

A Study on the Improvement of Search and Rescue Coordination for Effective Response to Marine Casualties

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해양사고의 효율적 대응을 위한 수색구조조정 개선방안 연구

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Abstract : KCG, responsible Agency of maritime SAR operation has been known to address the marine casualties well, however, it was criticized because KCG failed to take prompt and effective response to the recent Ferry disaster at the very early stage. In this regards, the authors analyze the characteristics of marine incident with historical data, and also review and examine the national SAR system focusing on SAR coordination and human resources to make recommendation and suggestion in order to minimize the loss of lives to future marine incidents. As a result, KCG shall augment its capabilities, inter alia, fast libeboats and rescue helicopters for prompt response to marine incidents at the coastal waters, and KCG shall re-adjust the establishment of Rescue Coordination Center to improve operational problems of current system in accordance with IMO guidance, KCG is required to introduce mandatory training, qualification and certificate system to enhance the professionalism of SAR personnel.

Key Words : RCC(Rescue Coordination Center), RSC(Rescue Sub-center), SMC(SAR Mission Coordinator), SC(Search and Rescue Coordinator), OSC(On-Scene Coordinator), SRR(Search and Rescue Region), Marine Casualties

요 약 : 해상수색구조 책임기관인 해양경비안전본부는 해양사고에 대하여 적절히 대응한 것으로 평가되어 왔으나, 최근 발생한 세월호 사고 발생 직후 초기단계의 신속·효율적인 대응에 실패함으로써 인해 비판을 받게되었다. 이와 관련하여 저자는 향후 발생할 수 있는 해양사고시 인명손실을 최소화하기 위한 방안을 모색하기 위해 우리나라 해역에서 발생하는 해양사고의 특징을 분석하고, 수색구조조정 과 인적자원을 중심으로 국가수색구조체계를 검토·분석하였다. 그 결과, 해양경비안전본부는 특히 연안역 해양사고에 신속하게 대응하기 위하여 고속구명정 및 구조헬기를 확충하여야 한다. 그리고 현행 조정체계의 운용상 문제점을 개선하기 위해 IMO 지침에 맞춰 구조조정 본부설치를 재조정하여야 하며, 수색구조요원의 전문성 제고를 위한 의무적 교육 및 자격 제도의 도입이 필요하다.

핵심용어 : 구조조정본부, 구조지부, 수색구조담당관, 수색구조조정관, 현장지휘관, 수색구조구역, 해양사고

1. Introduction

Experiencing a huge number of loss of lives caused by disaster of Namyong-Ho in the year of 1970 and Seohae-Ferry in the year of 1993 in Korea, the government ratified International Convention on Maritime Search And Rescue(SAR Convention 1979) in 1995 and undertook to take necessary measures to improve SAR

capabilities within jurisdictional waters, for examples, appointing Korea Coast Guard(hereinafter ‘KCG’) as a lead agency, amending SAR Act, adjusting and re-establishing Rescue Co-ordination Center/Rescue Sub-Center(RCC and RSC), establishing Korea Ship Reporting System(KOSREP), augmenting SAR human and equipment resources, entering into co-operation agreement with neighboring countries and so on. Since then, it has been known that KCG have addressed SAR incidents well and appropriately.

However, as 304 of 476 persons onboard trapped in the

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capsized vessel were all dead or missing at the time of Ferry ‘Sewol’ sinking incidents in south-west sea in April in 2014, KCG was criticized for failure of prompt and proper initial response to rescue operations at the very early stage. Consequently the entire national SAR system is now under examination to assess the KCG’s SAR capabilities. Meanwhile, the SAR system has many components that must work together to provide the overall services, and the three main components of system are Co-ordination(Organization and RCC/RSC), Resources (SAR personnel and facilities) and Communication. In this paper, the authors analyze the characteristics of maritime SAR incidents occurred in Korea with historical data, at the same time, examine and study the existing SAR system focusing on Co-ordination and Human Resources comparing with IMO guidance and maritime advanced countries’ system.

2. Analysis of historical data

With the increase of international trade volume and higher dependence upon marine transportation in Korea, shipping traffic becomes busier especially in the coastal waters, and in addition, there are more than 15,000 fishing boats engaged in fishing activities a day. Accordingly the likelihood of marine incidents is ever-present.

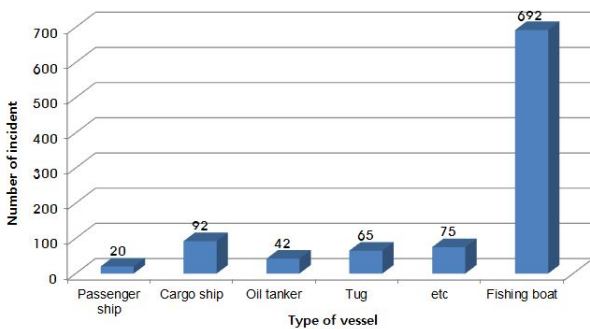


Fig. 1. Annual average number of vessel involved in marine incidents by vessel type including incidents out of jurisdictional waters.

Looking into past 3 years’(2011-2013) marine incident data, among many types of vessels involved in incidents such as passenger ship, cargo ship, oil tanker, tug boat, fishing boat, and so on, fishing boats have greatest number of incidents accounting for about 70 % of all as shown in Fig. 1. This result indicates

that there will be more SAR call-outs because most of fishing boats are small with poor maintenance. Furthermore, incidents by passenger ship, even infrequent, may cause a large number of persons in distress so that KCG shall prepare for mass rescue operation.

According to location of incidents(Table 1), about 81 % of incidents occur within territorial waters including in port, which requires KCG to augment rescue helicopters and fast lifeboats stationed along shoreline for expeditious response to marine casualties.

Table 1. Annual number of marine incidents by location within jurisdictional waters

	Within ports	Territorial waters			EEZ*		
		Dong-hae	Seo-hae	Nam-hae	Dong-hae	Seo-hae	Nam-hae
2011	64	96	286	256	79	31	62
2012	102	39	206	189	39	28	55
2013	81	48	197	156	39	26	48
Total	247		1,473			407	
percentage(%)	11.61		69.25			19.14	

* EEZ denotes the jurisdictional waters excluding territorial waters

Fig. 2 shows victims by marine incidents, by which we can see that about 120 persons have still been lost annually, so that the responsible organization is required to make more effort to minimize the loss of lives.

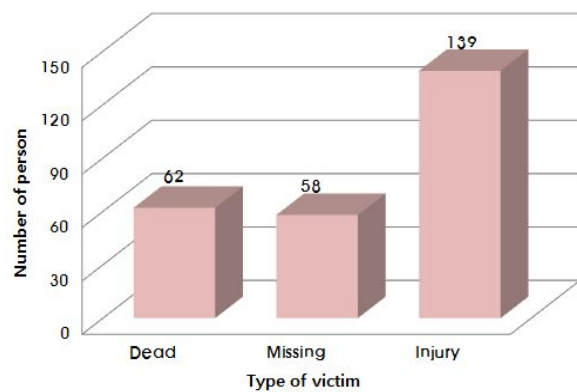


Fig. 2. Annual average number of victims caused by marine incidents.

3. Assessment and Recommendation on SAR-related Issues

3.1 Organization and Coordination

RCC(Rescue Co-ordination Center) is an operational body responsible for promoting efficient organization of SAR services and for coordinating the conduct of SAR operations within SRR(Search and Rescue Region), and RSC(Rescue Sub-Center) is subordinate of RCC where RCC is not able to exercise direct and effective control over SAR facilities in an area within its SRR. Therefore RCC(RSC) should be located where it can effectively perform its functions within its SRR and must have certain basic capabilities with SAR facilities and professional personnel.(IMO & ICAO, 2013a)

Korea, as a signatory to SAR Convention, established national SAR system in accordance with the international Convention. With respect to organization and coordination, 17 Search and Rescue Regions are established and there are 5 RCCs(Joongbu, Seohae, Jeju, Namhae and Donghae KCG Regional HQ) and 17 RSCs(Incheon, Pyeongtaek, Boryung, Gunsan, Mokpo, Wando, Yeosu, Jeju, Seoguipo, Tongyeong, Changwon, Busan, Ulsan, Pohang, Donghae and Sokcho KCG District Office) in Korean

waters based on the responsible area of each District and Regional KCG as shown in Fig. 3, and regarding command and control, District and Regional KCG are responsible for the incidents within their own SRR respectively, while KCG HQ takes the overall command and control in case of the large scale incident, in addition, KCG Commissioner and Regional HQ Commander take the direct command at the scene of the medium and large scale incident.

Let us look at the Coordination system of maritime developed countries, In USA, U.S.Coast Guard(USCG) establishes 11 SRRs based on the responsibility area of USCG Area(Atlantic and Pacific Area) and District(1, 5, 7, 8, 9, 11, 13, 14 & 17 District), and adds 2 Sub-regions at Sector(San Juan and Guam Sector) because of located too far from District office, and sets up 11 RCCs at SRR and 2 RSCs at Sub-region. Of those RCCs and RSCs, District and Sector conduct SAR operation within their responsible area with own assets, on the other hand, Area RCC generally performs as Search and Rescue Coordinator(SC) even though overall responsibility for areas covered by District and Sector in Atlantic or Pacific. In Japan, Japan Coast Guard(JCG) establishes 11 SRR based on Regional JCG and set up RCC at each SRR, and each RCC performs SAR operation in their responsible area with own assets. In Canada, unlike the coordination system of USCG and JCG, there are 3 SRR and 2 Sub-region, and Joint RCC(JRCC) is established at SRR with Defence Canada and Maritime RSC(MRSC) is established at Sub-region. Canadian Coast Guard(CCG) conducts SAR activities at JRCC with Air Force, however, CCG conducts it only with own assets.

Comparing with IMO guidance and fore-mentioned foreign system, there are a few problems to the SAR organization and coordination. First, 17 RSCs are able to conduct SAR operation with their own SAR resources, whereas 5 RCCs are unable to directly carry out the operations because of no own facilities. It indicates that RSCs are at the RCC level in size and capability. Second, RCC and RSC may create confusions in the command and control between them because their responsible areas are overlapped each other, Third, since On-Scene Coordinator(OSC) is appointed among SAR facilities deployed at scene, the role of OSC by KCG HQ commissioner and Regional HQ commander is not appropriate.

To correct these inconsistencies, RCCs and RSCs are to be re-adjusted like following suggestions. ① RSC is promoted to RCC provided that District KCG performs SAR Mission Coordinator(SMC) function, while Regional KCG does SAR

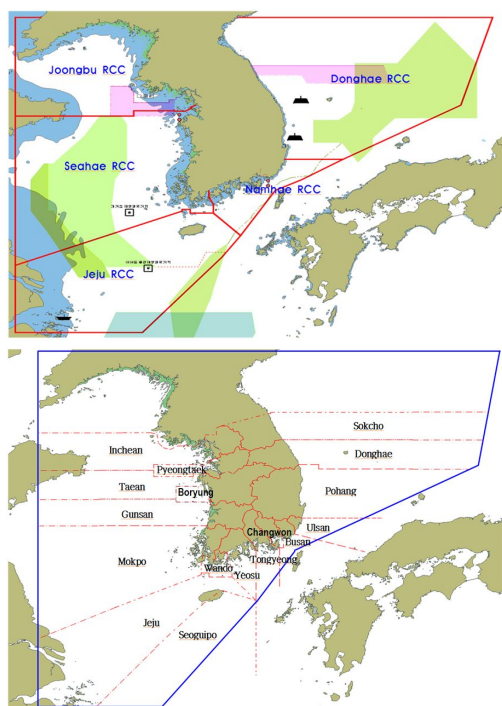


Fig. 3. Responsible area of each RCC(upper) and RSC(lower).

Coordinator(SC) function, ② RSC is promoted to RCC, however, with transfer of large cutters over 1,000tons from District to Regional KCG, District KCG is responsible for the area within contiguous waters(24 nm from the shoreline) and Regional KCG is responsible for EEZ except District KCG area ③ Regional KCG is responsible for its own SRR and District KCG performs SAR operation as a subordinate organization to Regional KCG, not as RSC. Of the above three options, first is most recommendable one because District KCG is capable to carry out SAR operation effectively with own resources without substantial changes of current SAR system. In addition, the chain of present command and control to respond to medium and large scale incidents is to be changed on the on-scene mission ability basis, i.e. first District KCG(RSC) which receives distress alert takes initial action designating SMC and OSC. If the incident is not under control by the District KCG, the Regional KCG assumes the responsibility of on-scene response with SMC unchanged unless determined to be incapable, and keeps KCG HQ informed of the situation, instead KCG HQ performs SC function as shown in Fig. 4. In any case, SMC must be given lead responsibility to coordinate the specific SAR response as a representative of designator.

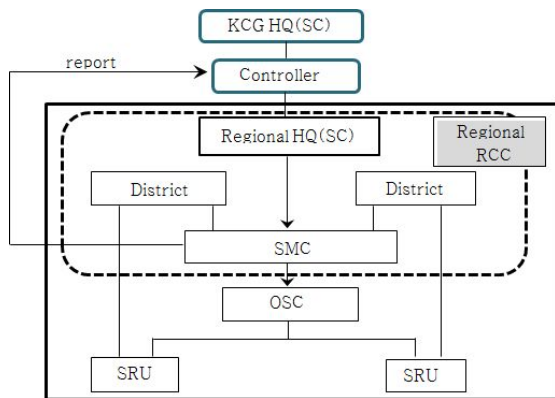


Fig. 4. SAR chain of Command for Mass Rescue Operation.

3.2 SAR personnel and Qualification requirement

The RCC usually coordinates SAR operations within its assigned SRR and must be prepared to undertake and continue operational duties 24 hours a day/7 days a week. This level of readiness requires multiple persons in RCC to be trained and qualified to assume SMC duties. SMC is in charge of SAR operation until a rescue has been effected or until it has become apparent that further efforts would be of no avail, or until responsibility is accepted by another RCC, in addition, the SMC should be able to use readily available facilities and request

additional ones during operation and plan the search, also coordinate the transit of SAR facilities to the scenes(IMO & ICAO, 2013b). Besides, SMC is designated to carry out all aspects of planning, coordinating and managing the response to a SAR incident.(USCG, 2013). RCC is routinely staffed with Chief and Duty officers. The RCC chief may be a person who also performs other functions, if not delegated, he must make appropriate preparations, plan and arrangement as well as oversee daily operations of RCC to ensure that when an incident occurs, the SAR operation can be promptly performed. Duty officers stand daily watches and they also co-ordinate, conduct and control SAR operations. Therefore SAR-related personnel must be properly trained, qualified, and certified, and should be fully competent to perform SMC duties.

Considering the importance of professionalism of SAR personnel, RCC staff are required to receive resident training and On-the-Job Training(OJT) as shown in Table 2. For instance, in USA, USCG provides mandatory SAR courses such as Maritime Search Planning Course, SAR Fundamentals(e-SAR) Course and SAR Supervisor Course for RCC staff with OJT, i.e., the candidates of SAR Controller must complete 3 weeks Maritime Search Planning Course and once stationed at RCC, candidates have about 6 weeks OJT, culminating in a written test and oral board to assess their knowledge and ability to successfully plan and coordinate SAR cases. Along with qualification requirement of SAR staff, once trained, these people typically remain in their RCC for 10 or more years except USCG personnel assigned for 3-4 years.(USCG, 2004). In Canada, CCG provides required training course of SAR Senior Course and Maritime SAR Controller Course for RCC staff with OJT, In Japan, JCG has no mandatory training courses for RCC staff, but requires them to have on-scene experience onboard cutter and/or aircraft(Mok et al., 2014).

Table 2. Length of SAR Controller Course and OJT period (USCG, 2004)

Country	Length of SAR School	Length of OJT Period
USA	3 weeks	6 weeks
Australia	2 months	2-3 months
Canada	1 month	6-7 months
Netherlands	3.5 months theory	3.5 months
Sweden	3.5 months theory	18 months
UK	10 days	3 months - 1 year

* Remark : Netherlands and Sweden SAR Controllers are trained at USA and Canada's SAR school because of no own school

By contrast, KCG is running District/Regional/HQ Operation Center similar organization to RCC, in which RCC staff performs daily operations associated with maritime law enforcement, maritime safety, security, sovereignty and environmental response, etc. including SAR. This job characteristic causes KCG to post non-SAR professionals with little expertise and experience in the operation center as RCC staff, and also causes their SAR proficiency to atrophy. In addition, since most of these staff is transferred at the interval of about 1 year, KCG has less continuity in SAR expertise and difficulties with constantly changing and complicated SAR planning software.

Considering such problems in personnel management system, KCG must develop required training courses for SAR personnel as shown in Table 3 with minimum level of knowledge appropriate for the assigned positions referring to IMO guidance in IAMSAR manual. also introduce mandatory qualification and certification system associated with course completion and onboard experience including OJT so that the qualified personnel should be designated to perform assigned SAR duties at RCC/RSC. In addition, KCG shall improve personnel system so that trained personnel could remain at same RCC for longer years.

Table 3. SAR courses for SAR personnel

Course name	Who to train	Main topics
Level-1 Responder Course	Operation Center duty officer, SRU	On-scene response techniques
Level-2 Coordinator Course	Operation Center duty officer, SMC, OSC	SAR planning and coordinating
Level-3 Administrator Course	Operation Center Chief, SC	Policy and administration

4. Concluding Remarks

Korea, as a signatory to the International SAR Convention, has taken necessary SAR-related measures to meet the requirements of Convention since 1995, appointing KCG as a lead agency, establishing RCC and RSC, augmenting SAR resources and cooperating with foreign countries, etc., KCG's SAR capabilities, however, were questioned in the process of rescue operations at the scene of recent Ferry disaster. In this

regards, the authors analyze the characteristics of marine incident, and attempt to examine and analyze the existing SAR system, then make some recommendations to enhance its capabilities focusing on SAR coordination and human resources.

The analysis of historical data(2011~2013) shows that about 770 marine incidents, which lead to about 120 fatalities, take place in Korean waters a year and fishing boats have greatest number involved in marine incidents accounting for 70% of all, and 81% of incidents occur within territorial waters. This result indicates that SAR call-out from small fishing boats in the coastal area will increase and KCG is required to build-up SAR capabilities, inter alia, fast lifeboats and rescue helicopter to do prompt response to the incidents at coastal waters.

As a result of close examination on SAR coordination and professionalism of RCC staff of the existing SAR system comparing with international convention and SAR system of maritime developed countries, the authors find out a couple of gaps and deficiencies, then offer following recommendations to improve SAR coordination and professionalism of SAR personnel as follows.

(1) Regarding Coordination and Command system, it is recommended that all RSCs are promoted to RCC provided that District KCG performs SAR Mission Coordinator function, while Regional KCG does SAR Coordinator function. And the chain of present command and control to respond to medium and large scale incidents is to be changed on the on-scene mission ability basis, i.e. first District KCG(RSC) which receives distress alert takes initial action designating SMC and OSC. If the incident is not under control by the District KCG, the Regional KCG assumes the responsibility of on-scene response with SMC unchanged unless determined to be incapable, and keeps KCG HQ informed of the situation, instead KCG HQ performs SAR Coordinator function. In any case, SMC must be given lead responsibility to coordinate the specific SAR response as a representative of designator.

(2) Regarding the professionalism of SAR personnel, KCG must develop required training courses appropriate for positions of SAR personnel such as Responder, Coordinator and Administrator Courses, also introduces mandatory qualification and certification system associated with course completion and onboard experience including OJT so that the qualified personnel should be designated to perform assigned SAR duties at RCC/RSC. In

addition, KCG shall improve personnel system so that trained personnel could remain at same RCC for longer years.

Considering that the above recommendations may not be the best alternatives for Korea's SAR system on realistic and effective aspect, the authors will continue further studies on the Coordination and Professionalism.

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