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WORLD MARITIME UNIVERSITY

Dalian, China

**STUDY THE DIFFERENCES ON MARITIME
SEARCH AND RESCUE SYSTEM BETWEEN
CHINA AND BRITAIN**

By

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SD1406

The People's Republic of China

A research paper submitted to the World Maritime University in partial

Fulfilment of the requirements for the award of the degree of

MASTER OF SCIENCE

(MARITIME SAFETY AND ENVIRONMENTAL MANAGEMENT)

2014

Declaration

I certify that all the material in this research paper that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this research paper reflect my own personal views, and are not necessarily endorsed by the University.

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Acknowledgement

This paper was as the last part of my studies to apply for the master degree of Maritime Safety and Environmental Management at WMU and DMU. If without the generous support and guidance of the following teachers and leaders, my paper is difficult to be completed, I express sincere thanks and ultimate gratitude for them.

First of all, I would like to thank the leaders of NanHai Rescue Bureau, without your support, I do not have the opportunity to go to Dalian learning the courses.

Secondly, I want to thank my colleagues and the leaders of ShenZhen Base. Without the support of Base leaders, I cannot go to DMU smartly. I leave the Base for two years, they helped me to complete my work selflessly.

Thirdly, I would like to thank my teachers. Through the 18 courses of WMU, I has broadened my vision and increased my knowledge.

Finally, I would like to give my highest respect to Professor Zhu Yuzhu and Chen RiXi (the director of NanHai Rescue Bureau ShenZhen Base). Under your guidelines, I am able to complete the dissertation successfully.

Abstract

Title of dissertation: Study The Differences On Maritime Search And Rescue System Between China And Britain

Degree: MSC

With China's rapid economic development, more maritime traffic is and more busy, accompanied by more maritime accidents, which is always testing China MSAR system. Although Rescue Bureaus have completed all search and rescue missions, some structural problems are reflected fully.

British MSAR system is considered as the world's oldest and most perfect system, and there are many advantages that we can learn. This paper is to find differences out by comparing two different national MSAR systems.

Key words: MSAR, Rescue Ship, Life Saving

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List of Abbreviations

DFT	Department for Transport
MOD	Ministry of Defence
MCA	Maritime and Coastguard Agency
CLG	Department for Communities and Local Government
ACPO	Association of Chief Police Officers England, Wales & NI
ACPO(S)	Association of Chief Police Officers Scotland
CFOA	Chief Fire Officers Association
RNLI	Royal National Lifeboat Institution
ASA	Ambulance Service Association
MR-EW	Mountain Rescue England and Wales
MRC of S	Mountain Rescue Committee of Scotland
BCRC	British Cave Rescue Council
ALSAR	Association of Lowland Search and Rescue
RLSS UK	Royal Life Saving Society UK
RAF	Royal Air Force
ARCC	Aeronautical Rescue Co-ordination Centre

MCA Maritime and Coastguard Agency

HMCG Her Majesty's Coastguard

MRCC Maritime Rescue Co-ordination Centers

ALB All-weather Lifeboat

ILB inshore lifeboats

MSAR maritime search and rescue

SAR search and rescue

SARSC MSAR Strategic Committee

CRS China Rescue and Salvage

nm nautical mile

MSA Maritime Safety Administration

Chapter I Introduction

With China's rapid economic development, more maritime traffic is and more busy, accompanied by more maritime accidents, which is always testing China MSAR system. Although Rescue Bureaus have completed all MSAR missions, some structural problems are reflected fully.

British MSAR system is considered as the world's oldest and most perfect system, and there are many advantages that we can learn. This paper makes the greatest possible to introduce the basic situations and operating modes in China and the UK MSAR systems in all aspects, I am to find differences out by comparing two different national MSAR systems.

Chapter II The basic situation of the British MSAR system

1. Structure

1.1 UK MSAR Strategic Committee

The UK MSAR Strategic Committee (UK MSARSC) is the highest authority in the UK MSAR system, responsible for formulating search policies, strategies, obligations and standards, constituting the UK MSAR organization framework, establishing MSAR standards, laying the foundation for the MSAR work smoothly and coordinating the organizations responsible for the specific organization in MSAR operations.

The main members:

- a) Department for Transport(DfT);
- b) Ministry of Defence(MOD);
- c) Maritime and Coastguard Agency(MCA);
- d) Department for Communities and Local Government (CLG);
- e) Association of Chief Police Officers England, Wales & NI (ACPO);
- f) Association of Chief Police Officers Scotland (ACPO(S));

- g) Chief Fire Officers Association (CFOA);
- h) Royal National Lifeboat Institution (RNLI);
- i) Ambulance Service Association (ASA).

The key functions of UK MSAR are to co-ordinate:

- a) MSAR in offshore, inshore and shoreline areas;
- b) aeronautical MSAR over land and sea;
- c) inland MSAR.

1.2 UK MSAR Operators Group

UK MSAR Operator Group (UK MSAROG) acts under the leadership of the UK MSAR Strategic Committee, and hold two meetings every year (at least) for the overall policy and strategic research on MSAR.

Working group members:

- (a) Department for Transport(DfT);
- (b) Ministry of Defence(MOD);
- (c) Maritime and Coastguard Agency(MCA);
- (d) Department for Communities and Local Government (CLG);
- (e) Association of Chief Police Officers England, Wales & NI (ACPO);
- (f) Association of Chief Police Officers Scotland (ACPO(S));
- (g) Chief Fire Officers Association (CFOA);
- (h) Royal National Lifeboat Institution (RNLI);

- (i) Mountain Rescue England and Wales (MR-EW);
- (j) Mountain Rescue Committee of Scotland (MRC of S);
- (k) British Cave Rescue Council (BCRC);
- (l) Association of Lowland MSAR (ALSAR);
- (m) Royal Life Saving Society UK (RLSS UK).

This working group holds meetings four times a year and exchanges information and coordinates various institutions to participate in the rescue work.

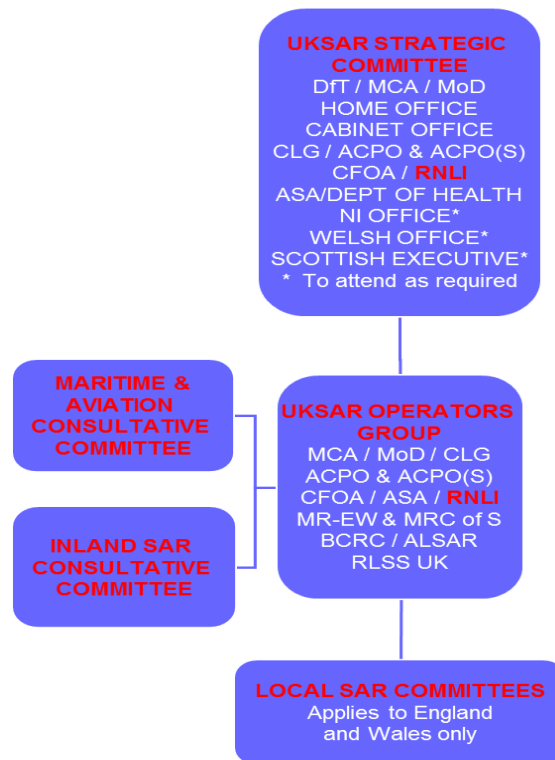


Figure 1 UK MSAR System

Source: Chen, R.X. (2013). Report on visiting Royal National Lifeboat Institution. Unpublished research paper, NanHai Rescue Bureau. GuangZhou, China.

1.3 UK MSAR Co-ordination

Britain sets up three kinds of coordination mechanism of search and rescue, land SAR and air SAR. Among them:

- 1) The British Ministry of defense and the Department of transportation co founded Aeronautical Rescue Co-ordination Centre (ARCC), responsible for military and civil aircraft rescue work;
- 2) Land MSAR work is responsible by the interior ministry police;
- 3) Maritime and Coastguard Agency of (MCA) - Her Majesty's Coastguard (HMCG) establishes the Maritime Rescue Co-ordination Centers (MRCC), responsible for the organizing and coordinating MSAR.

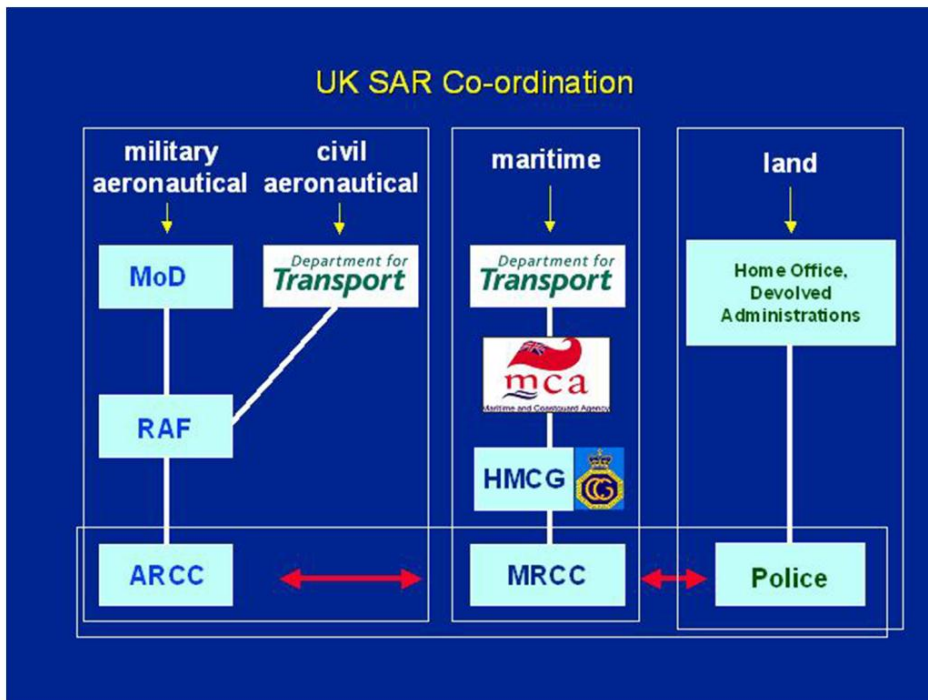


Figure 2 UK SAR Coordination

Source: Chen, R.X. (2013). Report on visiting Royal National Lifeboat Institution. Unpublished research paper, NanHai Rescue Bureau. GuangZhou, China.

2. Main Rescue Forces

The main British MSAR force is composed of government departments and non-governmental forces. The government departments are mainly the Maritime and Coastguard Agency (MCA), non-governmental forces including civil helicopter, Royal Boat Association (RNLI), the royal life-saving society (RLSS) and other civilian volunteers. And the main folk strength is the Royal National Lifeboat Institution (RNLI).

2.1 Maritime and Coastguard Agency (MCA)

MCA was originally set up by the Ministry of transport in 1909, which are:

- a) Responsible for 24-hours MSAR service;
- b) Safety management of vessels in Britain;
- c) Prevention and control of water pollution;
- d) The British ship registration;
- e) Providing services for seafarers.

Its working body is HMCG, and has 19 sub branches, distributing in the British coast, including 19 branches with MRCC, responsible for the maritime danger alarm and emergency response at 24 hours a day.

MCA is made up of 150 mobile stations (covering the entire British) to receive the alarm of VHF, MF; with 400 volunteer rescue teams, each team having 5-15 individuals, about 3500 volunteers, mainly to provide coastal patrol, mud and cliff rescue service. MCA is responsible for support personnel training, equipment, clothing and mobile equipment; MCA hires 4 long-term high-powered tugs using mainly for environmental protection and channel, towing the ships that have pollution risk and sinking possibility in lane in emergency.

2.2 Royal National Lifeboat Institution (RNLI).

RNLI, founded in 1824, is a charity and volunteer rescue team, responsible for the implementation of life saving, enhancing the safety at sea. RNLI lifeboats have accounted for 98% of all the lifeboats, and now its scope extends to the inland waters and beaches SAR service.



Figure 3 RNLI LOGO

Source: RNLI. Official web site: <http://rnli.org/Pages/default.aspx>

RNLI has 236 lifeboat stations strategically placed around the UK and Republic of Ireland, covering the coastal waters effectively with 24-hour standby lifeboats. 130 lifeboat stations equipped with 130 All-weather Lifeboats (interval of 10-15 nautical miles a ship), the other 102 rescue stations are only equipped with inshore lifeboats;

RNLI also has 59 beach lifeguard stations. RNLI has more than 5000 Volunteer seafarers, and RNLI is responsible for training volunteers to meet the strict standards of service. All operating costs of RNLI are from social contributions (about 140,000,000 pounds a year).

RNLI headquarter is in Poole, consists of 6 divisions in Scotland, England East, West, South, North and Irish area respectively, each division with 3 auditors, 3 engineers, 6 technicians, 3 trainers and 1 public relation personnel, managing 31-40 rescue stations.

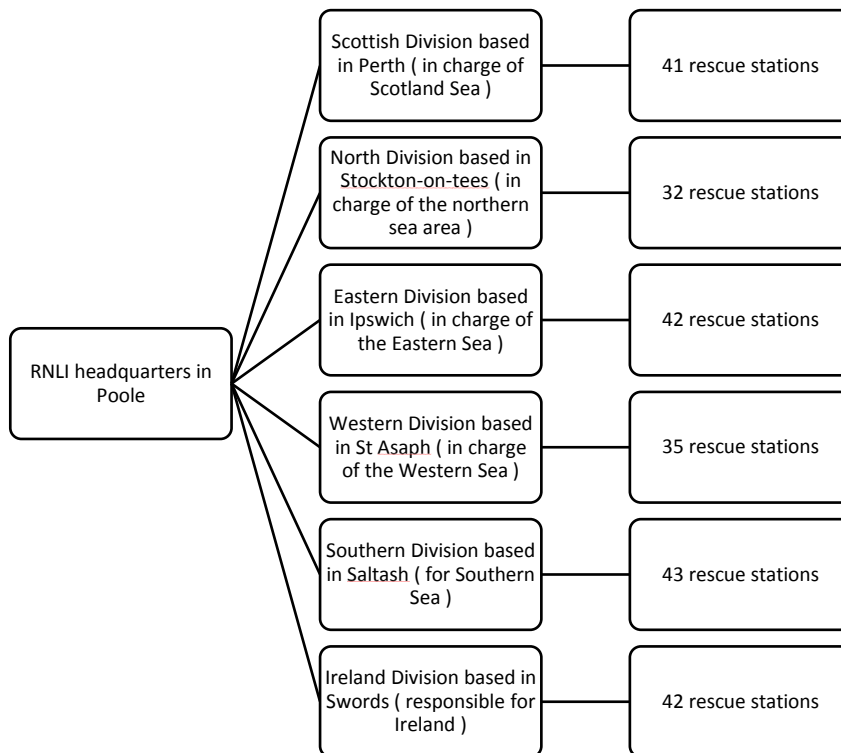


Figure 4 RNLI Structure

Source: RNLI. Web site: <http://rnli.org/aboutus/aboutthernli/Pages/about-the-rnli.aspx>

The royal life-saving society (RLSS) is a volunteer organization, responsible for drowning prevention and rescue work of beaches and inland waters and indoor swimming pools.

3. MSAR Situation

British MSAR running mode is that: MSAR strategic committee is the leader, the competent authority is responsible for the coordination, MSAR organizations collaborate together.

- (a) British MSAR strategy committee and its working group lead the MSAR work.
- (b) As a government department, Department of transportation is responsible for marine MSAR work.
- (c) The Maritime and Coast Guard Agency (MCA) and Her Majesty's Coastguard (HMCG) manage the whole British MSAR and pollution prevention works.
- (d) The local maritime rescue coordinating center (MRCC) under MCA is responsible for MSAR and Pollution Prevention Command and coordination.
- (e) The MSAR units implement the MSAR specific tasks.

3.1 Report of danger and disposal

Each MRCC is responsible for collecting all kinds of maritime dangers and accident alarm. The main channel is VHF, phone, DSC and EPIRB, other government or non-government rescue organizations such as RNLI, RLSS and polices receive maritime distress alarm. In accordance with the procedures, they shall report the danger situation to MRCC at the first time. After MRCC personnel on duty receives the alarm, according to the type and level of danger, according to reaction plan

(emergency response plan to implement BOQ), they shall respond in 5 minutes (to ensure the implementation rate of 98%), coordinate standby MSAR force of the area to rush to the scene to implement the rescue.

3.2 Response

When MRCC receives maritime distress signals, MRCC watch manager or officer accords to the actual situation of danger, notices the nearest RNLI lifeboat station or helicopter base around the accident site and sends a helicopter or boat, or both to MSAR. But in most cases, the main is the lifeboat while the helicopter is mainly used for water search and emergency rescue. 12 MSAR helicopters and more than 300 lifeboats of RNLI keep 24 hours standby, maintaining close contact with the local MRCC. The helicopter can receive the MRCC command, take off in 15 minutes during the daytime, 45 minutes at night. After receiving the MRCC MSAR command, the lifeboat can send the boat out quickly in 10 minutes. In the range of 12 nm, the boat could arrive at the scene at 0.5 hour, and arrive at the scene within 50 nautical miles at 2 hours (the insurance rate is over 90%). MRCC sends a rescue force and considers the specific location that the lifeboat or helicopter has returned, and arrange enough medical power in advance.

MRCC has a MSAR decision-making system, assisting the MRCC watch manager or officer to carry out MSAR work. When the watch manager takes measures in the response, at the same time, they shall contrast the check list of emergency response implementation, to confirm that the list of all the work is completed in accordance with the procedures, and reports the latest situation to the local MCA (DUTY AREA OFFICER). According to the level of danger, the MCA shall report to national MSAR officials (DNSARO), and the DNSARO coordinates more MSAR forces into

the MSAR operations. When an especially serious danger occurs, DNSARO shall report to rescue strategic committee secretary. When a major rescue operation begins, others such as RNLI, RLSS or emergency medical organizations shall send a deputy to the MRCC office, in order to better coordinate the disposal of MSAR operations.

In case of oil pollution incidents, when MRCC is dealing with maritime rescue, MRCC shall send emergency tugs, but also report the situation to the head of MCA pollution prevention officials and local government officials, in order to obtain more anti-pollution forces, in case of major pollution incidents, MCA headquarters will establish Pollution Control Center and call for pollution prevention experts group (Counter Pollution Team) to study. The pollution control center coordinates and disposes of pollution of the sea. Especially facing serious oil pollution incidents, MCA shall report the situation to the Secretary of state of British anti-pollution salvage. The Secretary of state decides to take action on the special disposal of major oil pollution incident.

3.3 Site disposal

The order MSAR work is in accordance with the life rescue, oil pollution disposal and salvage of property. In general, when the MSAR helicopter arrives on the scene, the captain is responsible for the rescue command of the scene. If encountering difficulties, he may request the other support to MRCC; After receiving the instruction, each lifeboat manager makes a decision whether to send the boat according to weather conditions, when there is obviously difficult to send out the boat, the manager shall report the specific reasons to MRCC (such cases rarely occur). After the lifeboat goes out, the captain has absolute command, including appropriate MSAR operations and timely notifying to the MRCC. If necessary, the

lifeboat requests to the MRCC for other forces to support the rescue. After the person has been rescued in distress, the lifeboat immediately returns to the position that where MRCC has specified on the shore, transfer distress personnel to medical aid organization for relief.

When major accidents occur at sea, it requires the coordination of multiple MSAR units to participate in MSAR operations. On-site command is determined by the MRCC, or MRCC sends personnel to the scene to conduct. In addition, on-site command organization coordinates and commands on-site MSAR operations, also responsible to notify the MRCC of the site. If necessary, it requests the MRCC sent other MSAR forces. MRCC may send or appoint to the Maritime Incident Communications Officer to be responsible for the site and MRCC communication.

When treating oil spill, under normal circumstances, the cleaning force accords to clean-up manual to decide cleaning process, but it must consider stopping the oil spill, and then cleaning up. When facing a major oil pollution incident, generally the professional salvage companies are responsible for pollution prevention salvage operation, the MCA pollution control center directs the cleaning process, The State Secretary of Anti-pollution Disposal Operation commands especially major oil pollution incident.

3.4 MSAR terminates

Terminating implementing of British MSAR operations is two level decisions: the local MRCC or national MSAR officials (DNSARO) of MCA decision. MRCC accords to the maritime rescue process and advice of on-site MSAR units to assess the necessity to continue to carry out MSAR, deciding whether to terminate the

MSAR. If the distress persons have been saved, terminate the MSAR; when there is no result of MSAR, if MRCC evaluate that the possibility of rescue is very low, it also terminates the MSAR, and therefore bears the possible consequences and responsibilities. If MRCC thinks he can't decide whether it shall terminate the MSAR operations, it shall report to DNSARO, DNSARO decides whether to terminate the MSAR. If DNSARO think of MSAR operations have been inside out, it then announced the termination of the MSAR, and bear the consequences and responsibility, or shall order local MRCC to take other further action until the DNSARO that the MSAR operations have been downright after termination.

Chapter III The basic situation of the Chinese MSAR system

1. Structure

1.1 National MSAR Inter-ministerial joint Conference

In 2005, according to the National MSAR emergency plan, the State Council agreed that the Department of Transportation was as the lead department to establish National MSAR Inter-ministerial joint Conference.

Members of the conference are: Ministry of Information Industry , the Ministry of Civil Affairs, the Ministry of Agriculture , Ministry of Health customs, SAWS , Bureau of Meteorology , the General Workers (Navy, Air Force) , the Armed Police Force and so on .

Members of the Conference are in accordance with their duties, combining MSAR emergency response actions with their actual situations to play the appropriate role, such as undertaking MSAR emergency response, supporting for the protection, rehabilitation treatment and other emergency works.

The duties of joint conference:

- (a) Under the leadership of the State Council, the conference studies and coordinates national MSAR works and ship pollution emergency response works, putting forward relevant policy suggestions;
- (b) Discussing and resolving major issues of MSAR and ship pollution treatment;
- (c) Organizing and coordinating major MSAR and ship pollution emergency response actions;
- (d) Guiding and supervising directly MSAR emergency response works of the relevant province, autonomous region and municipality;
- (e) Studying to determine the duties of members of the joint conference in the MSAR activities.

The joint conference convenes an annual meeting, studying and solving major problems, asking the leading comrades of the State Council chaired the meeting.

1.2 China MSAR Center

China MSAR center is the permanent office of the joint conference, responsible for the daily work of the joint conference, undertaking MSAR operation management. The joint conference has the Liaison Working Group, whose liaison is from each member of the joint conference. Chinese MSAR center is responsible for convening liaison working group meeting, primarily responsible for the sea (water) emergency warning prevention, rescue, environmental assistance and salvage of property, cleaning up the obstacles in important navigable waters and receiving and processing piracy information.

China MSAR is divided into administrative areas, established center, province and city, three level MSAR center, in coastal provinces, autonomous regions and municipalities, the local province governments establish the provincial level of the sea(water) MSAR center. The provincial MSAR center offices are located in the local Maritime Safety Administration. The MSAR work of inland areas is implemented by the local maritime safety administration in the leadership of the provincial government.

The provincial MSAR center bears the responsibility of organizing and commanding MSAR emergency works in the province. The municipal MSAR center is set by the provincial MSAR center, whose duties also shall be determined by the provincial MSAR center.

1.3 The joint liaison group

Liaison Working Group is responsible for analyzing maritime emergency response work situation and prominent problems of the national MSAR and marine pollution; informing the member units of work what carried out ; giving the joint conference some suggestions how to do MSAR and marine pollution emergency response better; completing the Joint Conference related matters. Liaison Working Group holds a meeting every six months.

1.4 National Expert Group on MSAR

The expert group is composed of experts, professional and technical workers, from shipping, maritime, aviation, fire, health, environmental, petrochemical, marine engineering, marine geology, meteorology and security management. They are responsible for providing MSAR technology consulting.

2. Rescue Forces

China MSAR forces are mainly composed of professional rescue forces , army, forces directly under the relevant central departments and local authorities, as well as a large number of Chinese merchant ships and fishing boats.

2.1 China Rescue and Salvage of Ministry of Transport

China Rescue and Salvage (CRS) is Chinese only national professional MSAR force. Its primary responsibilities are the response to marine accidents on Chinese waters, including life-saving, salvage of vessels and property, wreck removal, fire-fighting, spill clean-up, etc. It also carries out such important missions as the safeguarding of maritime transport and ocean resources exploitation, and the fulfilling state obligations of international conventions and agreement on behalf of the Chinese government.



Figure 5 CRS LOGO

Source: CRS. Official web site: <http://eng.crs.gov.cn/>

After 60 years of efforts, and especially after the organizational reform in 2003, which successfully separated its life-saving and property salvage functions, CRS has undertaken a unique development, with a comprehensive “three-in-one” organizational, functional, and developmental structure, able to respond to all kinds of maritime accidents.

The CRS Web site states that:

The " Three-in-one" setup is namely an organizational structure made up of ship rescue teams, property salvage teams and air rescue teams, a responsibility composition that includes life-saving, salvage of property, and protection of marine environment, and a functional makeup that consists of helicopter capabilities in air, fast response capacities on water, and diving and salvage abilities underwater.

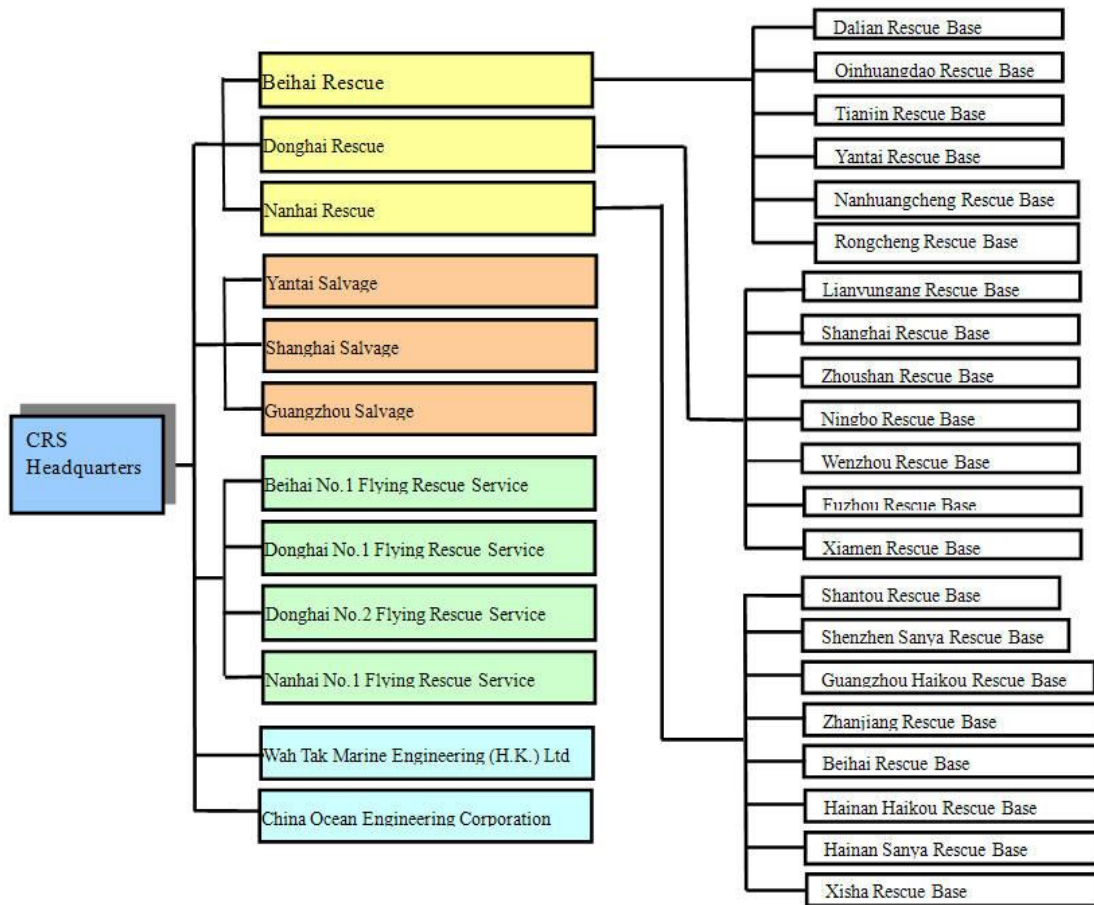


Figure 6 China Rescue and Salvage (CRS)

Source: CRS. Web site:

http://eng.crs.gov.cn/AboutUs_CRS/Organization_About/Overall_About/201105/t20110527_947589.html

2.1.1 Responsibilities and Functions

(This section quotes from CRS official website: http://eng.crs.gov.cn/AboutUs_CRS/Today_About/)

The primary responsibilities and functions of CRS given by the Chinese government are:

- (a) To formulate, and supervise the implementation of, policies, laws, regulations and technical standards in maritime rescue and salvage in China.
- (b) To carry out life-saving and fire-fighting missions as related to vessels and aircrafts, domestic or foreign, and marine structures or facilities, which get into distress on Chinese Waters.
- (c) To carry out missions at sea in property salvage, wreck removal, clearance of ports and fairways, clean-up of oil in ship wrecks and spilled oil from distressed vessels; to provide various marine engineering services.
- (d) To carry out special political, military emergency response missions and disaster relief missions assigned by the Chinese government; to be responsible for the organization and coordination of war preparedness in transportation; To fulfill on behalf of the Chinese government state obligations under relevant international conventions and bilateral maritime agreements.
- (e) Overall deployment and dispatch of maritime rescue resources, including rescue vessels and aircrafts; the overall coordination, command and control of maritime rescue operations.
- (f) Management of international and regional affairs in maritime rescue and salvage; organization and development of international and regional exchanges and cooperation.

(g) Qualification review of entities engaged in marine salvage and diving operations; management of the certification of divers engaged in industrial diving operation as well as other special occupational qualifications which only pertain to maritime rescue and salvage.

(h) Organization of studies and research on development strategies of the maritime rescue and salvage sectors; organization of the formulation of mid- and long-term development schemes in maritime rescue and salvage.

CRS Mission Statement: To ensure the safety of life and property at sea and maintain a clean marine environment.

CRS Objectives: To play key roles at key moments with a well-trained, fine-equipped and highly-skilled workers.

CRS Spirit: To give the hope of life to others and leave the danger of death of ourselves.

At present, CRS has:

1. over 9000 employees, among them about 3000 technical workers, 4000 seafarers, and 400 divers;

2. 206 vessels of various kinds, 76 of which dedicated maritime rescue vessels, and 123 of them vessels for salvage operations;
3. 20 aircrafts, including both helicopters and fix-wing ones.

2.2 National business law enforcement ship

Such as maritime law enforcement ships, coast guard vessels, but they are not the kernel and professional rescue forces.

2.3 Societal forces

There are a large number of fishing boats, merchant ships and so on.

3. MSAR Situation

3.1 Report of danger and disposal

Each level of MSAR centers set up the office to collect all kinds of danger information and accident alarm at sea from a variety of sources (telephone, radio, Internet, etc.). Other government or non-government rescue organizations such as polices, after receiving the maritime distress alarm, according to the program, they shall be in the first time to report the danger condition to the local MSAR center. After receiving the alarm, the watch officer on duty accords to the danger of the categories and grades, in the light of corresponding respond emergency plans, coordinates rescue forces to the scene to implement the rescue task. If the accident doesn't belong to the jurisdiction of the maritime accident or the accident is too serious, this level MSAR center has no ability to rescue, it shall immediately report to the higher MSAR center.

3.2 Response

After receiving the maritime danger information, according to the actual situation, the leader of MSAR center notifies the rescue ships or rescue flying helicopters near the accident site, or joint implementation of the rescue, at the same time, organizes other ships to assist rescue near the accident site. But in most cases professional ships or lifeboats are given priority to MSAR and the helicopter is mainly used for water search and emergency rescue in human lives. Rescue helicopters can take off after being instructed in 15 minutes during the day, 45 minutes at night. Rescue ships can respond to MSAR quickly in 10 minutes after being instructed by MSAR center.

Maritime emergency response is in accordance with the branch of MSAR, MSAR agencies at the provincial level, China MSAR center, from low to high response in turn. If any emergencies occur at sea, first of all, the MSAR responsibility is to respond from the lowest level of MSAR agencies. If the MSAR agency's emergency power is unable to control events extension, it shall request higher level MSAR agencies to carry out emergency response.

In case of oil pollution incident, the MSAR center shall immediately report to the superior, and immediately coordinates the Rescue Bureau, MSA and the local business of professional oil pollution disposal power for processing to prevent the spread of the oil pollution.

3.3 Site disposal

The order of MSAR work is in accordance with the order life MSAR, pollution treatment and property assistance. In a general MSAR operation, when MSAR

helicopter arrives at the scene, the pilot-in-command is responsible for directing the rescue. When in trouble, the pilot can ask MSAR center for other support; each Rescue Base, after receiving instructions, decides whether to dispatch the lifeboat according to weather conditions. When it comes to the obvious difficulty in the boat, the head shall report to the MSAR center with reasons and report to the higher Rescue Bureau to request other rescue tug to support. Under normal circumstances, the head of Rescue Base commands the MSAR, timely notifying the MSAR center and the superior department. If necessary, the base leader request superiors to dispatch other rescue forces to support. When the rescue ship finishes the rescue, it returns to the location on shore designated by MSAR center immediately, timely transferring the injured person to medical first aid organizations for rescue.

3.4 MSAR terminates

MSAR agency responsible for organizing emergency response and command rescue, decide whether to terminate the emergency action according to the following circumstances:

- (a) All accident sites have been searching.
- (b) The possibility of survival has does not exist, including temperature, water temperature, wind and wave.
- (c) The maritime emergency response has been successful or emergency situation has ceased to exist.
- (d) The dangers of maritime incident has thoroughly eliminated or under control, and no extensions or the possibility of recurrence.

Chapter IV Comparison of the Chinese and British rescue system

British MSAR system is the oldest and the most perfect in the world, International Lifeboat Federation was established in accordance with RNLI. China and the United Kingdom are not at the same level in all respects such as location and area, and the both life-saving systems have many differences, it is not comparable absolutely. But the British life-saving rescue system has many advantages and strengths, which is worthy for us to study. This article focuses on life saving, comparing the RNLI and Rescue Bureau.

A. From the aspect of MSAR system:

1.Differences on the composition of rescue forces

UK: on the respect of lifeboat, RNLI lifeboat accounts for 98% of the existing of UK ; on the respect of rescue aircraft , the Coast Guard and the Royal Air Force accounts for 60 % , the remaining 40% is through a contract to hire from private companies; on the respect of rescue tugs, the Coast Guard have signed a contract with commercial companies to use 4 tugs when needed; Britain's beaches are very busy in summer, RNLI beach patrol and lifeguard services take up the share of 70% (up to 163 public beaches), and the remaining 30% is responsible by local government.

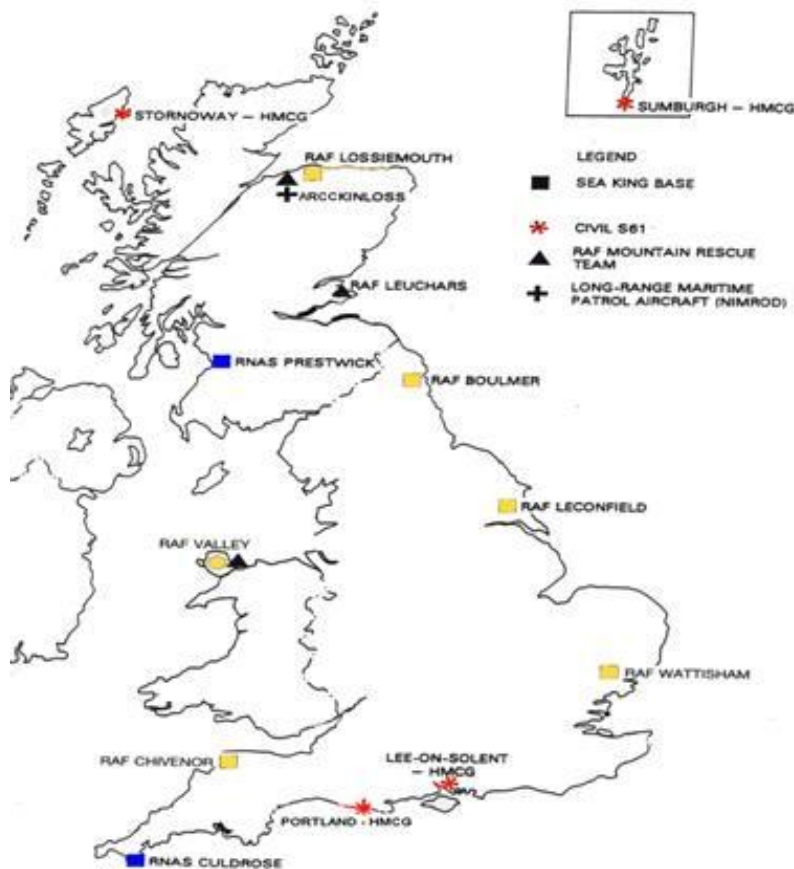


Figure 7 UK MSAR helicopter deployment

Source: Chen, R.X. (2013). Report on visiting Royal National Lifeboat Institution. Unpublished research paper, NanHai Rescue Bureau. GuangZhou, China.

China: China Rescue and Salvage of Ministry of Transport is the only professional rescue forces at sea, Rescue Bureau is responsible for directing and deploying the rescue ships, and has direct rescue responsibility for the accident, according to the accident rate, Rescue Bureau divides the sea and sets up duty point, arranges rescue ships to be on dynamic duty in high prevalence areas every hour. On the respect of Rescue aircraft, mainly relying on 4 Flying Rescue Services. If serious accidents occur at sea and the Flying Rescue Service needs support, MSAR center coordinates

military aircraft to help. If the accident occurs on inland rivers and lakes, rescue is organized by the local government.

Brief summary: British maritime rescue force is charity, salvage of property is commercial, but in China, maritime rescue is administrative.

2.Differences on the distribution of rescue forces

UK: 12 MSAR helicopters (belong to Coast Guard and the army) and RNLI lifeboats are on standby, achieving maritime and air MSAR forces to double cover the UK. British MSAR helicopters are large-scale, and its search radius is 150-200 nautical miles, and the effective range of 12 MSAR helicopters can cover all coastal waters.



Figure 8 RNLI lifeboat station deployment

Source: Chen, R.X. (2013). Report on visiting Royal National Lifeboat Institution. Unpublished research paper, NanHai Rescue Bureau. GuangZhou, China.

RNLI has 236 lifeboat stations in the UK to achieve the British coastal waters effectively covered by the lifeboat on standby. 130 lifeboat stations are equipped with the clock automatically righting lifeboat (10-15 nm a boat), the other 106 rescue stations are equipped with only inshore sailing lifeboat ; RNLI also has 59 a beach lifeguard station .

British coastline is 12429km, Irish coastline is about 1448km, and every 59km has a rescue station on average.



Figure 9 China rescue force deployment

Source: CRS. official web site:

http://www.crs.gov.cn/jiulaobs_jlj/dongtaidm_jlbs/201305/t20130530_1419774.html

China: Chinese coastline is about 18000km, sea areas are 3 million square kilometers, 19 Rescue Bases distribute along coastline, and interval of Rescue Base is 948km on average. There are 51 duty sites of rescue ships, and every 353km has a point on duty. 71 vessels (various types), interval of per vessel is 254km on average. The rescue ship radius is up to 127km. Currently, 4 Flying Rescue Services have 20 various MSAR aircrafts, an average of 900km per aircrafts, **China's current MSAR forces cannot cover coastal waters effectively.**

Table 1 data comparison

Countries	UK	China
Coastline (km)	13877	18000
Sea area (km ²)	5,900,000	3,000,000
Rescue station(duty site)	236	19+51=70
Rescue ship	340	71
Rescue helicopter	12	20
The average distance between rescue stations (km)	59	257
The average distance between rescue ships (km)	41	254

Source: Chen, R.X. (2013). Report on visiting Royal National Lifeboat Institution. Unpublished research paper, NanHai Rescue Bureau. GuangZhou, China.

Brief summary: the UK realizes the double effective coverage by rescue aircraft and rescue ships in the sea. In China, the existing rescue force can only cover key waterway, port area and accident prone areas, but cannot cover all the sea areas under the jurisdiction.

3.Differences on the nature of rescue organizations

UK: MSAR forces are mainly composed of government departments and non-governmental forces, the government department bases on Coastguard Agency (MCA), non-governmental forces are mainly civilian helicopters, the Royal Lifeboat Institution (RNLI), Royal Life Saving Society (RLSS) and other civil volunteers. The civil power is mainly for the RNLI, RNLI lifeboats have accounted for 98% of the existing nationwide, British key MSAR force. The Royal Life Saving Society (RLSS) is also a volunteer organization, whose every penny comes from donated by society.

China: Rescue Bureau is under the jurisdiction of the Ministry of Transportation, full funding of institutions. Property rescue is another source of rescue funds, which accounts for a very small proportion of rescue funds.

Brief summary: The two institutions are two distinct properties, each has its pros and cons. Worldwide, MSAR forces in most countries are dominated by the government, supplementing by folk strengths.

4.Differences on rescue command mode

UK: UK puts flat management into MSAR practice, MRCC does not follow administrative settings, and in accordance with the geographical setting, the local government generally does not interfere with rescue work, from the alarm, response,

MSAR command to terminate by the MRCC. MRCC duty officer is authorized to dispose of the MSAR operations, various rescue organizations and volunteers are able to cooperate actively, according to the procedure of MSAR operations. MRCC is equipped with the MSAR decision-making software system, each MRCC's MSAR operations can be supported by the information of the software from alarm to terminate, to make the MSAR operations in an orderly manner.

China: China's current MSAR system uses “4-level danger, 3-level response” management, and to develop a national, provincial and municipal response procedures. But 3-level response procedures could be easy to cross- prone longitudinally and transversely, Coordination is not smooth sometimes.

Although the MSAR center is responsible for MSAR at all levels, but in the process of MSAR MRCC are often subject to government intervention of various levels, and the MSAR command relationships are more complex, governments at all levels are longitudinal and each department's unique command system is transverse, unable to form a unified MSAR command system. In particular, if encountering with significant accidents the MSAR center is difficult to organize MSAR operations by the program, to a certain extent, increasing MSAR command levels is reducing the efficiency of MSAR.

Brief summary: The British MSAR command mode is characteristic of flat management structure, command is fast, simple and effective; Chinese rescue command mode is characterized by complicated relationship and hierarchy, chief executives' will decided the MSAR efforts. Simply, the UK MSAR is the rule of law, China MSAR is the rule of man.

5.Differences on rescue aircraft forces

UK: MCA equipped with 12 advanced helicopters and fixed-wing aircrafts, more than 400 lifeboats on standby deployed offshore around the coastline, the average time to reach the distress location is less than 30 minutes, sea and air MSAR forces dual standby provide MSAR work for the British.

China : sea and air rescue is currently in its infancy, rescue aircraft management model does not suit the requirements of maritime complex environment, single aircraft types , flight technology , flying experience, MSAR technology and equipment are still in its infancy. Currently the flying services only bear flying rescue missions within 110 sea miles range under the weather conditions during the daytime. It cannot conduct MSAR operations in adverse weather conditions at night, and cannot meet the needs of maritime emergency rescue of human life.

Brief summary: If British MSAR aircraft force is the college level, China MSAR aircraft force is the middle school student level.

6.Differences on coordination between MSAR organizations

UK: MSAR organizations cooperate implicitly, each is considered to be a MSAR indispensable link in the chain. Although MCA (MRCC), RNLI and military institutions are running independently, in the MSAR coordination, self-discipline is very good. By convening meetings regularly, they exchange information with each other and reach a variety of consensus. If RNLI lifeboat is setting base, it must listen to the views of MRCC; if lifeboats want to leave the base, they must promptly notify MCA (MRCC); if lifeboats leave the base over 3 hours for whatever reason

(including repair boats), they must prior arrange alternative lifeboats on standby, and timely notify MRCC.

China: the leading agency for MSAR is inter-ministerial joint conference, which is just a procedure of inter-ministerial co-ordination, directing rescue program is not standardized and cannot afford the daily coordination of MSAR operations at sea organizational tasks. MSAR Center is responsible for organizing, coordinating national MSAR operations, but it can only play a coordinating role in MSAR. In the crucial moment there is no direct command authority of various vessels, and it cannot be put in place to coordinate the various maritime rescue forces.

Brief summary: Britain's MSAR organizations go about their respective terms of references; China's MSAR organizations often shift the responsibilities onto each other.

B. From the aspect of professional rescue forces:

7.Differences on personnel

UK: Although the British MCA only has 400 government employees engaged in MSAR currently, it has a sufficient number of non-governmental organizations and volunteer MSAR teams. Government MSAR personnel are regular trained to ensure that they have the MSAR skills. RNLI, RLSS and other private rescue organizations conduct specialized training. After training, they are still qualified for their regular training and assessment, to ensure MSAR volunteers owning the competency skills. At present, the RNLI owns more than 31,500 volunteers, professional volunteer lifeboat seafarers are more than 4600, and volunteer beach lifeguards are more than 3100.



Figure 10 RNLI lifeboat crew

Source: RNLI. Official web site: <http://rnli.org/Pages/default.aspx>

China: China's current rescue teams are based on 3 Rescue Bureau, in the emergency rescue teams, which divers account for 90% of emergency rescue teams. In the fleet, senior officer graduated from the maritime colleges, and normal crew from veterans, fishermen etc. At present, 3 Rescue Bureaus have about 3000 employees, including professional and technical personnel, divers and crew accounting for more than 80%. But their professional skills are lower than that of RNLI personnel. In recent years, the rescue volunteers develop rapidly but still in its infancy, because of the lack of appropriate training and experience, volunteers lack of rescue skills and safety awareness.

Brief summary: The specialization degree of RNLI rescue personnel is high, and presents the trend of volunteers; China's current rescue personnel professional ability is low generally, volunteer development is still in its infancy.

8.Differences on training

UK: the agencies engaged in MSAR pay attention to training very seriously, formulating strict service standards to the participants. Although Britain's MSAR relies on volunteers extensively, MCA and RNLI have still relatively sound training systems to ensure that volunteers have a high level of professionalism.



Figure 11 RNLI training center

Source: RNLI. Official web site: <http://rnli.org/Pages/default.aspx>

RNLI introduces the skill-training system, each seafarer will hold a seafarer workbook, recording some skills training experience. To ensure strict evaluation standards, assessment guidance performed by personnel that must come from other boats or stations. Crew training courses include one week training course, mobile training camps, interactive programs and traditional on-site guidance and training courses.



Figure 12 At inshore lifeboat stations volunteer crew members maintain the engines and machinery and undertake an Inshore Lifeboat Mechanics course

Source: RNLI. Official web site: <http://rnli.org/Pages/default.aspx>

Take turbine courses as an example, RNLI arranges experienced instructors to teach lessons, the lessons include lifeboat hosts, auxiliary and electrical parts. The teacher pays attention to combine theory with practice, all electrical and mechanical equipment are placed in the classroom, so they learn theory with watching equipment in teaching process, in order to deepen the impression. When completing one section, teachers will bring students to see the field, effectively promoting the learning effect. Meanwhile according to training requirements, students want to inspect a lifeboat hull and machinery, and according to a regular maintenance program, they need to make regular maintenance and checks for two weeks, monthly and semi- annual, through the inspection and lifeboats Regular maintenance, it will deepen participants' understanding of the lifeboat, lifeboats also enhances the awareness of regular maintenance and checks.

China: The current level of training are still in its infancy, and there are no specialized training bases and teachers, the crew make the maintenance and checks based on their own experience and manufacturer requirements, no specific performance standards.

Brief summary: British rescue personnel training pattern is worth learning by China.

9.Differences on outfit

UK: In addition to research and develop lifeboats and other equipment, RNLI is also good at the labor protection for rescue workers. A complete protective outfit including: helmet (configuring call or camera depending on the circumstances), jackets, Siamese coat (jackets, pants and work shoes) , life jackets , etc.. A personal protective outfit is worth around £ 1,000. RNLI sets up internal injuries compensation fund for casualties, to resolve the issue of compensation through the internal compensation fund, which generally does not rely on commercial insurance.



Figure 13 RNLI protective outfits

Source: Chen, R.X. (2013). Report on visiting Royal National Lifeboat Institution. Unpublished research paper, NanHai Rescue Bureau. GuangZhou, China.

China: we need to improve rescue system! Currently, the protective outfit used in rescue ship such as clothes and work shoes, are ordinary civilian equipment, the Rescue Bureaus are only enough to buy the work-related injury insurance for workers, in the event of casualties, the organizations resolve the issue of compensation through insurance, but compensation is low.

Table 2 RNLI lifeboat crew outfit

All-weather lifeboat crew outfit		Inshore lifeboat crew outfit	
gloves	16pound	gloves	16pound
work shoes	42pound	Dry suit	319pound
pants	230pound	Warm coat	145pound
jacket	170pound	helmet	166pound
helmet	166pound	life jacket	263pound
life jacket	272pound		
SUM	896pound	SUM	909pound

Source: Chen, R.X. (2013). Report on visiting Royal National Lifeboat Institution. Unpublished research paper, NanHai Rescue Bureau. GuangZhou, China.

Brief summary: The two countries have very big different ideas on personal safety, the quality of the equipment is not in the same level.



10.Differences on type of equipment










UK: covering the entire UK coastal waters is 18 MCA's radar, AIS ground stations and various ports VTS along the coast. Radio channels that MCA has dedicated have covered 19 of 150 sea miles within UK waters. In addition, MCA is working to


develop the use of satellites in the field of MSAR. RNLI configures various all-weather lifeboats at sea. 12 MSAR helicopters that belong to army and MCA are also large-scale. The Royal Life Saving Society (RLSS) have owned cliff rescue rigging, and protection facilities for beach lifesaving and kayak, raft and even surfboards.

After 187 years of exploration and development, RNLI rescue equipment has formed its own unique system. Existing rescue equipment, including ALB - All Weather Lifeboat, Inshore Lifeboat, Hovercraft, Inshore Rescue Lifeboat, Rescue Watercraft, Rescue Board and a variety of boat trailers and trailer frame for transferring and sliding lifeboats into the sea. Currently, RNLI all-weather lifeboats includes: 46 SHEVERN class lifeboats, 20 TAMAR lifeboats, 40 TYNE class lifeboats, 36 TRENT class lifeboats, 37 MERSEY class lifeboats. On the Inshore Lifeboat aspects, including: 6 E -class lifeboats, 130 B-Class lifeboats, 150 D -class lifeboats. There are all kinds of RNLI lifeboat over 470 vessels.

Table 3 RNLI lifeboat types

All-weather lifeboats	Lifeboat	Launch type	Length	Max speed	Range	Crew
	Shannon	Carriage, slipway or afloat	13.6m	25 knots	250nm	6
	Tamar	Slipway or afloat	16.3m	25 knots	250 nm	7

	Severn	Afloat	17.3m	25 knots	250nm	6
	Trent	Afloat	14.3m	25 knots	250nm	6
	Tyne	Slipway or afloat	14.3m	18 knots	240 nm	6
	Mersey	Carriage, slipway or afloat	11.62m	17 knots	240nm	6
Inshore lifeboats	Lifeboat	Launch type	Length	Max speed	Range	Crew
	B class - Atlantic 85	Carriage, davit or floating boathouse	8.44m	35 knots	2.5 hours	4
	B class - Atlantic 75	Carriage, davit or floating boathouse	7.38m	32 knots	2.5 hours	3
	D class	Trolley or davit	5m	25 knots	3 hours	2-3
	E class	Afloat	9m	40 knots	4 hours	3
	Arancia inshore lifeboat	Trolley	3.88m	21.6 knots	1.5 hours	2

Hovercraft	Lifeboat	Launch type	Length	Max speed	Range	Crew
	Hovercraft aft	From transporter	6.88m	30 knots	3 hours	2-4

Source: RNLI. Official web site: <http://rnli.org/Pages/default.aspx>

China: At present, the Chinese MSAR system sets up 4 Flying Rescue Services for a total of 20 aircrafts in 3 sea areas, covering major ports and the key waters. The main MSAR helicopter type is EC225 helicopter. Professional rescue ships are: 3 "10X " series (14400kw) rescue tugs, 18 "11x" series (8000kw) professional rescue vessels, 20 "Huaying 3XX " series self- righting lifeboat (introduced from RNLI) and 20 "30X" series high-speed rubber boats, rescue vessels of various types sum to 61, and there are a number of diving equipment.

Table 4 China CRS rescue ship type

Type of vessel	10X series	11X series	20X series	Huaying series
Dimensions (m) : L×B×D	109.7×16.2× 7.6	98×15.2× 7.6	49.9×13.1× 4.5	14.3×4.6× 1.9
Draft (m)	6	6	1.6	1.3
Displacement (t)	6236	4896	230	28
Max speed (Kts)	22	20.1	30	18
Bollard Pull (kn)	1400	1050		50
Thruster (kw)	12×3	710×3		
Main Engine (kw)	7000×2	4500×2	2240×2	317×2

Generator (kw)	450×3	649×2	211×2	
Propellers	C. P. P×2	C. P. P×2	water jet pump×2	F. P. P×2
Builder	CSSC Huangpu Shipyard	CSSC HUANGPU SHIPBUILDING	Afai Southern Shipyard	UK
Picture				

Source: CRS. Official web site: <http://eng.crs.gov.cn/>

Brief summary: Because the climate of the two countries is totally different, China can refer to the advantage of the UK rescue ship, but the more important is to combine the characteristics of Chinese climate and geographical environment to design a suitable for their own ships.

11.Differences on design and construction of rescue ships

UK: In order to develop in line with the various requirements of lifeboats, RNLI headquarters in Poole set up their own rescue-boat design and test teams, the number of team member is over 20. They design all kinds of lifeboats and equipment, means of design and testing are very advanced. Many designers have rich experience in rescue, and it is possible to do a combination of theory and practice. Under normal circumstances, lifeboats designed will arrange professional shipyard, but the RNLI set up their own lifeboat factories in Lymington and the Isle of Wight. All-weather lifeboats are designed and made (lifeboats is mainly made of FRC material) In Lymington, lifeboats Center(ILC) in the Isle of Wight is responsible for the production, transformation of offshore lifeboats.



Figure 14 RNLI lifeboat factory in Wight



Figure 15 RNLI lifeboat center in Lymington

Source: Chen, R.X. (2013). Report on visiting Royal National Lifeboat Institution. Unpublished research paper, NanHai Rescue Bureau. GuangZhou, China.

China: because of the lack of practical experiences in the design and construction of the rescue ship, currently, rescue ships are designed mostly by reference to the RNLI's existing type or commercial tugs, designed by the Shanghai Marine Research Institute, and by imitating decades exploration, and gradually exploring the ship suited for the Chinese sea area. According to the needs of sea rescue, rescue vessels are mainly of large (14400kw), medium (8000kw) small (4000kw), large and medium rescue tugs mainly are manufactured by Guangzhou Huangpu shipyard, small rescue ships are currently in the design stage, speedboat design, test and build mainly in Shenzhen HaiSiBi shipyard. In fact, the quality and stability of the British rescue ship is still better than Chinese rescue ships.

Brief summary: China shall learn shipbuilding standards from the UK.

12.Differences on maintenance

UK: RNLI establishes the inspection system and the regular maintenance system for lifeboats. Their lifeboat inspection system is approved by MCA, so RNLI rescue equipment all need to be inspected by their own surveyors, unless the lifeboat accident occurs. RNLI has 16 surveyors, responsible for the entire rescue equipment for testing. RNLI establishes a regular inspection and maintenance system, the times are “two weeks, monthly, three months and semi-annual” inspection and maintenance. All inspection and maintenance are completed by the lifeboat mechanic, inspection and maintenance of each period shall not be replaced or offset each other. In the process of Mechanic performing inspection and maintenance, if they find themselves unable to solve the problem, they need to immediately report to the Division Engineer, coordinate and solve the segments.

China: inspection and maintenance of rescue ships are in accordance with the merchant standards, regularly conducting testing and certification by the MSA and CCS. Rescue Bureau establishes a regular inspection and maintenance system, implementing "3 Confirmation" who to do, what to do and what time to do. The times are namely “week, monthly, quarterly and annual” inspection and maintenance, the relative simple equipment maintenances are performed by engineers. If not, the ship shall report to the fleet, contacting maintenance plant to repair in the dock.

Brief summary: Each system has its own advantages and disadvantages, the key lies in the execution.

13.Differences on logistical support

UK: RNLI headquarters in Poole design a large-scale spare-part warehouse. Spare parts inventory reach more than 10,000 kinds of spare parts from hosts to a screws, and its market value is over 10 million pounds. Warehouse also has a intelligent computer-controlled system for small items, the worker simply enters the code of spare parts related to the control system on your computer, it is able to automatically find the spare part to the front of you. RNLI owns the distribution system and sets up convoys and distribution personnel, regularly distributing spare accessories to stations and recycling serviceable parts needed to be returned headquarters. Emergency spare parts are sent by courier.

China: if the rescue ship needs some corresponding parts, they shall report to the fleet. The fleet needs to purchase spare parts in market, and then sends the parts to the Rescue Base. The base sends the spare to rescue ships. Because of the absence of a complete parts inventory, purchasing supplies are required in accordance with the Chinese public procurement system, public bidding, shop around, which needs a lot of time, and parts delivery to the rescue ship are not in the shortest time.

Brief summary: I believe that when the vessels and equipment have been standardized, Chinese CRS could realize RNLI logistics level.

14.Differences on victims

UK: The majority of accidents are yachts. If they encounter a large ship accident at sea, after the completion of life saving, the task to save property is completed by the commercial salvage company.

China: the subject is the fishing boat accident, which accounts for 70%. When the accident occurs at sea, the first principle is saving life, the second is to save the property. Under normal circumstances, fishing are the source of livelihood of fishermen, most of fishermen have nothing if they lose fishing ship, so the Rescue Bureau tries to rescue persons and property at the same time!

Brief summary: Victims represent different economic development level, clearly, we can see that the UK is a developed country, China is a developing country.

15. Differences on efficiency

UK: when the lifeboat receives MSAR command, it can quickly go out in 10 minutes, and the lifeboat would spend 30 minutes arriving at the scene within 12 nm range and 2 hours arriving at the scene within 50 nm range (assurance rate is over 90%).

According to IAMSAR Manual--Vol. 1: Organization and Management-- 6.4.2: from the survival of disaster data, it shows that 2 hours is the average critical time of survival.

China: After the rescue ship received MSAR command, it could respond quickly in 10 minutes, but the jurisdiction area are large, and the ship speed is slow, there is no guarantee that it can spend 2 hours reaching the site within 50 nm range, particularly in the inland river or the reservoir, rescue vehicles arrived at the scene of the accident for longer periods of time.

Brief summary: I believe that to little Rescue Base is the main causes of low efficiency in China.

16.Differences on rescue stations

UK: RNLI has deployed a total of 236 rescue stations in the UK and Ireland. RNLI headquarters implement 24-hour duty. According to Britain and Ireland geographical characteristics, RNLI sets up different types of rescue stations, and RNLI arranges appropriate rescue personnel in lifeboats on duty. Full-time workers captain and mechanic are generally two in each rescue stations, the rest of rescue personnel are often volunteers. Only some rescue stations have full-time mechanics, and in some small rescue stations workers are all volunteers. Rescue station volunteers implement a shift system, implementing the duty phone.

In the absence of berthing conditions, RNLI sets up houseboats and slide, lifeboats on standby are pulled up to the house and lifeboats have good protection. The construction standards of boathouse and slipway are very high, and they require a lot of capital investment.



Figure 16 RNLI lifeboat station

Source: RNLI. Official web site: <http://rnli.org/Pages/default.aspx>

China: Three Rescue Bureau set up 20 Rescue Base (equal to rescue station) along the coastline, interval of each base is more than 500 kilometers on average. Jurisdiction rescue radius is large, and Base personnel and equipment configuration are the same basically.

Take Shenzhen Rescue Base in NanHai Rescue Bureau as the example, it is equipped with an "huaying 385 " self-righting lifeboat and a " NanHaiJiu 502 " rubber boats, 4 crew and a six -person emergency response team. The Base sets up a rescue duty room for 24-hour duty standby. The officer on duty receives information from superiors rescue agencies, MRCC or polices, to ensure that after receiving the information, the officer directs emergency team or lifeboat dispatched within 15 minutes. Meanwhile, the base is equipped with a contingency rescue vehicles, mainly for life saving in inland waters, rivers, equipped with a logistical support vehicles, it deliver procurement for large rescue ship primarily.

Strictly speaking, the Rescue Base is an independent small Rescue Bureau, the base bears a lot of responsibilities such as rescue, command, publicity and communication with local governments within the jurisdiction. After rescue is completed, the base submits a report to higher authorities and MRCC. If there is a major maritime accidents occurs within the jurisdiction, which cannot be completed by the base separately, it shall report to rescue command office of Rescue Bureau and MRCC, requesting support.

Brief summary: On the rescue station or Rescue Base setting, two countries concept is very different, each has advantages and disadvantages, but the Chinese Rescue Base is meeting a lot of problems and need to solve.

Chapter V The problems of China's MSAR system

A. From the aspect of MSAR system:

1.SAR under the leadership of Government is diversified.

"National MSAR emergency plan " states: "The government implements the unified leadership of the MSAR operations, forming emergency response mechanism effectively and timely, organizing social resources to create synergy; government implements unified command, to coordinate each MSAR parties in order to obtain the best results. " This shows that the government plays an important role in MSAR. MSAR itself has highly complex and specialized features, according to China's national conditions, there is no department independently assuming all the functions of MSAR, and we can only carry out MSAR at sea through the government coordinate all forces to collaborate. However, the diversification of MSAR organization also has its drawbacks, and the performance of each division of the MSAR organization is unknown and unclear, thus affecting the effectiveness of MSAR work.

2.Relevant legal contents are uncoordinated.

At present, China has not yet issued suitable national MSAR fundamental laws, and the relevant provisions of the law of MSAR main body are never the same. "Inland

Traffic Safety Management Regulations" states the local county-level governments shall be leadership and coordination of MSAR operations; "Production Safety Law" stipulates that local governments shall be responsible for the accident scene to organize rescue; while "maritime traffic security Act" does not state explicitly relevant local governments in MSAR responsibilities. The differences of provisions make MSAR authority blurred, and MSAR mechanism can be easily led to poor running.

3. MSAR center nature is not clear.

Currently, MSAR center does not have a legal personality, and it has not fully played its due role in MSAR. "National MSAR Emergency Plan" provides that China MSAR Center assumes management of MSAR operation. But during the running, it is often intervened by all levels of government, the Chief Executive of government tends to replace MSAR duty officer and the will of chief executive replaces the emergency response procedures. "State Council agrees to establish a national inter-ministerial joint conference system for MSAR approved" states: "Joint Conference does not have seal engraving, nor formal wording, following the spirit of the State Council and relevant documents, organize the work carefully." thus it can be seen that the joint conference is not liable in its own name, and therefore does not have the administrative body qualifications.

B. From the aspect of professional rescue forces:

At present, large-scale MSAR forces such as large-scale rescue tugs have been very fully developed, can implement rescue under the big storm condition, and able to complete all kinds of large vessels towing and other assistance. Because of the large

number of fishing vessels in China , fishing boats are poor quality, most of that are single- shell boats and fishermen do not pay attention to the safety of fishing boats in order to economic benefits. It can be said that most accidents of the fishing boats at sea was not because of bad weather but their hidden troubles. Most fishing activities are within 15 sea miles offshore, and rescue fishing boats rely mainly on Rescue Bases, and Rescue Bases development lag, lack of overall capacity. There is a huge gap between its ability and demand, mainly in the following areas:

4. Professional rescue personnel is less and degree of specialization is not high.

Take Shenzhen base as example, currently, it has 4 seamen and 3 divers, the average age is over 41 years. In order to ensure the normal operation of the lifeboat, lifeboat minimum requirement is 4 seamen and minimum requirements for the completion of the diving operation is 3 divers. The current number is only able to guarantee the normal duty and dispatched emergency rescue, but is unable to properly take turns to rest. With large-scale rescue mission, the seamen and emergency rescue team's continuous operation is more than 10 hours, no replacements, which is a huge security risk. Fewer seamen and emergency rescue members received professional training, low treatment also resulted in low enthusiasm.

5. Lifeboat is the old type and its speed is slow, which does not suit the actual sea conditions.

Currently the main base lifeboat is "Huaying "lifeboat, self-righting lifeboat , which is the lifeboat that RNLI developed for itself and uses out in the 1980s, the highest speed in the 15 knots, from the order received to arriving at the scene, the average time is over two hours. When maritime accident occurs, speed is of the essence, two

hours is sufficient to make the ship boat sink and person dead. Although there are high-speed inflatable boats, its wind resistance is poor, only suitable for rescue in the port area. “Huaying” lifeboat space is small and not suitable for hot and humid weather in the South China Sea. South China Sea in summer has the high incidence of accidents at sea, and temperatures is up to 40 degrees, rescue crew could not make work in “Huaying” lifeboat properly.

MSAR is a high- risk mission, lifeboat damage is inevitable. If “Huaying” boat wants to go to the boat dock annual maintenance for a month, during maintenance, there are no boat replacement on duty, affecting the rescue duty work seriously.

6.Responsibilities and capabilities do not match.

Rescue Base duty has 3 functions: life-saving is in river and inland waters within 500 km; life rescue and logistical support of rescue ship and aircraft within 50 nautical miles. The society demands on the Rescue Base increasingly, News media pays high attention on the Rescue Base, but the jurisdiction scope of the base is very large.

Rescue forces are less and poorly equipped. If an accident occurs in inland waters, from receiving information to arriving the accident site it tends to need over 2 hours , leading to the new media criticizing the Rescue Base and local government misunderstanding.

Chapter VI Recommendation

A. The aspect of MSAR system:

1. To amend the relevant MSAR laws and develop MSAR national regulations

"Maritime Traffic Safety Law" (MTSL) has been enforced over 25 years, the maritime traffic conditions have changed dramatically, and the law shall stipulate clearly the local governments' responsibility (on the county level) for MSAR at sea , the law shall also stipulate the MSAR response entity clearly and the relevant legal obligation, to develop a unified national regulations applicable to MSAR as soon as possible , and improve the current MSAR legal system rigorously and concertedly. We shall study the international conventions about MSAR actively to establish and improve laws and regulations of China's MSAR, to ensure the legal status of MSAR.

2. To define the nature of MSAR center

China MSAR Center, as the MSAR inter-ministerial joint conference's working body, shall be given its own independent administrative authority. Currently, the MSAR work is unclear and the responsibility is unknown, largely caused by the unclear nature of MSAR center.

Under the existing MSAR legal provisions, MSAR center is unified leadership of MSAR, responsible for coordinating all MSAR organizations, which is on the "right" requirement. Regard to the "responsibility". No provision provides the responsibilities of MSAR center, which does not meet the "unification of rights and responsibilities" principles of administrative law. Therefore, to clear the MSAR center responsibility can help to clarify the problems of commitment responsibility, making MSAR operation mechanism more smooth.

3. To improve the compensation mechanism, and fully mobilize the enthusiasm of the forces of social assistance

Throughout Western MSAR system, an obvious feature is its high level of socialization of MSAR forces. According to statistics, at present, 99% of the UK MSAR works are completed by the social force, MSAR relies on the RNLI, only the MCA is responsible for MSAR command and coordination. MCA leads 400 MSAR teams, 3,500 volunteers and RNLI more than 5,000 volunteers, which provides adequate human resources.

In China, Our MSAR forces to participate in MSAR work lack appropriate compensation mechanism and policy support, so that social forces have low enthusiasm in maritime security assistance. Social MSAR forces, such as shipping companies, generally do not want to get high returns, only hoping to be compensated on MSAR costs. However, under the current legal system of China, the social costs of MSAR forces cannot be compensated. Meanwhile, if the shipping company has to do MSAR under MSA pressure, but due to lack of financial support, it affects MSAR enthusiasm and effect. Therefore, it is pressing to improve the compensation mechanisms of social MSAR forces and enhance their enthusiasm for MSAR.

4. To integrate MSAR resources

Integration of the country's maritime resources is to establish a new maritime force that can do MSAR, anti-smuggling and fishing protection. The new organization shall have a command of the MSAR with overall responsibility for organizing, directing, coordinating MSAR, taking maritime security and MSAR integrated model, not only to complete the MSAR, maritime inspectors and other tasks, but also to respond quickly when shipwreck occurs. It would reduce the probability of accidents and increase the success rate of rescue.

5. To innovate MSAR technology

The government shall organize or hire experts to study and track MSAR technology, lives on first aid, marine firefighting, emergency rescue and advanced rescue equipment, overcome the MSAR system and air rescue practical operation skills, MSAR assistance technical problems. All is to realize the MSAR digitization and information and modernization as soon as possible.

6. To build professional training system and mechanism

To learn from the experience of RNLi training college education is to build professional training system and mechanism, training a number of rescue masters that have advanced technology and professional skills, it convenes regularly MSAR organizations, conducts rescue training and exercises and researches new typical MSAR cases.

7. To establish emergency funds

Money is the lifeblood of emergency work, and lack of funds is the bottleneck restricting the development of MSAR work. RNLI funds are mainly from social contributions. China CRS can learn from RNLI experience, establishing a special rescue fund, protecting money supply around the country.

8. To strengthen the air MSAR ability

Learning from the British MSAR experience, China CRS shall strengthen air forces, with sufficient quantity and scientific proportion, rational layout fixed-wing MSAR aircraft and rescue helicopter. All is to protect that when maritime accident occurs, rescue force could arrive at the site to save lives successfully and quickly.

B. The aspect of professional rescue forces:

Rescue Base is the forefront of Rescue Bureau, to accelerate the construction of the Rescue Base and development is to consolidate the social status of Rescue Bureau and the inherent requirements of sustainable development, and this is an effective way to serve the people. To speed up Rescue Bases needs to start from the following 4 points.

9.To increase professional rescue personnel and improve rescue personnel's professional level.

Take Rescue Bureau Shenzhen base as example, the base has an all-weather lifeboat and a fast boat, requiring 6 seamen and 6 divers to have holidays by turns, but now

only 4 seamen and 3 divers. If you increase the rescue ships, the required number of personnel needs to keep pace.

10. To increase the number of rescue ships and improve rescue equipment quality.

According to the actual situation of the jurisdiction area, the best rescue ship must have some characteristic that can meet a certain wind resistance and its speed is fast (more than 30 knots), its working environment suits for hot and humid weather, and it is easy to maintenance (easily damaged in rescue). If the accident occurs during typhoon, the superior commands the large-scale rescue ship to rescue.

11.To increase the number of rescue point on duty

Because of long coastline, according to the accident area incidence, to increase rescue point on duty is to improve efficiency and the fastest way to reach the accident site. If funds are permitted, it shall be 50 nautical miles radius to arrange a small rescue point on duty, equipped with a high-speed inflatable lifeboat, which speed is between 35 and 45 knots.

12.To advance base even Rescue Bureau open to the society

At present, because of institutional reasons, the public really knows very little about MSAR system, more people misunderstand. We shall promote the Rescue Base opening actively, and set up a public day, arranging volunteers, students, civil servants and other social enthusiastic workers to visit Rescue Bases, meanwhile the Rescue Base shall refer to the foreign advanced approach in the establishment of fund-raising center, publishing financial position regularly to attract raising funds

and win the support of local governments. All uses to solve the serious problem of insufficient funding.

Chapter VII Conclusion

In general, the problems of Chinese MSAR are closely related with China economic development, many problems will be resolved with the development of economy and capital input. The Chinese government leaders focus on the safety of the people, to a certain extent, that is great thrust to the healthy development of China MSAR.

MSAR is a manifestation of China's comprehensive national strength, also safeguard the maritime transport and development activities of marine resource. Due to the different domestic systems and different levels of economic development, the development of maritime rescue systems emerges large differences, China CRS exists many problems, we shall actively learn from the advanced experience from the UK in terms of concept, mode and equipment, and strive to build fast and efficient maritime rescue forces to ensure the safety of life and property at sea, so that China's MSAR closes to the level of developed countries as soon as possible.

References

1. The China Rescue and Salvage web site gives further information on courses (<http://eng.crs.gov.cn/>)
2. The Royal National Lifeboat Institution web site gives further information on courses (<http://rnli.org/Pages/default.aspx>)
3. Yang, X.D. (2007). Thinking Of British maritime search and rescue. *Navigation Technology*, 6, 74-76.
4. Chen, R.X. (2013). *Report on visiting Royal National Lifeboat Institution*. Unpublished research paper, NanHai Rescue Bureau. GuangZhou, China.
5. China National Maritime Search and Rescue Emergency Plan, from the World Wide Web: http://www.gov.cn/yjgl/2006-01/23/content_168935.htm
6. China MSA. (2007). Comparison of maritime search and rescue management between China and UK. *China MSA*, 2, 52-54.
7. China Maritime Search and Rescue Center web site gives further information on courses (<http://www.moc.gov.cn/zizhan/siju/soujiuzhongxin/>)
- 8 .People's Republic of China Maritime Traffic Safety Law, from the World Wide Web: http://www.gov.cn/banshi/2005-08/23/content_25604.htm
9. IAMSAR Manual, from the world wide web: <http://e.jd.com/30040284.html#none>