



Jurnal Pertahanan

Media Informasi tentang Kajian dan Strategi Pertahanan
yang Mengedepankan *Identity*, *Nationalism* dan *Integrity*
e-ISSN: 2549-9459

<http://jurnal.idu.ac.id/index.php/DefenseJournal>



IMPROVING THE INDONESIAN'S MINE COUNTERMEASURE SMART MINE CAPABILITY BY ANALYTIC HIERARCHY PROCESS AND MEASUREMENT OF EFFECTIVENESS METHODS

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Article Info

Article history:

Received : March 18, 2022

Revised : June 9, 2022

Accepted : August 31, 2022

Keywords:

Analytical Hierarchy
Process,
Measures Of Effectiveness,
Mine Counter Measure,
Mine Warfare,
Smart Mine

Abstract

Mine warfare is still developing in line with technological developments. Technological developments in the field of mines have produced smart mines that can select targets as desired precisely and accurately. Currently, minehunting vessels are owned by the Indonesian Navy. In this study, an analysis of the capability of minehunting vessels class will be carried out including the capability of the sensor weapon command system, the professionalism of the crew, and Explosive Ordnance Disposal (EOD) divers as well as ship degaussing systems. This study aims to analyze the ability of the class mine-hunting ships of the Indonesian Navy to deal with modern mine warfare, especially to deal with mines that can choose their targets or often called Smart Mines. This study uses quantitative research methods, namely data analysis with Measures Of Effectiveness (MOE) and Analytical Hierarchy Process (AHP) methods. This study found that the increase in Sewaco's ability to deal with modern mine warfare will also have to be followed by improvements or changes in tactics and strategies that are adapted to the increase in the ship's capabilities. This increase in the professionalism of soldiers is carried out at all levels of rank, starting from officers through Mine Warfare Officer (MWO) education either organized by the Navy or abroad, then at the non-commissioned and enlisted levels to improve their skills carried out through regular and scheduled training. Mine ships with a good degaussing system function will be very supportive in carrying out mine operations, stating that modern sea mines are equipped with sensors or magnetic sonar that are placed on the sea surface or below sea level. For this reason, the function of the degaussing system must be able to operate properly in the face of these modern mines.

DOI:

<http://dx.doi.org/10.33172/jp.v8i2.1651>

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INTRODUCTION

Indonesia is the largest archipelagic country in the world with a total of 17,504 islands, a coastline of approximately 80,791 km, an area of Indonesian jurisdictional waters of 5.8 million km² covering an area of archipelagic waters, and inland waters covering an area of 2.7 km² and an Exclusive Economic Zone covering an area of 3.1 million km². With the extent of the territorial waters of Indonesia, the Indonesian Navy as the guardian and enforcer of law and sovereignty in the territorial waters of the national jurisdiction as mandated in Law No. 34 of 2004 concerning the duties of the Navy must be able to carry out sea control in the area. Sea control can be controlled by carrying out sea operations by the Indonesian Navy's operational units. The types of naval operations of the Indonesian Navy according to their weapons and activities or Warfare Tasks are anti-air warfare, anti-submarine warfare, anti-surface warfare, mixed warfare, amphibious warfare, and mine warfare. Of the six types of marine operations above, this study will focus on Mine Warfare. It is also stated in the draft of the Indonesian Navy's 2005-2024 posture that one of the defense capabilities that must be possessed by the Navy is the capability of Mining Operations and Anti-mines, both of which are part of mine warfare. To support the fulfillment of these needs, strength development will be carried out, one of which is the fulfillment of the elements of mine warfare. Minehunting capability is a skill in Mine Warfare, especially mine countermeasures, which must always be maintained and improved in order to support the implementation of Marine Operations both in peacetime and in times of war. Skills in mine warfare as a capability must be maintained and enhanced. This skill requires the readiness of the crew of the Mine Hunter class and special forces qualified for Explosive Ordnance Disposal (EOD) in the face of modern mine warfare. EOD itself is a special qualification possessed by soldiers

in dissipating bombs, this qualification is owned by special forces in this case Frog Man. EOD involves the detection, identification, evaluation, safe rendering, recovery, and disposal of explosives. In practice, EOD operations deal with mines, ammunition and sub-munitions, artillery shells and mortar bombs, hand grenades and rifles, guided missiles, rockets, and aircraft bombs among other items.

Mine warfare is still developing in line with technological developments. Technological developments in the field of mines have produced smart mines that are able to select targets as desired precisely and accurately. The latest sensor technology and mine programming system based on smart logic programming allows to hit targets with various signals received in the form of Acoustic, Magnetic, and Pressure and can be detonated using a remote. Able to be spread on all seabeds (mud, coral, sand, and combination) and has a large destructive power so that it can destroy targets with a tonnage of > 1,000 tons. This means that the effectiveness of mines in a war is very high. Currently, various types of existing mines are designed to have sophisticated systems, stronger sensor capabilities, not too heavy as conventional mines but have high explosive power, these mines are classified as modern mines or smart mines. From some of the explanations above, starting from the Indonesian Navy's mine warfare operations, the capability of the current minehunting vessel rental system, the readiness of crew members and special forces with EOD qualifications to the development of modern mines that have been made, it is necessary to increase the capability of the class minehunting ships to deal with modern mine warfare. This study aims to analyze the ability of the class mine-hunting ships of the Indonesian Navy to deal with modern mine warfare, especially to deal with mines that can choose their targets or often called Smart Mines. The development of mining technology must be able to be anticipated by the Indonesian Navy by

building the strength and capabilities of its defense equipment so that an analysis of the capabilities and strengths of the current minehunting ships is needed to deal with modern mine warfare.

Indonesia's geographical shape with strategic funnels and shipping lanes has a configuration that is vulnerable, especially to the danger of mine weapons. Mining activities by opponents can have an impact on the implementation of sea control and projection of power by sea. The development of mines has now reached smart mines, where mines are able to choose their own targets. Meanwhile, the mine ships owned by the Indonesian Navy are currently the mainstay of the minehunting vessels. Faced with the current development of mining technology, the strength, and capability of the defense equipment owned by the Indonesian Navy is far behind to deal with modern mine warfare. The identification of problems carried out by study related to the ability to deal with modern mine warfare are:

1. The limited ability of the class minehunting ships becomes an obstacle in carrying out modern mine warfare in this case carrying out minehunting.
2. The development of minehunting technology and smart mines has not been followed by an increase in the capability of the Indonesian Navy's minehunting ships.

With Sea Power, a country will be able to control the sea which is its jurisdiction. After being able to be controlled, the country will be able to hold control of the sea under its territorial jurisdiction. Likewise with Indonesia, as an archipelagic country with an area of Indonesian jurisdictional waters reaching 5.8 million km², the Indonesian Navy as the main force in the field of defense at sea must be able to carry out sea control so that all the potential of the sea can be utilized as much as possible for the welfare of the Indonesian people. To be able to obtain Sea Power in the territorial waters of national jurisdiction, the Indonesian Navy deploys

its naval forces to maintain and enforce sovereignty and law by conducting sea operations. One type of naval operation of the Indonesian Navy is mine warfare operations. The application of the Sea Power theory in research on the analysis of the capability of the class minehunting ships in the face of modern mine warfare is mine warfare as one of the capabilities that the Indonesian Navy must possess in order to gain control of the sea Sea Power in the marine area of Indonesia's national jurisdiction (Mahan, 1987).

Maintenance plays an important role in the production activities of a company that involves the smoothness and bottlenecks of production, production volume and so that products can be produced and received by consumers on time and keep no idle resources due to machine downtime during the production process so that can minimize the cost of lost production. Maintenance activities can be divided into 3 types, namely corrective maintenance (breakdown maintenance), preventive maintenance, and total productive maintenance. The application of the maintenance theory above in this study will be the basis for to study that every piece of equipment has an age where one day it will inevitably experience damage and malfunction so that it requires maintenance so that the equipment can reach its lifetime. If it is no longer able to function according to its basic function, it needs to be replaced so that it is hoped that the ability can increase (Patton, 1995).

The elaboration of the growth of military professionalism has three characteristics as follows:

1. Skill. A military force requires supporting knowledge to be able to organize, plan, and direct its activities both in war and in peace.
2. Special social responsibility. A military officer in addition to having high moral values apart from economic incentives also has a basic responsibility to the state. Unlike the previous period, at that time an officer seemed to be private

property of his commander and had to be loyal to him. During the period of professionalism, an officer has the right to correct his commander if the commander conflicts with the national interest.

3. A corporate character that gives birth to a strong sense of esprit de corps. Unlike other professional groups, the military officer corps is a professional bureaucracy whose members serve the state bureaucracy, but as a unit in the state bureaucracy the officer corps is an autonomous social unit, which has independence in the bureaucracy, educational institutions, journals, associations, customs and traditions.

The Military Mind which became the basis for military and state relations. The core of The Military Mind is an ideology that contains professional military recognition of the supremacy of civilian government. The application of the professionalism theory above in this study is that to study will examine the professionalism of crew members and EOD divers in carrying out mine warfare operations and become the basis for increasing the professionalism of personnel so that they are able to face modern mine warfare (Huntington, 1957).

Future Mine Countermeasure that sea

mines do not only threaten warships but are also dangerous for merchant ships or civilian ships where the economy is very dependent on the shipping traffic of these ships. Therefore, the capability to ward off mine threats is necessary to provide freedom of movement not only for self-owned and friendly naval forces but also for shipping merchant ships (Schwarz, 2014). Conceptual Design of Future Undersea Unmanned Vehicle (UUV) System for Mine Disposal conceptual design is proposed for an effective mine countermeasures system (MCM), consisting of three unmanned underwater vehicles (UUV) and 10-20 small dispatchable vehicles. A new underwater optical communication system was introduced to enhance landmine reconnaissance and decision-making with key technologies focused on system and communication efficiency, data processing capabilities, and the cost-effectiveness of MCM systems. The proposed UUV MCM system is cost-effective as it adapts single-use mine neutralization instruments, improves data processing units, and configures optical communication systems between underwater and surface vehicle units that are heterogeneous in operation (Sub Song & Chu, 2014).

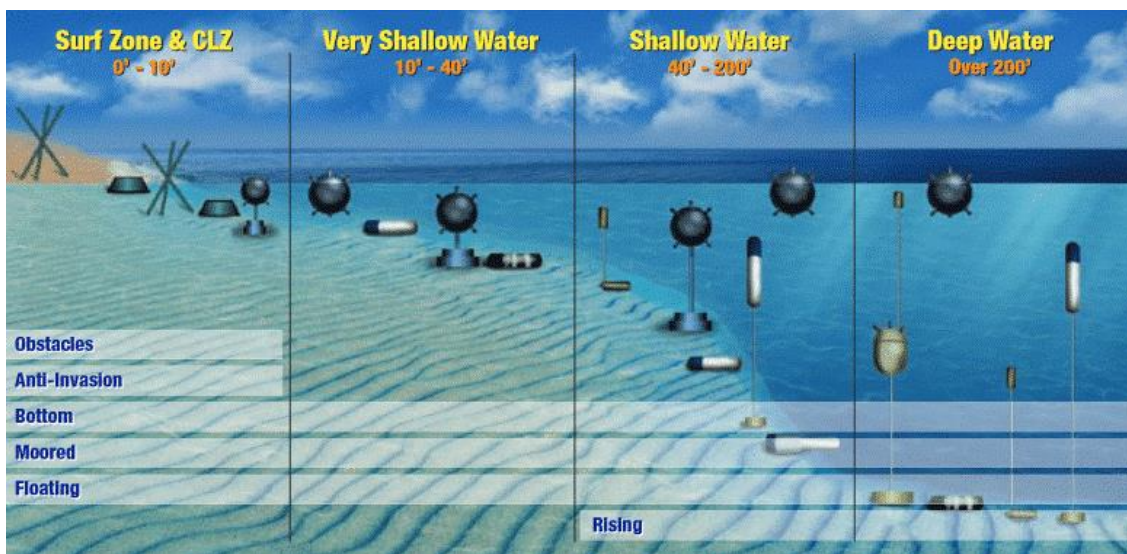


Figure 1. Optimization of MCM
 Source: Naval Mine Counter Measure, 2022



Figure 2. Optimization of MCM
Source: Naval Mine Counter Measure, 2022

Table 1. World's Smart Mine Data

Mine Name	Mine Type
Stonefish MK III	Surface, Air, Submarine-launched ground influence mine
Sigeel-400	ground mine
EM-52	Rocket Propelled Rising Mine
Manta	Shallow Water Seabed Influence Anti – Invasion Mine
MK-41	Underwater Charge
Murena	General Purpose Seabed Influence Mine
Mila-6B	Naval Limpet Mine
BGM 100 (Rockan)	Anti – Invasion ground influence mine
BGM 600	Cable controlled multi-influence mine
BGM 601	Ground influence mine
Sea Urchin	Programmable influence mine
Stonefish	Programmable influence mine
MK 36, 40, 41 & 115 A	Aircraft – laid Seabed mine
MK 52, 55, 56 & 57	Submarine / Aircraft – laid Seabed mine
MK 60 Captor	Encapsulated torpedo
MK 67 (SLMM)	Guidance and control system upgrade for SLMM

Source: Naval Underwater Systems, 2022

METHODS

In order to collect information or data and conduct investigations on the data that has been obtained. The research method provides an overview of the research design which includes, among others: procedures and steps that must be taken, research time, data sources, and with what steps the data is obtained and then processed and analyzed. The researcher uses quantitative research

methods in carrying out research related to the analysis of the ability of the class minehunting ships in the face of modern mine warfare. Quantitative research method is a process of finding knowledge that uses data in the form of numbers as a tool to analyze information about what you want to know. To study use quantitative research methods because they have found problems and determined variables in their research

explicitly related to the ability of the class minehunting ships in the face of modern mine warfare. In this study, the researcher determined 2 variables in his research, namely the ability of the class minehunting ship and modern mine warfare.

In this study, the population as a generalization area consisting of objects/subjects that have certain qualities and characteristics that have been determined by the researcher to be studied and then drawn conclusions. The population that has been determined by the to study in carrying out this research is East Java soldiers who serve in the Mine Ship Unit, Frog Man, Operations Staff and Logistics Staff.

The hypothesis is a temporary answer to the formulation of the problem or sub-problem proposed by the researcher, which is described from the theoretical basis or theoretical study and still has to be tested for truth, because it is still temporary, it is necessary to prove the truth through collected empirical data or scientific research. The results of this study are expected to provide benefits both theoretically and practically related to the ability to deal with modern mine warfare. Research on the analysis of the capabilities minehunting ships is expected to provide theoretical benefits, namely applying the Analytic Hierarchy Process (AHP) and Measurement of Effectiveness (MOE) methods to analyze the capabilities of Class Minehunting Vessels in the face of modern mine warfare.

Analytic Hierarchy Process (AHP) is a method in a decision-making system that uses several variables with a multilevel analysis process, the analysis is carried out by assigning a priority value to each variable, then performing pairwise comparisons of the existing variables and alternatives (Saaty, 2000). Definition of Measures of Effectiveness is a measure of the ability of a system to meet certain needs or requirements from a certain point of view. These measures may be quantitative or qualitative and allow comparable

systems to be classified. These effectiveness measures are defined in a problem-space. Implicit in meeting the requirements problem is that the values must exceed that threshold. Effectiveness is a measure of the extent to which the system can be expected to achieve the specified mission requirements, and is a function of availability, reliability and capability. MoE can be described as a hierarchical diagram. Where each level of the horizontal hierarchy describes 100% effectiveness or performance. This sample is part of the number and characteristics possessed by a large population. The number of samples that will be taken as respondents is based on the results of calculations using the Slovin Formula. The Slovin formula can be used if the level of confidence in the population is 95% (Tejada & Punzalan, 2012). In the population related to the ability to deal with modern mine warfare due to limited time and energy. To study will use samples taken from the population. This sample is part of the number and characteristics possessed by a large population. The number of samples that will be taken as respondents is based on the results of calculations using the Slovin Formula, namely:

$$n = \frac{N}{(1+Ne^2)}$$

with description,

n = number of samples

N = population size

e = the percentage of leeway with a value of e = 10% for a large population and a value of e = 20% for a small population.

After knowing the total population (N), then the calculation of the number of samples that will be used as respondents is carried out using the Slovin formula so that the following results are obtained:

$$n = \frac{397}{(1+397.(0.2)^2)}$$

$$= 23.51$$

= 24 samples that will be used as respondents

In carrying out this research, this study used research instruments as a tool used to obtain and collect research data, as a step to find results or conclusions from research without leaving the criteria for making a good instrument. The instrument used in this study was a questionnaire or questionnaire. Collecting data using a research instrument in the form of a questionnaire with a sample of 24 respondents who will be taken from the Mine Ship Unit. In collecting data, to study need the most appropriate data, so that valid and reliable data are actually obtained. Data collection techniques carried out by interviews (interviews) and questionnaires (questionnaires). After the data is collected, the next process is data processing. The initial process of data processing begins with editing each incoming data. In editing, what will be done is to examine whether or not the data obtained are complete, the relevance of the answers and the uniformity of the data unity. The next process, to study classify the answers obtained.

Data analysis is an activity after data and all respondents or other data sources have been collected. Activities in data analysis are grouping data based on variables and types of respondents, tabulating data based on variables from all respondents, presenting data for each variable studied, performing calculations to answer problem formulations and testing hypotheses that have been proposed. To study used data analysis techniques with Analytical Hierarchy Process (AHP) and Measurement of Effectiveness (MOE) methods.

Instrument to collect quantitative data. The instrument for the MoE method, respondents will assess the effectiveness of the statements given related to the sensor weapon command system, professionalism and the degaussing system. To study have determined the value of effectiveness as follows:

Very Ineffective (STE)=	0
Ineffective (TE)	= 0.25
Indecisive (R)	= 0.5
Effective (E)	= 0.75

Highly Effective (SE) = 1

For the AHP method of questionnaire, this study also determines the value that the respondent must choose regarding the criteria and alternatives that have been set by this study namely:

Quite important	= 1
Important	= 2
Very important	= 3
Absolute Important	= 4

The number of respondents based on calculations using the Slovin formula. The number of respondents selected is calculated based on the Slovin formula with the results of 24 samples that will be used as respondents to obtain quantitative data.

The weight value of each level is between 0 to 1 ($0 \leq W_i \leq 1$). The total weight value for each level is 1 ($\sum W_i = 1$). The weight values for each level can be seen in the Tables below.

Creating scores based on the results of the questionnaire recapitulation to the respondents to determine the effectiveness of the components to be measured. The determined effectiveness value is as follows:

Very Ineffective (STE) =	0
Ineffective (TE)	= 0.25
Indecisive (R)	= 0.5
Effective (E)	= 0.75
Highly Effective (SE) =	1

In dealing with modern mine warfare using the MoE method, the following results are obtained:

1. The MoE value for the sewaco system is 0.0875
2. MoE value for professionalism is 0.0891
3. MoE value for degaussing is 0.0712

The total MoE value of the ability of the class mine hunter to face modern mine warfare based on data processing using the MoE method is 0.247917. In accordance with the effectiveness value that has been set for the MoE value of 0.247917 it is in the Ineffective category so that based on these results, the ability of class mine hunter in dealing with modern mine warfare is Ineffective.

Table 2. Component measure

Component	Value Weight	Information
Sensor weapon command system	0.5	
Professionalism	0.2	
Degaussing System	0.3	
Wi	1	

Source: Naval Mine Counter Measure, 2022

Table 3. More specific component

	Sensor weapon command system	Professionalism	Degaussing System
Preparation	0.2	0.2	0.2
Detection	0.2	0.2	0.2
Classification	0.2	0.2	0.2
Identification	0.2	0.2	0.2
Destruction	0.2	0.2	0.2
Wi	1	1	1

Source: Naval Mine Counter Measure, 2022

Table 3. MOE Value
Value MoE

	Weight		Effectiveness Value	Total value
	Component of Measure	More specific component		
Sewaco System	0,5			
Preparation		0,2	0,166667	0,016667
Detection		0,2	0,177083	0,017708
Identification		0,2	0,1875	0,01875
Classification		0,2	0,15625	0,015625
Destruction		0,2	0,1875	0,01875
Professionalism	0,2			
Preparation		0,2	0,333333	0,013333
Detection		0,2	0,583333	0,023333
Identification		0,2	0,458333	0,018333
Classification		0,2	0,375	1
Destruction		0,2	0,479167	0,019167
Sistem Degaussing	0,3			
Preparation		0,2	0,270833	0,01625
Detection		0,2	0,270833	0,01625
Identification		0,2	0,229167	0,01375
Classification		0,2	0,229167	0,01375
Destruction		0,2	0,1875	0,01125
Total MoE Value				0,247917

Source: Naval Mine Counter Measure, 2022

Table 4. AHP Value

ALTER	Sewaco	Professionalism	Degaussing	Criteria	Criteria Rank
Maintain	0,104750707	0,136504535	0,109452505	Sewaco	0,636985564
Modernization	0,258302519	0,238490682	0,308995702	Professionalism	0,104729437
New Procurement	0,636946774	0,625004784	0,581551793	Degaussing	0,258284999

ALTER	Final Rank	Rating
maintain	0,109290671	Rank 3
Modernization	0,269320925	2nd
New Procurement	0,621388403	rank 1

Source: Naval Mine Counter Measure, 2022

From the results of the analysis using the priority AHP method that must be done to deal with modern mine warfare based on alternatives and predetermined criteria, the priority ranking is obtained, as follows:

1. Rank 1 Procurement of new MCM vessels with a Final Rank value of 0.62
2. Rank 2 Modernization of class mine hunter with a Final Rank value of 0.27
3. Rank 3 Defending class mine hunter with a Final Rank value of 0.11

RESULT AND DISCUSSION

After carrying out data processing to measure the effectiveness ability to deal with modern mine warfare using the MoE method, the following results were obtained:

1. The MoE value for the rentalco system is 0.0875
2. MoE value for professionalism is 0.0891
3. MoE value for degaussing is 0.0712

The total value of MoE from the ability face modern mine warfare based on data processing using the MoE method is 0.247917. In accordance with the effectiveness value that has been determined for the MoE value of 0.247917 it is in the Ineffective category so that based on these results, the ability in dealing with modern mine warfare is Ineffective.

From the results of the analysis using the

priority AHP method that must be carried out to deal with modern mine warfare based on alternatives and predetermined criteria, the priority ranking is obtained, as follows:

Rank 1 Procurement of new MCM vessels with a Final Rank value of 0.62. Rank 2 Modernization with a Final Rank value of 0.27. Rank 3 Defending with a Final Rank value of 0.11.

The need for mineboats for a high-tech Sensor weapon command system in the mine operation stage is very high, whereas currently the Sensor weapon command system as a minehunting vessel is far behind with the development of existing mines. Based on the analysis of priority/ranking data using the AHP method, the results show that the Sensor weapon command system is the first priority (rank 1) for capacity building to be carried out and based on the existing alternatives, the capacity building of the Sensor weapon command must be carried out is to procure/build a new MCM type mine vessel with system capability. Sensor weapon command has the latest technology so that it is able to deal with modern mine warfare. The expected improvement of Sensor weapon command to be able to deal with modern mine warfare is upgrading the Sensor weapon command system to the M-CUBE Mine Counter Measure

Management System generation 2010 and above with the main specifications being digital data processing, such as Additional Military Layers (AMLs), weather data and measurement data. digital. The M-Cube is like a flexible TACTICOS CMS, it can be integrated with supporting ship systems and portable aircraft. The ability to process data directly by displaying data accurately from data on probability, percentage of clearance, risk management, types of mines, and shape of the seabed. MCM Database capable of processing all digital data such as area maps, routes, contacts, shipwrecks, types of the seabed, supporting data. Communication System integrated with bridge and Machine control; and data communications: applications using fast Ethernet or standard serial links for navigation sensors. To manpower mine ships in carrying out mine operations requires the professionalism of soldiers with the ability to operate ships with modern technology. Based on the analysis of priority/ranking data using the AHP method, the results show that professionalism is the third priority (rank 3) to be implemented to increase the capability and professionalism of soldiers. To avoid magnetic mine attacks, warships must have a degaussing system that can function properly to remove the ship's magnetism. Based on the analysis of priority/ranking data using the AHP method, the results show that the degaussing system is the second priority (rank 2) to be implemented for capacity building and based on the existing alternatives to increase the capability of the degaussing system, what must be done is to procure/build a new mineship type MCM with the capability the latest technology rental system so that it is able to deal with modern mine warfare.

Mine warfare is still developing along with technological developments. Technological developments in the field of mines have produced smart mines that are able to select targets as desired precisely and accurately. The latest sensor technology and mine programming system

based on smart logic programming allows to hit targets with various signals received in the form of Acoustic, Magnetic, and pressure and can be detonated using a remote. Able to be spread on all seabeds (mud, coral, sand, and combination). And has a great crushing power so that it can destroy targets with a tonnage > 1,000 tons. This can be interpreted that the effectiveness of mines in a war is very high. To be able to control the sea, a strong navy is needed, as well as the Indonesian Navy as the main force in the sea, it must have a strong navy so that it can control the waters of Indonesian jurisdiction. As explained earlier, currently the development of mines has reached the stage of using smart mines to protect water areas, the Indonesian Navy is expected to be able to have a navy, especially warships capable of fighting smart mines that have developed at this time.

Modern mine warfare that already uses smart mines is able to select targets precisely and accurately. These mines cannot be dealt with by the ship charter system starting from the initial phase of operation, namely preparation, detection, classification, identification to destruction. Along with the age of the old ship, of course, the age of use of the equipment on the ship has also decreased considerably. To prevent a decrease in the ability of the material, maintenance is needed. However, this maintenance cannot be carried out continuously, when the equipment has reached its life time period it must be replaced with a new one. Likewise with the ship as a unified system, with an age that has reached its life time, it is necessary to replace it with a new one.

The age of the ship, including the equipment in it, of course also affects the professionalism of the crew members. This professionalism can certainly be improved, but training and education are needed with more modern equipment. The increase in the capabilities of the equipment on the ship will be directly proportional to the increase in the professionalism of the soldiers.

Improving the professionalism of soldiers is carried out at all levels of rank ranging from officers through Mine Warfare Officer (MWO) education either organized by the Navy or abroad, then at the non-commissioned and enlisted levels to improve their skills carried out through routine and scheduled training in the environment. The technical specifications of the MCM vessel are expected to have 4 units of UUVs of the AUV type that have the ability to detect, classify and identify capable of carrying out operations with a distance of $> 2,000$ Nm, has magnetic, acoustic and pressure measuring equipment, has the ability to determine position accurately (accurate navigation precision) has Self Protection Measures (SPM) equipment, namely low magnetic, acoustic and pressures, has 4 units of Unmanned Mine Sweeper (UMS) type ROV / AUV which capable of forming a ship signature of magnetism > 100 nT, acoustics > 105 dB and water pressure > 10 Pa. Other technical specifications include being able to onboard 1 helicopter unit which has the ability to transport and drop marine bombs,

Mine development now has reached a smart mine where the mine is able to select the target correctly and accurately, the ship charter system cannot deal with the operational phase of preparation, detection, classification, identification to destruction or neutralization. To improve the capability of the charter ship system in dealing with modern mine warfare based on the results of data processing using the AHP method, the results obtained are that it is necessary to procure new MCM class minehunting vessels. The professionalism of soldiers who have not been effective is because for now they are still operating old equipment with technology that is far behind compared to the development of modern mines today. If the equipment they are facing is old, the professionalism of the soldiers can only be limited to the capabilities of the equipment. To increase the professionalism of soldiers based on data processing using the AHP

method is through the procurement of new minehunting vessels that have modern technology equipment in accordance with current mine developments. With a new ship with modern technology. The function of the degaussing system on military ships to avoid magnetic mines is very important in mine warfare but for now the system degaussing Based on data processing using the AHP method, it produces an alternative priority that must be carried out by procuring a new mine Buru ship with a ship degaussing system that can function properly. Mine ships with a good degaussing system function will be very supportive in carrying out minehunting operations, especially in dealing with mines that have magnetic sensors to attack their targets.

Airborne Mine Counter Measure (AMCM) is an action against mines using an aircraft or helicopter with the following capabilities: Have the ability to minehunting using sonar or laser energy to carry out mine classification and identification as well as the ability to carry out mine neutralization.

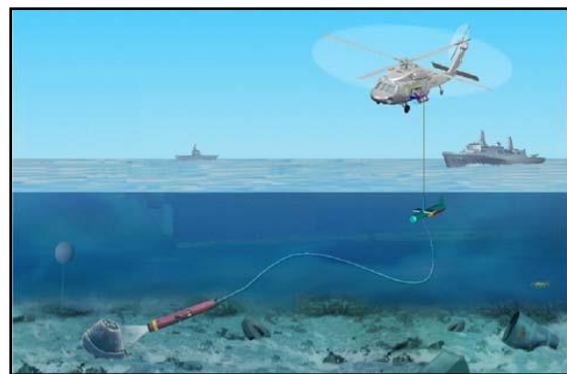


Figure 3. Airborne of MCM

Source: Naval Mine Counter Measure, 2022

Division MCM Assist in carrying out mine action operations, unmanned portable equipment is needed that has the following capabilities: detection it can operate at currents of up to 5 knots, provides high accuracy data with sonar and camera, and is capable of detecting metal under mud. Implementation of classification and identification. Able to provide dimension and shape data from contacts, can hover

and can be operated at speeds up to 5 knots. Implementation of neutralization. Mine Disposal Vehicle (MDV) can carry bombs, can hover and has sonar and camera.

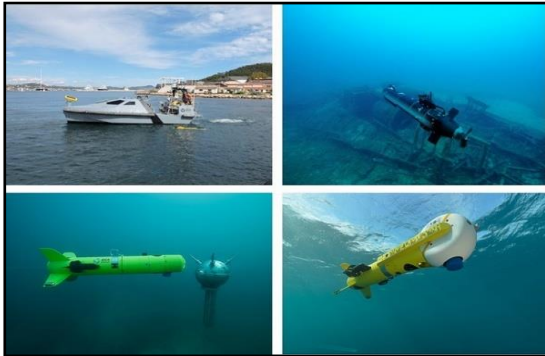


Figure 4. Division of MCM
Source: Naval Mine Counter Measure, 2022

Several countries have developed more effective technologies by utilizing drones or unmanned vehicles/vessels. This is in line with the statement in the Indonesian Defense White Paper that the state's defense posture is realized by developing maritime defense supported by satellite technology and drone systems. This Unmanned Ship is equipped with equipment and sensors with capabilities so that it can carry out mines and neutralize sea mines like a ship (Larson, Bruch, & Ebken, 2006).

Unmanned Vessel is a vehicle ship on water that operates or carries out activities on water without any personnel on board the vehicle (Yan, Pang, Sun, & Pang, 2010). Countries that have developed Shipless technology enabled crew saw how this technology could very effectively carry out operations. This effectiveness is seen from its easy operation, requires less personnel and takes less time in operating procedures. Thus, Unmanned Ships have become one of the solutions that will be very helpful in mine warfare.

CONCLUSIONS, RECOMMENDATION, AND LIMITATION

After carrying out a discussion related to the analysis of the ability of the class mine hunter in dealing with modern mine warfare using the MoE and AHP methods where the

capabilities discussed include the capabilities of the sensor weapon command system, the professionalism and the degaussing system, to study will then provide conclusions on the discussion. The value of the effectiveness of the system capability of the class mine hunter ships based on the results of data processing using the MoE method is 0.0875. Based on data collection from sources, for the sensor weapon command system, the highest weight value is 0.5. This is certainly a natural thing because the role of the sensor weapon command system in a mine operation is very important at every stage of the mining operation. The value of the professionalism of soldiers in class mine hunter based on the results of data processing using the MoE method is 0.089167. For this professionalism, the weight value given based on data collection from sources is 0.2. The value of the effectiveness of the degaussing system of class mine hunter based on the results of data processing using the MoE method is 0.07125. The weight value for the degaussing system itself is 0.3. The function of the degaussing system on military ships to avoid magnetic mines is very important in mine warfare.

To improve the capability of the charter ship system in dealing with modern mine warfare based on the results of data processing using the AHP method, the results obtained are that it is necessary to procure a new MCM class minehunting vessel. The new Minehunting Vessel is expected to have the M-CUBE Mine Counter Measure Management System. To increase the professionalism of soldiers based on data processing using the AHP method is through the procurement of new minehunting vessels that have modern technology equipment in accordance with current mine developments. With a new ship with modern technology, soldiers can improve their professionalism through education and training using the new ship's more modern and sophisticated equipment. Based on data processing using the AHP

method, it produces an alternative priority that must be carried out by procuring a new mine Buru ship with a ship degaussing system that can function properly. Mine ships with a good degaussing system function will be very supportive in carrying out minehunting operations, especially in dealing with mines that have magnetic sensors to attack their targets.

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Appendix

RESPONDENT IDENTITY

1. Group/Corps :
2. Department :
3. Type Sex : a. Man b. Woman
4. Age Moment This :
a. < 25 Year b. 25-25 Year c. 36-45 Year d. > 45 Year
5. Education General Final :
6. Education Military Final :

A. Determine score score

Charging way: Respondent give opinion about effectiveness three aspects which will analyzed that is system sewaco, professionalism and system degaussing on each stages in operation hunting mine that is preparation, detection, classification, identification and destruction. Mark (X) according to your most accurate opinion.

Very Not Effective	Not Effective	Doubt	Effective	Very Effective
VNE	NE	D	E	VE
1	2	3	4	5

NO	STATEMENT	VNE	NE	D	E	VE
1	2	3	4	5	6	7
	System Sewaco					
1	Phase preparation in hunting mine that is with doing checking speed voice use Sound Velocity Meter (SVM) and tes kemexcuse me sonar hunting mine					
2	Fase detection which held is with doing setup parameter sonar cover type mechanical scanning, CAD, scale and hal-halanotherfor could doing pendetesorry in accordance with needs					
3	Fase classification which conducted that is for determine is contact of of got During phase detection is mine-like or non mine-like					
4	Fase identification is for determine object which got in phase classification is mine or no mine. Identification conducted through two cara that is use ROV (Remotely Operated Vehicle) or pun with use diver					
5	Phase destruction held for destroy object which after held identification is in the form of mine (mine)					
	Professionalism					
1	Phase preparation in hunting mine that is with doing checking speed voice use Sound Velocity					

	Meter (SVM) and tes kemexcuse me sonar hunting mine					
2	Fase detectionwhichheld is with doing setup parameter sonar cover type mechanical scanning, CAD, scale and hal-halanotherfor could doing pendetesorry in accordance with needs					
3	Fase classificationwhichconducted that is for determine is contactofofgot During phase detection is mine-like or non mine-like					
4	Fase identification is for determine objectwhichgot in phase classification is mine orno mine.Identification conducted through two cara that is use ROV (Remotely Operated Vehicle) orpun with use diver					
5	Phase destruction held for destroy objectwhichafter held identification is in the form of mine (mine)					
	System Degaussing					
1	Phase preparation in hunting mine that is with doing checking speed voice use Sound Velocity Meter (SVM) and tes kemexcuse me sonar hunting mine					
2	Fase detectionwhichheld is with doing setup parameter sonar cover type mechanical scanning, CAD, scale and hal-halanotherfor could doing pendetesorry in accordance with needs					
3	Fase classificationwhichconducted that is for determine is contactofofgot During phase detection is mine-like or non mine-like					
4	Fase identification is for determine objectwhichgot in phase classification is mine orno mine.Identification conducted through two cara that is use ROV (Remotely Operated Vehicle) orpun with use diver					
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