





Joint Search and Rescue Centers (JSRC)

- 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
 - Benefits in fewer facilities to establish or maintain
 - Reduced cost
 - Less complexity for alerting posts in forwarding distress alerts
 - Better coordination and sharing
- A coastal State may have a MRCC but not be able to be provided with an ARCC
- Properly established, the JRCC may improve SAR service performance in most areas



Purpose and Requirements

- ICAO's Annex 12 and the International Convention on Maritime Search and Rescue **require that SAR providers establish an RCC for each SRR.**
- The **RCC must have certain basic capabilities** before it is recognized as having responsibility for an SRR.



RCC Required Capability

- ❑ 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
- ❑ Immediate communications with associated:
 - ❑ ATS units and RSCs
 - ❑ DF and position-fixing stations associated CRSs
- ❑ Rapid and reliable communications with:
 - ❑ Parent agencies of SRUs and RCCs
- ❑ Designated meteorological offices
- ❑ Employed SRUs
- ❑ Alerting posts
- ❑ Plans of operation
- ❑ Ability to coordinate medical advice and assistance





RCC Desired Capability

- ❑ Wall chart depicting SRR, SRSs, and neighboring SRRs, and SAR resources
- ❑ Computer resources
- ❑ Databases
- ❑ Vessel tracking information / systems





Facilities and Equipment

Communications

- An **RCC** should be **located where it can effectively perform** its functions within its SRR
- 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
- **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
- **All voice equipment**, including telephones, should be **attached to a multichannel tape recorder**, preferably with a time recording



Facilities and Equipment

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
- **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 colored pins or other symbols, information of interest.



Facilities and Equipment

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.

Publications and supplies

- The publications and supplies to be available at the RCC should include:
 - ❑ SAR publications of ICAO, IMO, the national and neighboring 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

- RCC Chief
 - RCC chief may be a person who also performs other functions
 - Must make appropriate preparations, plans, and arrangements
 - Ensure that when an incident occurs the SAR operation can be performed.

- 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.
 - 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.



Staffing

SAR Mission Coordinator (SMC)

- A 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
- **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.
- **SMC is responsible for planning the search and coordinating the transit of SRUs to the scene.**
- 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)
 - need to allow for **vacation, training courses, illness, relief and travel.**



Training, Qualification, Certification

- RCC chiefs, SMCs, and RCC staff **need specific training** in watch standing, coordination of assorted resources, search planning, and rescue planning.
- **SAR Managers** have the responsibility to **ensure** that the overall training program is effective and ensure that all SAR service personnel reach and maintain the required level of competence.
- **Qualification and Certification processes** are used to ensure that sufficient experience, maturity and judgement are gained.
- 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.



Plans of Operation

- 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
 - ❑ Are in a convenient form for quick and easy use



Rescue Sub Centers

- There may be situations where an RCC is not able to exercise direct and effective control over SAR facilities in an area within its SRR. The establishment of an RSC with its SRS may be appropriate. Examples of such situations include:
 - ❑ Where the **communications facilities** in a portion of an SRR are **not adequate** for close co-ordination between the RCC and SAR facilities;
 - ❑ Where the SRR encompasses a number of States or territorial divisions of a State in which, for **political or administrative reasons**, local facilities can only be directed and controlled through designated local authorities
 - ❑ Where **local control of SAR operations will be more effective**



SAR Facilities

- SAR facilities **include designated SRUs** and other resources which can be used to conduct or support SAR operations.
- 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, such as 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.



Equipment Needed By SRU

- Communications
- Mobility
- Supplies and Survival Equipment
- Other required equipment as determined





Search and Rescue Unit

- Designated SRU
 - SRUs need not be dedicated solely to SAR operations, but should have the training and equipment necessary for proficient operations.
- Specialized SAR Units
 - Specialized SRUs are teams with specialized training and equipment created for specific rescue scenarios; such as mountain or desert rescue





Search and Rescue Unit

■ Other SAR Facilities

- 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

■ Medical Advice and Assistance

- Maritime telemedical assistance service (TMAS)



On Scene Coordinator (OSC)

- When two or more SAR facilities are working together on the same mission, it is usually advantageous if one person is assigned to co-ordinate the activities of all participating facilities.
- The SMC designates this OSC, who may be the person in charge of an SRU, ship, or aircraft participating in a search, or someone at another nearby facility able to handle OSC duties.
- Usually the first to arrive on scene
- May perform duties as the SMC



Support Facilities

- Support facilities **enable the operational response** resources (e.g., the RCC and SRUs) to provide the SAR services.
- There is a wide range of support facilities and services, which include the following:
 - ❑ Training facilities Facility maintenance
 - ❑ Communications facilities Management functions
 - ❑ Navigation systems Research and development
 - ❑ SAR data providers (SDPs) Planning
 - ❑ Medical assistance Exercises
 - ❑ Aircraft landing fields Refuelling services
 - ❑ Voluntary services (e.g., Red Cross) Critical incident stress counsellors



Computer Resources

- Rescue Planning
- Extensive data bases are available
- Develop a list of on line tools (<http://sarcontacts.info/>)
- Acquire applications for SAR planning
- Determined from analysis



Summary

- Components of SAR System
 - Search and Rescue Region (SRR)
 - Communications / SAR Coordination
 - Rescue Coordination Centers (RCC)
 - Purpose and Requirements
 - Facilities and Equipment
 - Staffing and Training
 - Rescue Sub-Centers (RSC)
 - SAR Facilities
 - On-Scene Coordinator (OSC)
 - Support Facilities
 - Computer Resources



Competence

SAR Training, Qualification & Certification Process



Overview

- Building Professionals
- Training, Qualification, Certification
- Exercises



Building PR Professionals

- Training
 - ❑ Critical to performance and safety
 - ❑ Train to produces true professionals to save lives
- Qualification
 - ❑ Development and implement a standardized qualification program
- Certification
 - ❑ Develop set of standards that can be evaluated
- Exercises
 - ❑ Routinely exercise this capability



Training

- Who to train
 - All SAR specialists need some training, in particular, the SCs, SMCs, and OSCs
 - RCC and RSC watch standers 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
 - individual's training must be based on a needs analysis.
 - This analysis compares actual performance and behavior with required performance and behavior at a currently held position.
 - Based on this analysis, training needs and methods to overcome the deficiencies can be identified.



What to Train

- Working knowledge of the **English language**
- Study of the application of **SAR procedures**, **techniques** and **equipment** through lectures, demonstrations, films, and SAR manuals and journals;
- Assisting in or **observing actual operations**; and
- **Exercises** in which personnel are trained to co-ordinate individual procedures and techniques in a simulated operation.
- SAR managers performing administrative functions may benefit from courses in:
 - planning
 - organizing
 - staffing
 - budgeting, performance assessment, and accounting



Training should include at least the following topics

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



How to Train

- There are three ways to train
 - **Training based on performance** helps SAR specialists and teams to perform their duties effectively. Ensure that all SAR service personnel reach and maintain the required level of competence.
 - **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.
 - **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.



On the Job Training

- Checklist
- Planned Progression
- Assignment Rotation
- Coaching
- Library



Formal Training

- Classroom training
- Train the Trainer
- Maintain a training facility
- Add to curriculum
- Conferences



Exercises

- Exercises test and improve operational plans, provide learning experience and improve liaison/coordination skills

Types of Exercises

- Communication exercise
- Coordination exercise
- Full Scale
- 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.
- Plan. Prepare. Execute. Assess



Summary

- SAR Training, Qualification, Certification Process
 - Building Professionals
 - Training, Qualification, Certification
 - Exercises



SAR Communications

SAR Communications



Overview

- Basic Functions and Requirements
- Important Factors of SAR Communications
- Reception of Distress Alerts (Report / Locate)
- Co-ordination of components of the SAR system



Basic Functions and Requirements

- Communications support distress alerting, co- ordination, and locating functions by allowing:
 - those in distress to alert the SAR system;
 - the SAR system to respond and conduct its mission; and
 - survivors to help SAR units respond and conduct a rescue



Basic Functions and Requirements

- Operating requirements for SAR Comms include:
 - Timely delivery of alerts
 - Complete and easy to understand alerts
 - Minimum number of false alerts
 - Capability to contact units in distress
 - Common Language



Important Factors for SAR Comms

- Priority
- Reliability
- Availability

- Interoperability
- International Coordination



Available Technology

- Mobile Communications Equipment
- Emergency Distress Comm Devices
 - Emergency Locator Transmitter (ETL) – 121.5 MHz
 - Emergency Position-Indicating Radio Beacons (EPIRB)
 - Personal Locator Beacons (PLB) – 406 MHz
 - Global Positioning System (GPS)
 - GADSS
 - Space Based ADS-B





Available Technology

- SRU Comms Equipment
 - Direction Finding (DF) capability
 - Line of Position (LOP)





Available Technology

- Land-Based Infrastructure
 - Alerting Post
 - SAR Communications Network
 - SAR Data Providers
 - GMDSS Master Plan
 - Ship Reports for SAR
 - Supplemental Capabilities
 - Instant-replay Recording Equipment
 - Caller Identification
 - MEDICO communications
 - Social media

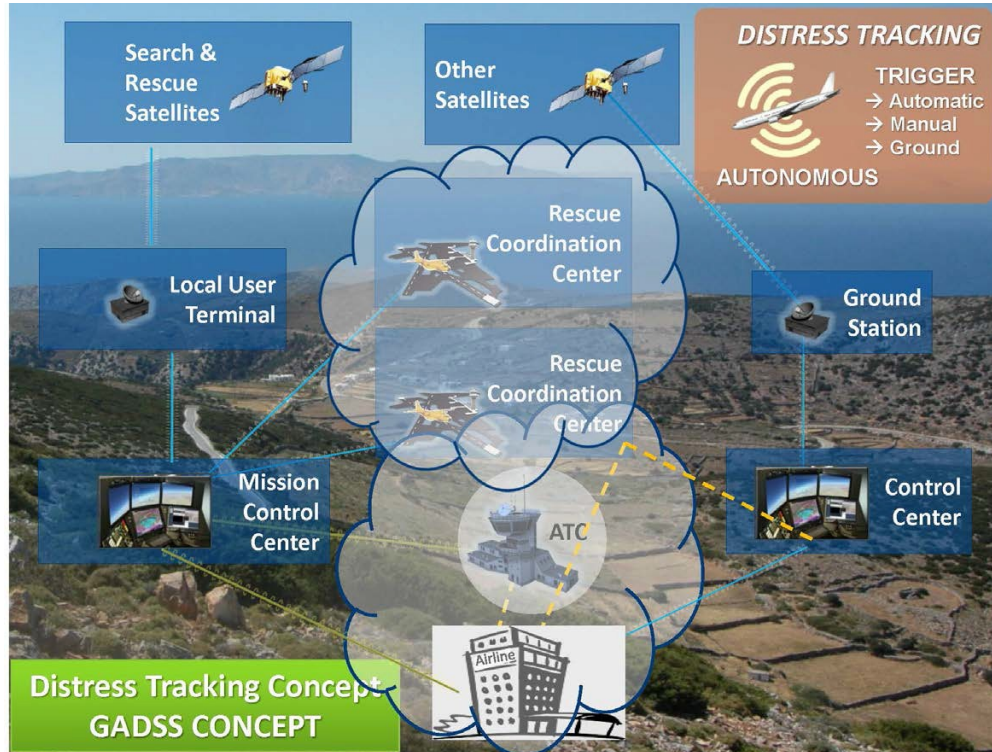


SAR Communications



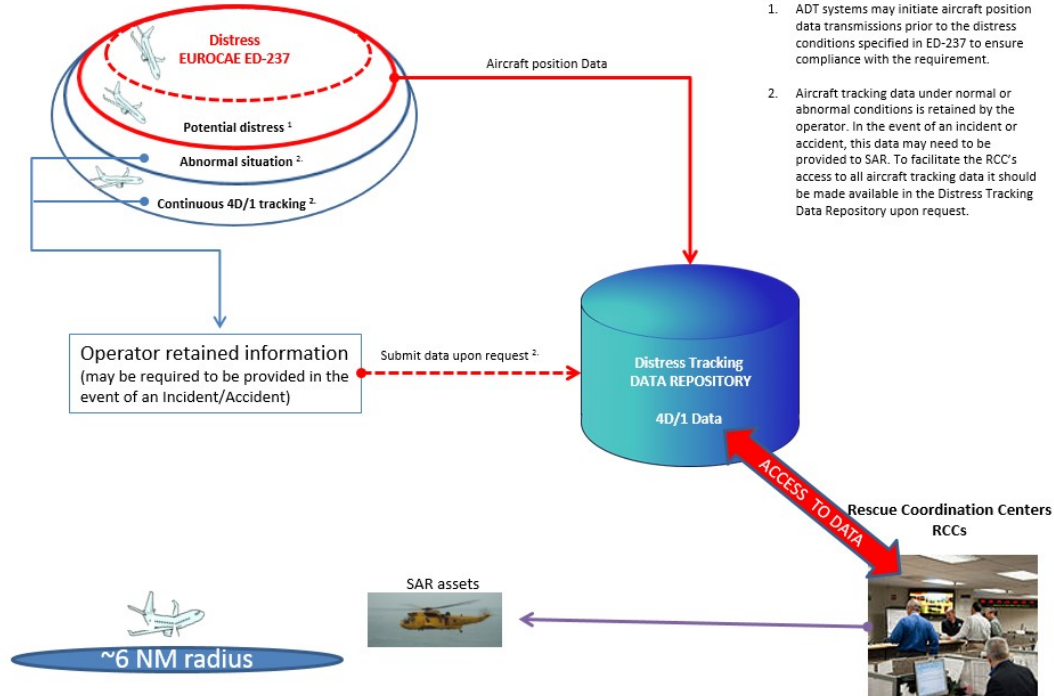


ICAO's Global Aeronautical Distress and Safety System (GADSS)





GADSS



Notes.

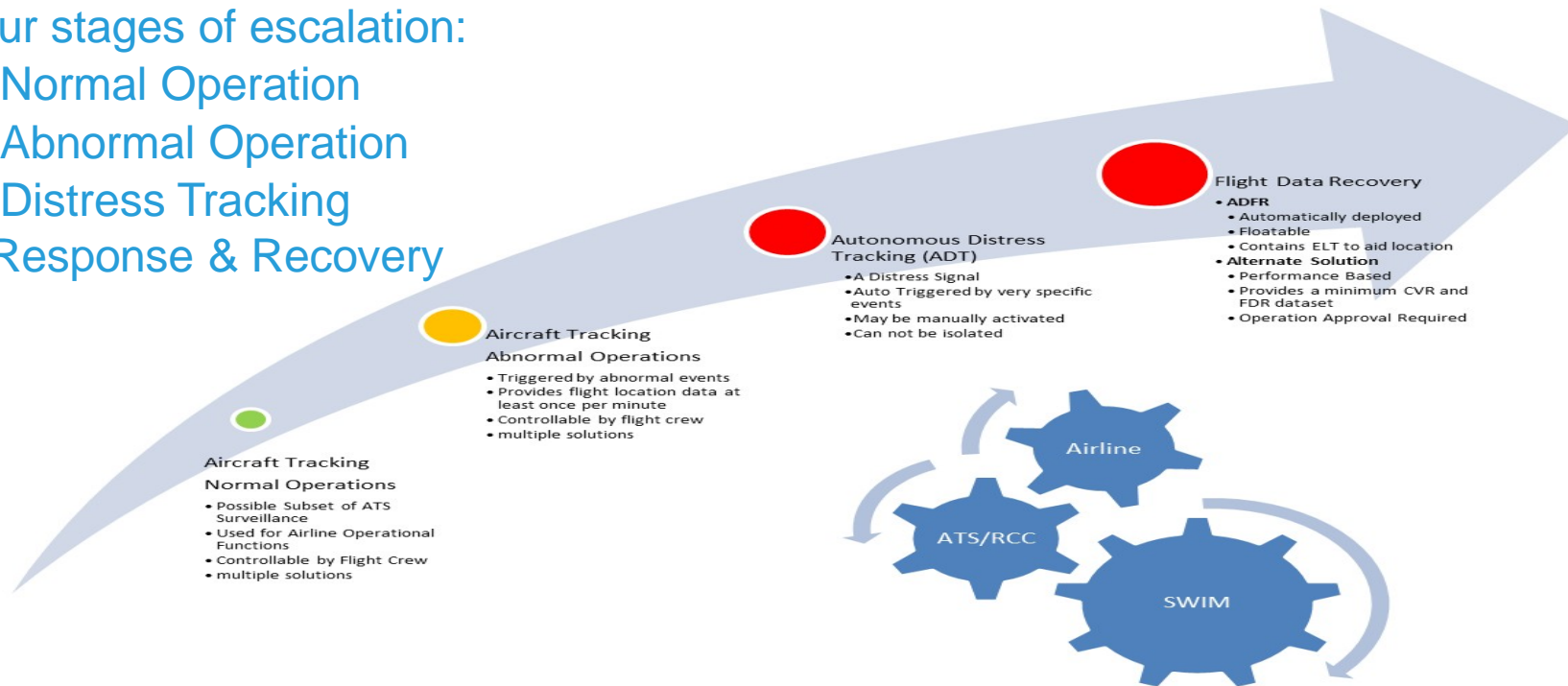
1. ADT systems may initiate aircraft position data transmissions prior to the distress conditions specified in ED-237 to ensure compliance with the requirement.
2. Aircraft tracking data under normal or abnormal conditions is retained by the operator. In the event of an incident or accident, this data may need to be provided to SAR. To facilitate the RCC's access to all aircraft tracking data it should be made available in the Distress Tracking Data Repository upon request.



ICAO's Global Aeronautical Distress and Safety System (GADSS)

Four stages of escalation:

- Normal Operation
- Abnormal Operation
- Distress Tracking
- Response & Recovery





GADSS

- Aircraft Tracking
 - Aircraft' s position reported at least every 15 min
 - accuracy within 1 NM
- Autonomous Distress Tracking (ADT)
 - 4D position (Lat, Long, altitude, time)
 - autonomous transmission at least every minute
 - localize accident site to within 6 NM radius
 - immediate or no later than five seconds latency



SAR Communications

- Maintain a continuous watch on the following international frequencies, if equipped to do so:
 - 2,182 kHz (radiotelephony)
 - 156.8 MHz FM (channel 16, radiotelephony) for vessel distress
 - 121.5 MHz AM (radiotelephony) for AC distress or beacon distress signals

- SOLAS communications equipment is referred to as Global Maritime Distress and Safety System (GMDSS) equipment:
 - Inmarsat ship earth stations
 - VHF, MF, and HF digital selective calling (DSC) radios
 - maritime safety information receivers like NAVTEX and SafetyNET
 - hand-held VHF equipment
 - emergency position-indicating radio beacons (EPIRBs, ELT, PLB 406 MHz)
 - search and rescue radar transponders (SARTs)
 - AIS search and rescue transmitters (AIS-SARTs).



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- SOLAS communications equipment is referred to as Global Maritime Distress and Safety System (GMDSS) equipment:
 - Inmarsat ship earth stations
 - VHF, MF, and HF digital selective calling (DSC) radios
 - maritime safety information receivers like NAVTEX and SafetyNET
 - hand-held VHF equipment
 - emergency position-indicating radio beacons (EPIRBs, ELT, PLB 406 MHz)
 - search and rescue radar transponders (SARTs)
 - AIS search and rescue transmitters (AIS-SARTs).



Summary

- SAR Communications
 - Basic Functions and Requirements
 - Important Factors of SAR Communications
 - Reception of Distress Alerts (Report / Locate)
 - Co-ordination of components of the SAR system



SAR Planning

SAR System Management Planning Process

“If you fail to plan, you plan to fail”



Overview

- SAR Management Planning Process
 - Assessment & Preparation
 - Analysis
 - Plan & Resource
 - Capability & Capacity
 - Full Spectrum Analysis
 - Capabilities Based Assessment
 - **DOTMLPF** Analysis



Planning Process

- SAR management planning processes involve:
 - **Assessing emerging technologies** and other **environmental changes** and opportunities;
 - **Appraising the system**, including use of SAR statistics to identify recurring causes of distress incidents;
 - **Analyzing and responding** to the findings and recommendations of accident investigations;
 - **Promoting legislation, rules, treaties, or agreements to improve safety**;
 - **Sharing information** among programs and organizations; and
 - **Participating** in SCCs and international and interagency **SAR meetings**



Best Business Practice

- If you don't know the problem you can't fix it
- Plan, Prepare, Execute, Assess – It is a continuous cycle
- Conduct After Action Reviews (AAR) for all events
- Incorporate Lessons Learned or they become Lessons Observed
- Rehearse
 - Table Top Exercise
 - Run Drills
- Review and modify checklists



Analysis

- **Analysis** – An analytical study of problems undertaken to provide the responsible Leadership and staff agencies with a scientific basis for decisions or action to improve operations
- **Analysis is a Structured Study That...**
 - Solves a problem
 - Examines a range of alternatives
 - Converts real life into math models or simulations
 - Processes data and derives meaning from results
 - Conveys understandable results to the Decision Maker





Capability & Capacity

- **Capability** – The **ability to achieve a desired effect** under specified standards and conditions through a combination of means and ways across doctrine, organization, training, materiel, leadership and education, personnel, and facilities (DOTMLPF) to perform a set of tasks to execute a specified course of action

**ANALYSIS
DEVELOPMENT**



**CORRECTIVE
ACTIONS**





Full Spectrum Analysis

There are several different methods you should use to derive / define / refine issues and requirement. Each method produces a slightly different set of issues and requirements. Any method used by itself will yield an incomplete set of issues leading to an incomplete set of requirements and an inadequate solution. in combination, they yield a full spectrum of solid, testable, requirements.

- “What, Who, When, Where and How” mode
- Functions mode
- Customer and Process mode
- Products and Services mode
- Characteristics and Qualities mode





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WHAT
Threat
Shortcomings/Needs
Present
Projected/Future
Technology Application

Specific core deficiencies, problem areas, or opportunities stated as *single* issues.

WHO
Strategy
Policy
Goals and Objectives
Plans and Procedure
Ownerships of Assets
Decision Authority
Command Relationships
Comm Interfaces
Training Issues
Competencies
Knowledge
Skills
Abilities
New schools
Process and Procedure
Staffing Issues
KSAs
Occupational Specialty Impact
Qualifications
Support Needs
Interfaces

Organizational setting
Which organizations interface with the system? Address interfaces with other Joint systems. Who will use the system when it is developed and fielded?

WHEN
Program
Time frames
Milestones
Deadlines
Date to be delivered
FoS Synchronization (PJ)
Time Phasing
Spiral Development
Operational
Phases of campaign
IOC
Deployment Process

Time frames that will support acquisition approach. Milestones and/or date to be delivered/fielded. Also consider phases of campaign.

WHERE
Place on the future battlefield
Mobility/Accessibility
Survivability
Physical Environment
Facilities
Terrain
Weather & Climate
Theater specific considerations
Supplies
Transportation
Deployment
Installation
Network
Maintenance
Civil Considerations

The system's place on the future environment. Consider physical environment.

HOW
Military Conditions
OPLANS
TTP
Doctrine
ROE
FoS Integration
Performance
Decision Support
Information Management
Deployment

Employment operation. How the system will be used to attain present or future objectives. Consider under which the system will be used.



Capabilities Based Assessment

Existing
Guidance



NEEDS



What we need
for the mission



GAPS



The problems
and the risks



SOLUTIONS



What should we
do about it?



Preparation

- Gather all pertinent publications (Laws, Regulations, Agreements)
- Case Studies and After Action Reviews
- Narrow the focus
 - Leaders & Staff
 - Units / Forces
 - Individuals
- Rapport Building / networking



Plan & Resource

- Products of Analysis
 - Specified Tasks
 - Implied Tasks
 - Shortfalls / Gaps
 - Plan Of Action and Milestones (POAM)
 - Resourcing Requirements
 - Determine / Develop Architecture & Process to accomplish the SAR execution tasks
 - Identify and accomplish directed planning and preparation
 - Plans, Orders, Checklists
 - National SAR Plan, Local/Regional SAR Plan, MRCC SOP, SRU
 - **PACE**- Primary, Alternate, Contingency, Emergency
 - Subordinate Command / Unit directed tasks



Identifying a Capability

Capability -
(includes tasks to
achieve desired
effect)



Answers What you
need to accomplish



Review Capability
efficiencies and
effectiveness.

Driver - Legislative or
Strategic Guidance,
Policy, Direction or Goals



Answers Why you
need to accomplish it.



Identified reference
from guidance, laws

Requirements
(Standards and
Conditions)



Provides clarifying details-
Answers questions including
Who, Where, and When



- Staff and Leaders
- Review Process in place by FYXX
- Capture data

Solutions/Enablers (Ways
and Means)



Answers How you
will accomplish it.



DOTMLPF
Assessment



DOTMLPF Analysis

- D**octrine
- O**rganization ➤ Framework for capability analysis and identifying the key enablers of a capability
- T**raining
- M**ateriel
- L**eadership
- P**ersonnel
- F**acilities



Doctrine

- Principles we follow and the tactics, techniques and procedures for what we want to accomplish...
 - Determine if Doctrine Exists – National? State? Agency?
 - Review Organization and applicable other agency Doctrine (MOA/MOU)
 - Determine if Doctrine is Current
 - Identify Doctrinal Gaps
 - Publication Synchronization
 - Operating procedures in place?
 - Operating procedures NOT being followed?
 - Can existing processes or procedures be improved?
 - Business process reengineering assessment complete?
 - Develop Program of Objectives, Actions & Milestones (POA&M)
 - Provide monthly status reports for all actions



Organization

- Determine Operational Impacts
- Develop Mission Statement
- Develop Table of Organization and Equipment
- Determine Command Relationships
- Determine Requirement to Reconstitute Capabilities
- Determine Additional Maintenance/Support Requirements
- Determine Manning Precedence Level to be Assigned
- Develop Essential Task Lists
- Determine changes required to current Essential Task Lists
- Determine who is responsibility for status/program Reporting
- Where is the problem occurring?
- What is the mission/management focus?
- What are the organizational values and priorities?
- Organization properly staffed and funded to deal with the issue?
- Is Leadership /senior management aware of the issues?
- Who exactly is aware of/impacted by the issue?



Training

- Determine All Training Requirements
- Determine Training Available
- Determine Instructor requirements
- Develop Training Manual / Schedule
- Develop Individual Training Road-Maps
- Determine Training program Impacts
- Determine Individual Related and Incidental Certification requirements
- Determine Annual Training requirements
- Determine Formal School Requirement
- Validate, Develop and/or Implement All Formal School House Curriculums
- Develop POA&M for all Training Actions required
- Is there lack of or inadequate training?
- Is the training being delivered effectively?
- Are training results being measured and monitored?
- Lack of competency or proficiency on existing systems and equipment?
- Was the issue discovered in an exercise?
- Personnel have access to training?
- Does Senior Level/management support/enforce training?
- Is training properly staffed and funded?



Materiel

- Determine Impacts on Readiness
- Caused, at least in part, by inadequate systems or equipment?
- Too many systems?
- New functionality needed?
- Better operational performance needed?
- Lack of competency or proficiency on existing systems and equipment?
- Increase performance in existing systems?
- Users of the proposed systems or equipment?
- Interoperability
- Determine / Evaluate resources available from Government, other agencies
- Review material solution studies / capabilities
- Determine Sourcing Plan for Equipment
 - Determine cost and develop appropriate budget submissions
 - Prioritize Sourcing with Other Sourcing Efforts
 - Develop Procurement plans/ estimates of supportability (timeline)
 - Develop New Equipment Fielding Plans
- Develop Disposition Plan for Equipment currently on hand by units that may be used
 - Develop Redistribution Plans
- Determine Operational Impacts



Leadership & Education

- Inability or decreased ability to cooperate / coordinate / communicate with external organizations
- Leadership understand the scope of the problem?
- Leadership have resources to correct the issue?
- Is leadership being trained on effective change management principles?
- Leadership assessed the level of criticality, threat, urgency, risk, etc.?
- Aware of the drivers and barriers to resolving the issue within her/his own organization?
- Does the issue effect operations?
- Determine Strategic Communications plan
- Determine Command relationships
- Develop Service Letters of Agreement (If necessary)
 - Command and Control Relationships
 - MOAs, MOUs



Personnel

- Determine Operations Tempo / Personnel Impacts
- Determine personnel shortage Impacts
- Determine Legislative Constraint Impact
- Determine Organizations Screening Issues
- Individual Assignment and Conversion Policy
- Maintenance and support skill sets (also with Organization)
- Generate Grade Shaping Assessment
- Able to place qualified and trained personnel?
- Different occupational specialties needed?
- Will new personnel need new training programs developed?
- Right Civilian skill set?



Facilities

- Conduct Facilities Assessment
- Adequate infrastructure?
- Determine Base/Facilities Support Impact
- Develop an integrated Facilities Plan
- Develop Facilities addendum to agency Letter of Agreement (if necessary)
- Develop POA&M for all Facilities Actions required
- If infrastructure is adequate – what is problem?
- Proper environmental controls?
- Adequacy of all related Facilities



Where Does Architecture Fit This Process?

- If you can develop a set of DOTMLPF capabilities-based requirements without referencing architecture products, integrated or otherwise, then what purpose do architectures serve?
- Architectures
 - Provide a basis for double-checking the requirements
 - Provide a realistic context in which to interpret the requirements
 - Provide the basis for developing system requirements and specifications which will provide the “value added”
 - Provide the delta between the “as is” views and the “to be” views provides important information needed to
 - Make decisions on spiral acquisition
 - Determine whether or not spiral development will be required to provide a solution
 - Determine the spiral development approach
 - Help analysts and technical experts identify possible technical gaps which may not have been observed or experienced in field operations or exercises, or found in tests, evaluations, or assessments



Common Pitfalls

Ignoring Second and Third Order Effects

- Examples: Org Requirements, Training the Trainers

Unrealistic Procurement and Timelines

- Example: Not Accounting for Funding and Contractual LeadTime

Using Best Case Scenarios

- Example: All Materiel Funding Will Be Provided Through Supplemental
- Provide Contingency Plan If Best Case Scenario FallsThrough

Using Different Data Among DOTMLPF Pillars

- Standardize Data Set Early On, i.e. Use the Same Fiscal Year Authorized Strength Report and Cost Assumptions Throughout WorkingGroup

Planning in a Vacuum Among DOTMLPF Pillars

- Cross Pollinate Early and Often

Forgetting about the Funding Cycle...not only when you need it, but when you need to ask for it



DOTMLPF Analysis

- When an Organization decides to Not Develop New Materiel Systems
- Non-Materiel Solutions
 - Change policy
 - Change doctrine
 - Reorganize
 - Train and educate personnel differently
 - Acquire commercial or non-developmental items
 - Acquire more quantities of existing items
 - Add or reassign personnel
 - Move or realign facilities



The Next Step

- Conduct Mission Analysis
- Run Worst Case Scenarios
- Develop Courses of Action
- Implement
- Rehearse & Exercise
- Assess



Summary

- SAR Management Planning Process
 - Assessment & Preparation
 - Analysis
 - Plan & Resource
 - Capability & Capacity
 - Full Spectrum Analysis
 - Capabilities Based Assessment
 - DOTMLPF Analysis



Summary of Agenda

- **SAR System Concept**
 - Benefits of Services
 - Global, National, Regional Systems
- **Components of SAR System**
 - SAR as a System
 - Rescue Co-ordination Center and Sub-Centers
- **Training, Qualification, & Certification of SAR Professionals**
 - Building Professionals – Training, Qualification, Certification
 - Exercising Capability
- **SAR Communications**
 - Basic Functions and Requirements
 - Co-ordination of components of the SAR System
- **SAR System Management & Organizational Improvement**
 - Planning and Resource
 - Assessment, Analysis, and Implementation
 - DOTMLPF Analysis



SAR Goals

- Useful goals are consistent with SAR mission and purpose; they are associated with specific objectives, clear implementation plans, reasonable yet firm target dates and measurable outcomes. Some typical SAR goals are listed below.
 - Minimize loss of life, personal injury, and property loss or damage.
 - Minimize time spent searching for persons in distress by using technology, research and development, education, regulation, and enforcement.
 - Improve safety so that the number of distress events is reduced. Achieving this goal may require close cooperation with other aeronautical and maritime authorities, since they, and not the SAR managers, may be responsible for the necessary safety programs.
 - Improve co-operation between aeronautical and maritime SAR authorities



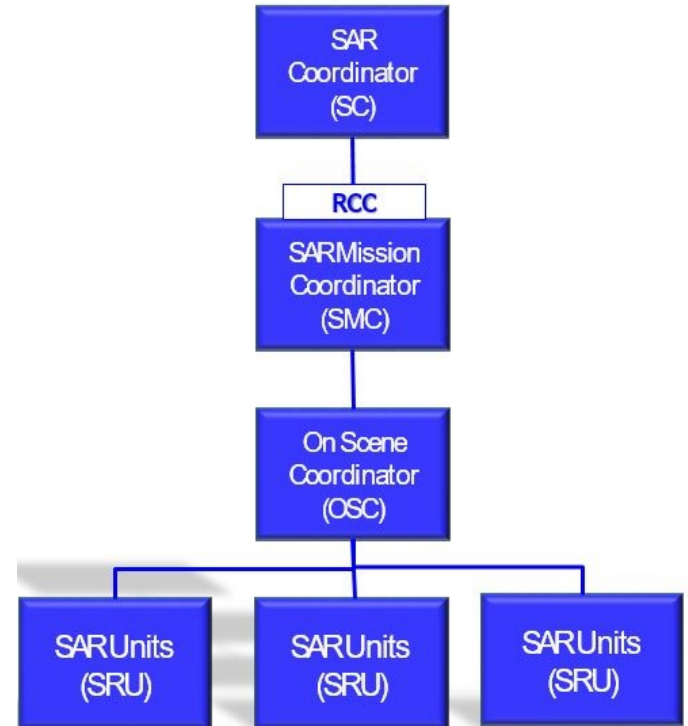
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SAR Organization

- SAR Coordinator (SC)
- SAR Mission Coordinator (SMC)
- Rescue Coordination Center (RCC)
- Rescue Sub-Center (RSC)
- On Scene Coordinator (OSC)
- SAR Units (SRUs)





SAR Organization

- SAR Coordinators are executive-level leaders and managers
- SAR Coordinator is the person or agency with overall responsibility for establishing and providing civil SAR
 - Establishing, staffing, equipping and managing the SAR system
 - Providing appropriate legal and funding support
 - Establishing RCCs and RSCs;
 - Providing or arranging for SAR facilities and SAR resources;
 - Coordinating SAR training and exercises; and,
 - Promulgating SAR policies and supporting documents



SAR Organization

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.



SAR Organization

Search and Rescue Mission Coordinator (SMC)

- Designated person for duration of a SAR incident, usually in an RCC who is well trained and thoroughly familiar with SAR plans
- Manages/Guides a SAR operation until completion
 - Gather information about the distress situations
 - Develop accurate and workable SAR action plans
 - Dispatch and coordinate the resources to carry out SAR missions
- SMC Duties
 - Obtain and evaluate all data on the emergency
 - Ascertain the type of emergency equipment involved in incident
 - Knowledgeable of prevailing environmental conditions



SAR Organization

- SMC Duties continued...
 - Ascertain locations of vessels and alert shipping
 - Plot the areas to search and decide method and assets to be used
 - Develop Search Action Plan and Rescue Plan
 - Coordinate with other RCCs
 - Review all reports and Modify plans
 - Arrange logistical support for Search effort i.e. Fuel, food, lodging...
 - Arrange logistical support for survivors
 - Issue reports
 - Determine when to suspend or terminate
 - Release of search assets
 - Notify accident investigators
 - Notify the State of registry
 - Prepare and disseminate final report



SAR Organization

On-Scene Coordinator (OSC)

- When two or more SAR facilities are working together on the same mission, one person on scene may be needed to coordinate the activities of all participating facilities.
- SMC designates an OSC, who may be the person in charge of a:
 - Search and Rescue unit (SRU), ship, or aircraft participating in a search, or...
 - Nearby facility in a position to handle OSC duties
- The person in charge of the first facility to arrive at the scene will normally assume the OSC function until the SMC arranges for that person to be relieved.



SAR Organization

SAR Units

- A unit subordinate to a Rescue Coordination Center
- Composed of trained personnel
- Provided with equipment & material suitable for expeditious conduct of search & rescue operations



ICAO

North American
Central American
and Caribbean
(NACC) Office
Mexico City

South American
(SAM) Office
Lima

ICAO
Headquarters
Montréal

Western and
Central African
(WACAF) Office
Dakar

European and
North Atlantic
(EUR/NAT) Office
Paris

Middle East
(MID) Office
Cairo

Eastern and
Southern African
(ESAF) Office
Nairobi

Asia and Pacific
(APAC) Sub-office
Beijing

Asia and Pacific
(APAC) Office
Bangkok



THANK YOU